LE STUDIUM

Loire Valley
Institute for Advanced Studies

SCIENTIFIC REPORT 2015

TABLE OF CONTENT

THE PRESIDENT
EDITORIAL

The year 2015 was marked by a substantial increase in the activities of LE STUDIUM Loire Valley Institute for Advanced Studies and the international visibility of its programmes with the support of the Marie Skłodowska-Curie Actions COFUND from the European Union.

Our main aim remains to contribute to the international renown of the research conducted in the region Centre-Val de Loire and the development of the territory. Hundreds of international researchers have been hosted this year, for stays lasting a few days (Conference, Workshop), week (Consortium) or from several months to the whole year (Fellowship, Chair, Professorship). In residence in 2015 at the University of Orléans, University François-Rabelais of Tours, CNRS, INRA, CEA and Inserm, the researchers found, as result of the environment created by LE STUDIUM, favourable conditions for the success of their project, and more broadly to the enhancement of their stay in the region Centre-Val de Loire.

Serving the regional scientific community, LE STUDIUM describes in this report scientific research activities undertaken by the researchers during their stay. The report seeks to demonstrate the benefits derived from attracting international researchers to the region and how the different instruments offered by LE STUDIUM contribute to desirable outcomes. We were also very careful to report the quality of the professional environment offered to these researchers by our different member organisations in region Centre-Val de Loire.

In keeping with the commitments made by Professor Paul Vigny, founding President of LE STUDIUM, we continued in 2015 the development of LE STUDIUM SMART LOIRE VALLEY PROGRAMME, which includes the original General Programme and the research projects of the Ambition Research Development 2020 programme supported by the Region Centre-Val de Loire, which represents the regional action in the frame of the Smart Specialisation Strategy of the European Union.

Finally, as contained in this report the achievements for 2015 are very positive, thanks to the support of the Regional Council in Centre-Val de Loire, the City of Orléans, the Department of Loiret and the European Regional Development Fund, but also to the support of its members and partners and the quality of work done by the entire team in Orléans and Tours by Professor Nicola Fazzalari Scientific Director, Sophie Gabillet Secretary General, Dr Aurélien Montagu Manager of Scientific Relations, and our staff Marie-Frédérique Pellerin, Vincent Godard, Amélie Schneuwly and Ludovic Michel.

I renew to our members, partners and donors, my sincere thanks for their commitment and to the entire team of LE STUDIUM.

Professeur Ary Bruand
President

L'ÉDITO
DU PRÉSIDENT

L'année 2015 aura été marquée par l'accroissement substantiel des activités du STUDIUM Loire Valley Institute for Advanced Studies et de la visibilité internationale de ses programmes avec notamment le cofinancement des Actions Marie Skłodowska-Curie COFUND de l'Union Européenne.

Notre ambition principale demeure de contribuer au rayonnement à l'international des recherches conduites en région Centre-Val de Loire, ainsi qu'au développement du territoire. La centaine de chercheurs internationaux accueillis cette année, pour des séjours d'une durée de quelques jours (Workshop, Conference), d'une semaine (Consortium), ou encore de plusieurs mois à l'année entière (Fellowship, Chair, Professorship), y a largement contribué. En résidence en 2015 à l'Université d'Orléans, l'Université François-Rabelais de Tours, au CNRS, à l'INRA, au CEA et à l'Inserm, ces chercheurs ont trouvé, grâce à l'environnement créé par LE STUDIUM, des conditions favorables à la réussite de leur projet, et plus largement à la valorisation de leur séjour en région Centre-Val de Loire.

Au service de la communauté scientifique régionale, LE STUDIUM a fait à nouveau le choix de décrire dans ce rapport scientifique l'ensemble des activités de recherche développées par ces chercheurs au cours de leur séjour. Ce choix répond à la volonté de rendre compte de la richesse de tels accueils et de la façon dont les différents instruments proposés par LE STUDIUM y contribuent. Nous avons aussi été très attentifs à faire état de la qualité de l'environnement offert à ces chercheurs par nos différentes organisations membres en région Centre Val-de-Loire.

En continuité avec les engagements pris par le Professeur Paul Vigny, Président fondateur du STUDIUM, nous avons poursuivi en 2015 le développement du LE STUDIUM SMART LOIRE VALLEY PROGRAMME qui inclut le Programme Général initial et les programmes de recherche Ambition Recherche Développement 2020 soutenus par la Région Centre-Val de Loire, contributions à la déclinaison régionale de la Smart Specialisation Strategy de l'Union Européenne.

Enfin, si le bilan de l'année 2015 est très positif, ainsi qu'en atteste le contenu de ce rapport d'activité, c'est grâce au soutien du Conseil Régional Centre-Val de Loire, de la Ville d'Orléans, du Département du Loiret et du Fonds Européen de Développement Régional, mais aussi à l'appui de ses partenaires et membres et à la qualité du travail accompli par l'ensemble de l'équipe tant sur les sites d'Orléans que de Tours par le Professeur Nicola Fazzalari, Directeur Scientifique, Sophie Gabillet, Secrétaire Générale, le Docteur Aurélien Montagu, Chargé de relations scientifiques, et nos collaborateurs Marie-Frédérique Pellerin, Vincent Godard, Amélie Schneuwly, et Ludovic Michel.

Je renouvelle à nos membres, partenaires et bailleurs, mes remerciements les plus sincères pour leur engagement à nos côtés ainsi qu'à toute l'équipe du STUDIUM.

Professeur Ary Bruand
Président

MESSAGE OF THE SCIENTIFIC DIRECTOR

This has been a busy year for LE STUDIUM Loire Valley Institute for Advanced Studies, with our focus remaining on our mission to build the human capacity for research and scientific knowledge for socioeconomic development and innovation. We have the expertise to attract, manage and grow a global research network, create new scientific value chains, and contribute to the emergence of innovative, collaborative research and enterprise activity. The impact of new knowledge on the economy is incremental, but the cumulative effect of these changes is substantial.

In March 2015, LE STUDIUM was awarded a COFUND grant in the category of the Marie Skłodowska-Curie Actions. This European Union Horizon 2020 award will attract an increased number of experienced research fellows to the region Centre-Val de Loire. The award represents the achievement of one of our strategic goals set two and a half years earlier. We accomplished this due to the high level commitment by LE STUDIUM team and the support provided by the Regional Council of Centre-Val de Loire. Under the banner of the SMART LOIRE VALLEY (SLV) Fellowship programme, the five years of funding provided by this award highlights substantial benefits available to all the laboratories of LE STUDIUM members.

The SLV programme seeks to create synergies between disciplines and industry in order to increase diversity and stimulate socioeconomic development. LE STUDIUM's activities contribute to building the human capacity for research in intra- and inter-sectorial, transdisciplinary research domains. The SLV programme will assist outward looking research communities who aspire to the research values of LE STUDIUM: Curiosity, Imagination and Intuition.

This past year, LE STUDIUM attracted and welcomed 22 international researchers from 13 countries, an increase over last year. In June 2015, the Scientific Council recommended a total of 10 awards, including a Research Professorship, Fellowships and Consortia. These awards were across diverse disciplines from the social sciences, natural sciences and engineering at laboratories located in Orléans, Tours, Bourges and Blois.

The format of LE STUDIUM Thursdays has changed to include an introduction by the host laboratory Director or host scientist prior to the presentation by the Research Fellow. This format has been well accepted by both the host laboratory and the research fellows and enables the fellows to gain a deeper understanding of the scope of regional research activities.

LE STUDIUM Conferences continue to attract a large number of leading international researchers to the region Centre-Val de Loire. These conferences are multidisciplinary and are accompanied by dynamic discussion, which often results in new ideas for research and international collaborations.

Public awareness of research being undertaken in the region is important. We live in a time of rapid changes in technology, where the community at large quickly adopts new technologies. The evening Public Lectures, which are linked to LE STUDIUM Research Conferences, keep the local community informed about the research activities in the region. The Lectures have become increasingly popular following the implementation of a new community linked strategy to promote the events.

This past year we have also been pleased to partner with regional laboratories to hold a number of affiliated scientific fora. These partnership events are an important new collaboration between LE STUDIUM and the laboratories of our regional members.

Furthermore, this year's annual report includes stories that demonstrate the local impact of fellowships and the translation of fundamental knowledge into potential socioeconomic outcomes for the region and beyond. These stories show the diverse pathways, involving innovation, taken to translate fundamental research and bridge with the enterprise domain.

The ARD 2020 programmes also continued to evolve, with the launch of the Cosmetosciences programme and final negotiations for the PIVOTS programme. Meanwhile, the Biopharmaceuticals and LAVOISIER programmes were fully operational and LE STUDIUM has developed strong and productive partnerships.

Fundamental research leads to new knowledge, it creates the fund from which the practical application of knowledge must be drawn. LE STUDIUM's mission nurtures this process and innovation, together with the laboratories of our members, to achieve quality socioeconomic outcomes for the region Centre-Val de Loire.

Professor Nicola Fazzalari

Scientific Director of LE STUDIUM

IDENTITY & MISSION

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

The SMART LOIRE VALLEY programme, for the period 2015-2020, will operate with a co-financing from the European Union in the framework of the Marie Skłodowska-Curie Actions - COFUND for the mobility of experienced researchers. This co-funding will increase the number of LE STUDIUM fellowships to be awarded each year.

LE STUDIUM attracts and leads the scientific exchange, network activities and animation of an international faculty of fellows, in order to favour cross-disciplinary exchanges with regional and international scientific communities to build human capacity and scientific knowledge for research, development and innovation.

Since relocation to the city centre of Orléans in the Hôtel Dupanloup, the International University Centre for Research, LE STUDIUM has adapted and responded to the possibilities that have become accessible, particularly for new and deeper interactions with many cities and regional structures and agencies. This location has provided exceptional facilities for researchers and an enhanced international presence in the city of Orléans that strengthens its attractiveness, enabling it to welcome high-level talents in the region Central-Val de Loire. LE STUDIUM relies on the laboratories in the region Centre-Val de Loire to host foreign researchers that can benefit from and contribute to the laboratories and the region's international recognition in various research themes.

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

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

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

THE SMART LOIRE VALLEY PROGRAMMES

The call for applications, open from November each year to February next year, for the period 2015-2020, will operate 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. This co-funding instrument will increase the number of fellowships to be awarded each year.

LE STUDIUM Loire Valley Institute for Advanced Studies attracts experienced researchers and leads the scientific exchange, network activities and animation of an international faculty of fellows, in order to favour cross-disciplinary exchanges with regional and international scientific communities to build human capacity and scientific knowledge for research, development and innovation.

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

THE SMART LOIRE VALLEY GENERAL PROGRAMME*

The call for applications, open from November each year to February next year, is designed to create synergies between academic disciplines and links with the industrial world in order to increase interdisciplinary research and translational research to stimulate socioeconomic development. It promotes intra- and inter-sectorial research that facilitates translational research, which aims to develop outward looking interdisciplinary teams with a reputation in developing the EU economic landscape. LE STUDIUM Research Fellows are evaluated and selected by independent external peer reviewers and an independent Scientific Council to award the best candidates and high added-value research projects. To be eligible, applicant researchers must be national or long-term resident of a country other than France.

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

LE STUDIUM RESEARCH FELLOWSHIP award enables experienced international researchers to work in a host laboratory for one-year. The awards are designed to offer internationally competitive researchers the opportunity to discover and work in nationally accredited laboratories with international renown in the region Centre-Val de Loire.

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

THE ARD 2020 PROGRAMMES

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

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

Thus, the region has supported the strengthening of quality research in a number of domains to foster the development of world-class poles to enhance research and innovation activity in the region: in 2014 ARD 2020 biopharmaceuticals, ARD 2020 LAVOISIER and starting in 2015 ARD 2020 Cosmetosciences and ARD 2020 PIVOTS. LE STUDIUM is an official partner of these ARD 2020 regional programmes.

ARD 2020
BIOPHARMACEUTICALS

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

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

The programme aims to:

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

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

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

Research institutions and Partners

- University François-Rabelais of Tours (Programme leader)
- Centre Inra Val de Loire
- CNRS Centre Limousin Poitou-Charentes
- Inserm
- University of Orléans
- CHRU Tours
- LE STUDIUM Loire Valley Institute for Advanced Studies
- POLEPHARMA Cluster
- GROUPE IMT

ARD 2020
LAVOISIER

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

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

The AlHyance platform is dedicated to joint research efforts (CEA, Universities, CNRS, industrials) in the domain of materials and low carbon energies. The thematics of research are the following: design and materials expertise, safety and effectiveness of the systems, synthesis and characterisation, and methods and implementations. This programme covers activities through research to transfer of technologies and is supported by the Centre-Val de Loire Regional Government with 10.2 M€ over 3 years.

The programme aims to:

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

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

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

Research institutions and Partners

- CEA le Ripault (Programme leader)
- University François-Rabelais of Tours
- CNRS Centre Limousin Poitou-Charentes
- INSA Centre-Val de Loire
- University of Orléans
- LE STUDIUM Loire Valley Institute for Advanced Studies

ARD 2020
COSMETOSCIENCES

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

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

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

1. Cosmétopée and Sustainable Cosmetics,
2. Glycochemistry and Glycobiology
3. Innovation in Formulation, Cellular Tools and Technologies.

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

Research institutions and partners

- University of Orléans (Programme leader)
- University François-Rabelais of Tours
- CNRS Centre Limousin Poitou-Charentes
- Cosmetic Valley Competitiveness Cluster
- LE STUDIUM Loire Valley Institute for Advanced Studies

ARD 2020
PIVOTS

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

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

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

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

Research Institutions and Partners

- BRGM (Programme leader)
- University of Orléans
- CNRS Centre Limousin Poitou-Charentes
- Centre Inra Val de Loire
- LE STUDIUM Loire Valley Institute for Advanced Studies
- DREAM Competitiveness Cluster
- Antea Group

MATERIALS & ENERGY SCIENCES

LABORATORIES IN MATERIALS & ENERGY SCIENCES

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

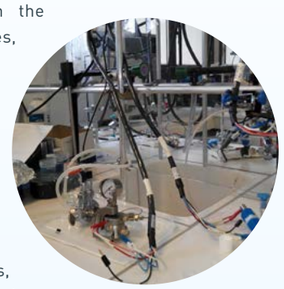
Originally formed in 1969 and then renamed the «Centre de Recherche sur les Materiaux à Hautes Températures» (1998). In 2008, it merged with the Centre d'Etudes et de Recherches par Irradiation laboratory. Its goals are to analyze and understand the physical and chemical properties of materials under 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. The laboratory uses and develops cutting-edge experimentation in high-temperature spectroscopies, non-contact instrumentation, thermic analyses, and irradiation for both materials damaging and characterisation.

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

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

LABORATORIES IN MATERIALS & ENERGY SCIENCES

PHYSICO-CHIMIE DES MATÉRIAUX ET DES ELECTROLYTES POUR L'ENERGIE (PCM2E) - EA 6299 - UNIVERSITÉ FRANÇOIS-RABELAIS DE TOURS



PCM2E was established in 2012 and works in the field of conversion and energy storage (batteries, supercapacitors, photovoltaic hybrid, ionic liquids) on nanostructured materials and organic electrochromic devices. The PCM2E laboratory has 35 people including 14 research professors, and a partnership with the CEA Le Ripault, since 2010. The PCM2E laboratory research projects are available in 3 themes:

1. Electrolytes, membranes and electrode materials for energy storage including Li-ion batteries and supercapacitors, separators for batteries, polymer electrolytes and innovative electrode materials.
2. Organic semiconductors and nanostructured materials including hybrid solar cells, electrochromic devices and nanocomposites.
3. Ionic Liquids including their synthesis and physicochemical and electrochemical studies.

DR RAMASAMY CHANDRASEKARAN

September 2015 to September 2016
FROM University of Madras, India
IN RESIDENCE AT PCM2E, Tours

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

Pr Mériem Anouti
Laboratory Host Scientist

Mériem Anouti is a Professor in physical chemistry, electrochemistry and thermodynamic sciences in the laboratory Physicochimie des matériaux et électrolytes pour l'énergie (PCM2E) at the University François-Rabelais of Tours. Her research focuses on electrolytes for electrochemical energy storage (electrochemical capacitors, lithium-ion and sulfur batteries, and hybrid systems) with a particular emphasis on new ionic liquids. She coordinates numerous ANR, Regional funded and industrial research projects while also supervising PhD students. Her industrial research includes contracting with national and multinational companies. Her international collaborations include laboratories in Ireland, Canada, Germany and Poland.

REDOX-FLOW AND HYBRID ENERGY STORAGE SYSTEMS

The objective of the research project is to find and analyze a suitable electrolyte system in terms of conventional cost effectiveness and adjusting both aqueous and organic electrolyte system behaviours.

It concerns a formulation of electrode materials by intercalated oxide materials, modified activated carbons, composite materials (electrostatic-redox), etc into the advanced energy storage devices like redox flow and hybrid capacitors.

Electric double-layer capacitors (EDLCs) are fabricated by using the aqueous gel based Polyvinyl alcohol and a Li salt. The EDLCs are also examined by using Pyrrolidinium nitrate ionic liquid ($PYRNO_3$). The applied gels are at five different versions namely low to rich type by Li salt, Ionic liquid and its mixture; finally, a hybrid form of the gel (aqueous-organic mix) is also tested.

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

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

DR ARAYIK HAMBARDZUMYAN

FELLOW

September 2014 to December 2016

FROM Yerevan State University, Armenia

IN RESIDENCE AT ICMN, Orléans

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

Dr Marylène Vayer

Laboratory Host Scientist

Marylène Vayer, CNRS researcher, is a chemical engineer graduated from the ENSCS (Ecole Nationale supérieure de Chimie de Strasbourg). She obtained her PhD at the University of Nancy I, in Material Science in1987 and her HDR in 2002. She has expertise in surface and interface science. She works on phenomena involving surfaces and interfaces such as catalysis, ion implantation and the nanostructure of polymers in thin films.

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

Fuel cells (FCs) are electrochemical devices that produce electrical energy from the chemical energy of a fuel and oxygen. Although the most common fuel is hydrogen, other fuels, such as methanol, are also used. Hydrogen contains more energy per unit weight than any other fuel.

The advantage of electricity generation from hydrogen via a FC is evident if electrical energy is used directly (e.g. in domestic power supplies, communication equipment, electronic devices, and portable electronics) rather than indirectly to generate mechanical movement. Since the 1960s, FCs have been used to power numerous mechanical and electronic systems, from spacecraft systems to electric vehicles, submarines, and portable electronics.

One of the crucial steps in the fabrication of FCs is the preparation of mechanically resistant polymers films, which are the most commonly used materials for polymer electrolyte applications in lithium batteries due to their cationic solvatation ability.

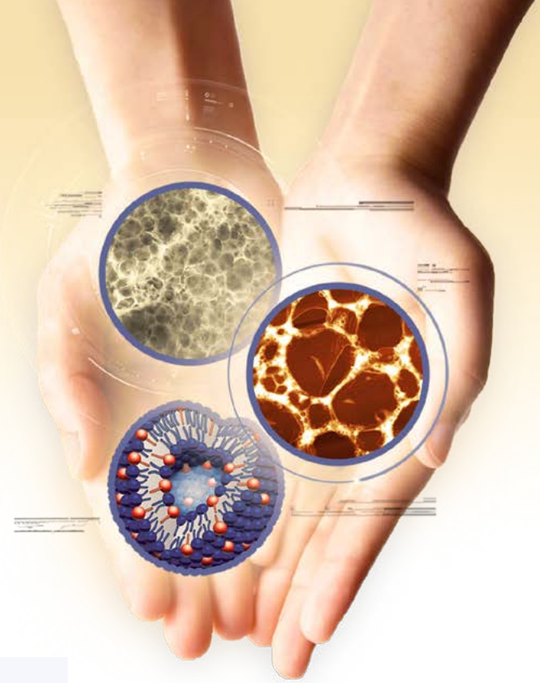
The purpose of this study is to investigate a new way of processing cellulose whiskers reinforced polymer based on the introduction of cellulose nanocrystals (CNs) in the matrix of the polymer.

However, from a practical point of view, the processing of a composite polymer electrolyte from an aqueous suspension of cellulose whiskers (generally, cellulose whiskers are obtained during an acidic hydrolyze of micro-fibrils of cellulose in aqueous medium) is not easy, since water is not miscible with the solvent of polymers (generally organic or hydrophobic solvent).

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

LE STUDIUM CONFERENCE

Arayik Hambardzumyan at ICMN Laboratory



LE STUDIUM

CONFERENCES

Bioinspired molecular assemblies as protective and delivery systems

The conference was intended to promote cross-disciplinary fertilization of new ideas in this emerging field and create a cohesive community by promoting interactions between scientists from various countries. This conference enabled the establishment of contacts with a number of scientists, who work in the field of surfaces and interfaces and served as a solid base to create an international scientific network. This observation was also shared by many of the invited speakers.

LE STUDIUM

LECTURES

Qualités et facteurs de qualité du champagne

Dr Roger Douillard, formely centre Inra Nord-Picardie-Champagne

Champagne aims to meet the needs of those who consume it but this is an exceptional product, adapted to circumstances that come most often from the ordinary. Champagne's most desired qualities are its organoleptic qualities that generate pleasure during tasting. However, the psycho-social qualities of champagne should not be neglected and we can summarize an important aspect through the maxim: it is champagne as Champagne. It is the reputation of the designation of origin and the prestige of tradition. The qualities attributed to champagne also occur through the intrinsic qualities of the Champagne terroirs and nourishment provided by the countryside to the vines. This exceptional wine, excellently prepared since the 18th century, champagne never stops improving its quality. Virtually all the factors involved first in the production of grapes, in protecting the environment, in developing the quiet wine fermentation, and second the excitement in the aging of wine, in the choice of the bottle and its packaging, in its distribution, and protection of the PDO (Protected Designation of Origin) influence the qualities of champagne. Finally, the ongoing work to promote quality is desired and implemented by all wine growers and Champagne houses organized in their unions and associations and with a common tool: the "Champagne Committee".

Visit of the ICMN laboratory

LE STUDIUM CONFERENCE

Equipment at ICMN Laboratory

PR SCOTT KROEKER

FELLOW

August 2014 to August 2015

FROM Department of Chemistry, Winnipeg, Manitoba, Canada

IN RESIDENCE AT CEMHTI, Orléans

Scott Kroeker is a professor of chemistry at the University of Manitoba, Canada. After an M.Sc. in physical organic chemistry (Manitoba, 1995) and a PhD in physical and theoretical chemistry (Dalhousie, 1998), he joined the department of Geological and Environmental Sciences at Stanford University as an NSERC postdoctoral fellow. Since joining the faculty at the University of Manitoba in 2001, he has established a multidisciplinary research program focusing on the use of solid-state NMR to discern structure-property relationships in disordered inorganic materials including coordination polymers, minerals and glasses. He was an EPSRC visiting professor in Mineral Physics at the University of Cambridge (2007/08), is a founding member of the Manitoba Institute of Materials, and serves on the international advisory boards of several conferences in glass science and nuclear waste disposal.

Dr Pierre Florian

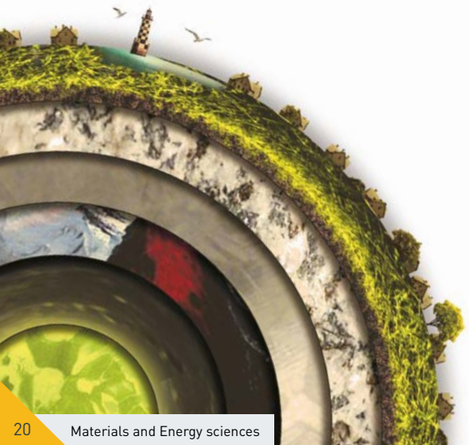
Laboratory Host Scientist

Pierre Florian received an engineer degree from l'École Supérieure de l'Énergie et des Matériaux, University of Orléans and a PhD in physical chemistry at University of Orléans (1993). After two years as a postdoctoral researcher at Ohio State University (U.S.A.), he joined the CNRS in 1996. He currently manages the NMR platform (6 instruments in the network of Infrastructures de Recherche Résonance Magnétique Nucléaire, Très Hauts Champs - TGIR RMN THC - FR3050) at the CEMHTI. His research focuses on developing *in-situ* high temperature and high-resolution NMR experiments with applications to materials science. He currently has more than 80 publications in peer-reviewed journals, has given several invited talks at international conferences, has been part of European programs (Research Infrastructure, Large Scale Facilities and Marie Curie Training Sites) and has taught at several summer schools.

HIGH-TEMPERATURE NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY OF DEVITRIFICATION PROCESSES IN NUCLEAR WASTE GLASSES

The motivation for this work stems from the significance of nuclear power as an important component of our current global energy portfolio. A key obstacle to widespread acceptance of nuclear power is the disposal of radioactive waste after fission. Despite effective engineering solutions and materials carefully designed to isolate the waste from interaction with the biosphere, the extremely long time-scale of radioactive decay demands the highest degree of reliability. Although some radioisotopes decay to safe levels after a few hundred years, many remain radioactive for hundreds of thousands of years, dwarfing the life-spans of cities and civilizations. In view of this long-range perspective, utmost attention must be devoted to ensuring that the materials used to lock up radioactive species remain intact effectively forever. For this reason, highly durable borosilicate glasses are used to encapsulate the radioactive waste products that result from reclaiming unused fuel from spent-fuel rods. Encased in stainless steel canisters, these glasses are able to withstand all manner of environmental incursions, retaining the dangerous ions within the robust network of the solid.

However, recent innovations in nuclear fuels have introduced elements into the front end of the fuel cycle, which improve energy efficiency but tend to resist complete incorporation into the glassy phase at the back end of the cycle, resulting in the separation of less-durable phases from the bulk glass. While the current practice is to reduce fuel-loading levels sufficiently to prevent such phase separation, the human and environmental health imperative demands a comprehensive understanding of such processes. This research project relies on nuclear magnetic resonance (NMR) spectroscopy to determine the chemical phases involving molybdenum in borosilicate model nuclear waste glasses at temperatures ranging from ambient, where the materials exist as solids, to 1000°C, where they are liquids. The most direct approach to studying molybdates in these complex materials is by the NMR spectroscopic observation of 95Mo, a challenging nuclide best probed by high magnetic fields in samples which have been isotopically enriched. Successful enrichment of glasses and partially crystallized glasses has been verified by 95Mo magic-angle spinning NMR experiments at ultrahigh fields at CEMHTI, and protocols for routine NMR experiments were established during the course of his tenure. Complementary calculations of molybdate phases likely to be present in these materials predict that the NMR characteristics are distinct and amenable to identification and quantification. By defining the structures and amounts of each distinct phase as a function of temperature, the mechanism of phase separation during the formation of nuclear waste glasses can be discerned, thereby providing a scientific basis for developing chemical solutions to improve the incorporation of molybdenum in nuclear glasses and ensure their long-term durability.



LE STUDIUM
CONFERENCES

Nuclear Waste Disposal: Designing Materials for the End of Time

This conference drew specialists together in various aspects of nuclear waste immobilization ranging from atomic-level characterisation of wasteforms to global health and safety, to focus on the role of fundamental science in long-term radioactive waste disposal. Speakers contributed not only as experts in their own fields, but also as citizens who have thought carefully about the larger societal context and implications of their research. With an emphasis on communicating results across disciplinary boundaries, valuable interchanges spanning from molecular to planetary length scales stimulated new ideas and strategies for the future of nuclear waste disposal. The sessions were enlivened by vigorous discussions about unresolved questions relating to long-term glass dissolution and how best to investigate such critical issues. Facilitated and spontaneous discussions addressed detailed analyses of experimental data and promoted contemplation on the limits of science in planning for the unforseeable future.

LE STUDIUM
LECTURES

La vitrification des déchets nucléaires La saga d'un succès français

Professor Etienne Vernaz is Director of Research at CEA (Marcoule) and Professor at the Institut National des Sciences et Techniques Nucléaires (INSTN).

Pr Vernaz is the founder of the public nuclear education centre, Visiatome, and plays an active role at the interface between society and technology. His presentation, entitled, "La vitrification des déchets nucléaires: La saga d'un succés français," described how decades of fundamental scientific research underly nuclear waste policy and technology in France. In our present climate of energy uncertainty and media hysteria, accessible accounts of decisive scientific results are essential to frame and guide public discourse about nuclear power, facilitating clarity about what is understood and what challenges remain for research and development.

AROUND THE PROJECT

Oral Communications

- Kroeker, S. Expanding the NMR palette: multinuclear magnetic resonance of glasses, coordination polymers and paramagnetic phases, Seminar of Institut de Chimie de la Matière Condensée de Bordeaux, Pessac (France), June 29, 2015.
- Kroeker, S. High-Temperature NMR Spectroscopy of Phase Separation in Model Nuclear Waste Glasses, American Ceramic Society Glass and Optical Materials Division and Deutsche Glastechnische Gesellschaft Joint Annual Meeting, Miami (USA), May 17-21, 2015.
- Kroeker, S. Through a Glass Darkly: How NMR Spectroscopy is Improving Nuclear Waste Disposal, Presentation to the Unité de Catalyse et Chimie du Solide, Université de Lille, Lille (France), April 17, 2015.
- Kroeker, S. Through a Glass Darkly: How NMR Spectroscopy is Improving Nuclear Waste Disposal, Presentation to the Department of Chemistry, University of York, York (UK), March 12, 2015.
- Kroeker, S. Through a Glass Darkly: How NMR Spectroscopy is Improving Nuclear Waste Disposal, Presentation to the Department of Chemistry, University of Liverpool, Liverpool (UK), March 11, 2015.
- Kroeker, S. Expanding the NMR palette: multinuclear magnetic resonance of coordination polymers and paramagnetic phases, Presentation to the Department of Inorganic Chemistry, University of Oxford, Oxford (UK), March 9, 2015.

LE STUDIUM CONFERENCE

LE STUDIUM CONFERENCE

LE STUDIUM LECTURE

LIFE & HEALTH SCIENCES

Laboratories

Fellows

Consortia & Events

LABORATORIES IN LIFE & HEALTH SCIENCES

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

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

INFECTIOLOGIE ANIMALE ET SANTÉ PUBLIQUE (ISP) - UMR 1282 - CENTRE INRA VAL DE LOIRE - UNIVERSITÉ FRANÇOIS-RABELAIS DE TOURS

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

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

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

LABORATORIES IN
LIFE & HEALTH SCIENCES

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

ICOA is a joint research unit of CNRS and University of Orléans. It originates from successive combinations of bio, organic and analytical chemistry labs from Orléans campus.

The story dates back from 1969, when Pierre Sinaÿ founded the Structural Biochemistry Laboratory (LBS), a lab directed towards the synthesis of carbohydrates and related molecules. At this time, the Laboratories of Organic Chemistry and of Physical Organic Chemistry and Chromatography headed respectively by Gérald Guillaumet and Michel Dreux merged to give the Bioorganic and Analytical Chemistry Laboratory (LCBA). LCBA and LBS merged in 1995.

The main objective of the laboratory's research activities is the discovery of novel bioactive molecules having potential applications as drugs or as components of cosmetic formulation. The scientific approaches to these new molecules involve design by molecular modelling techniques, preparation by organic synthesis, with a particular emphasis on heterocyclic compounds, carbohydrate derivatives and nucleoside analogs, extraction from plant material using high performance separation techniques and mass spectrometry analysis, and by chemo-enzymatic methods.

ICOA has numerous collaborations and partnerships in the region Centre-Val de Loire, with other research laboratories such as CBM (CNRS UPR 4301), forming with this laboratory a Research Federation (FR2708), with CEA (ICOA is correspondent academic laboratory LRC M09), with many companies and through Clusters of Competitiveness.

By its important scientific productivity, ICOA is a research laboratory having achieved national and international recognition. Since 2012, ICOA has been a member of two Laboratories of Excellence (LABEX), SYNORG and IRON.

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

The GICC laboratory created in 2008 is a joint research unit located in Tours, which is certified by the CNRS and University François-Rabelais of Tours. It is a mixed joint unit focusing on the pathophysiological mechanisms of disease, in order to set up and personalize new therapeutics. Previously headed by Yves Bigot and Marie-Claude Viaud-Massuard, its current director is Gilles Paintaud (2012-2017).

The research focuses on the pathophysiological mechanisms of cancer (notably leukaemia and cancers of the digestive tract), the immuno-inflammatory diseases, and on the personalisation of medicines. In the field of the optimisation of therapeutics, the team studies the immuno-pharmacology of therapeutic antibodies by both biological and mathematical approaches using pharmacokinetic and pharmacokinetic-pharmacodynamic modelling.

LABORATORIES IN
LIFE & HEALTH SCIENCES

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

The Centre of Molecular Biophysics (CBM) is a key participant in the development of biophysics in France, and is one of the largest research laboratories in the region Centre-Val de Loire. It was founded in 1967 to set up interdisciplinary collaboration between chemists, biologists and physicists. Since 2003, the CBM has developed a new, complementary research direction with the establishment of an imaging platform, involving several research groups. This includes various imaging modalities (MRI, visible and near IR optical). This platform is an integral part of a large-scale and global development supported by the region. The CBM undertakes research in the field of coordination chemistry of lanthanides, associated with the design and characterisation of MRI contrast agents and agents for biophotonics. The CBM has high level MRI and optical imaging equipment for small animals. Dr Éva Jakab Tóth who is an internationally recognized researcher in the field of lanthanide coordination chemistry related to biomedical applications leads the host laboratory. She has been active in the design and physical-chemical characterisation of Ln^{3+} chelates as MRI contrast enhancing agents with a special focus on understanding the relationships between chemical structure and MRI efficacy of Gd^{3+} complexes. She has wide experience in designing highly efficient and smart MRI imaging probes based on lanthanide complexes. Recently, she reported responsive agents for the detection of enzymatic activities, extracellular Ca^{2+}, neurotransmitters, etc. and she also interested in novel chelator structures for stable Gd^{3+} complexation, which ensure optimal relaxation properties.

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

The mixed research unit of Inserm and the University François-Rabelais of Tours has international recognition in research at the interface between cancer and nutrition. The team was the first to link diet-related changes in the lipidome of breast associated adipose tissue to breast cancer development and metastasis. The role of lipids on cancer development and progress is examined at the structural, metabolic and physiological levels. The laboratory is specialized in lipid biochemistry and metabolism as well as in breast and prostate cancer, cancers frequently associated with bone metastases.

The research is multidisciplinary and focuses on the transversal interaction between medicine, pharmacology and sciences. The N2C researchers explore different modes of molecular and cellular actions and, the impact of specific lipids on mitochondrial function, cancer cell lines and, the relationships between tumor and its host. This knowledge may benefit patients who have chemical-resistant and/or metastasized cancers.

DR PETER ARENSBURGER

FELLOW

December 2013 to September 2014 and June -July 2015

FROM California State Polytechnic University, Pomona, USA

IN RESIDENCE AT PRC, Nouzilly

Peter Arensburger is Assistant Professor at the California State Polytechnic University in Pomona California, USA. His laboratory is mainly focused on bioinformatic analysis of whole genome sequences.

His professional achievements include authorship of 24 manuscripts including 5 manuscripts in Science and 1 in Nature.
He has recently been the recipient of the Provost Teacher-Scholar award at the California State Polytechnic University, Pomona.

Dr Yves Bigot

Laboratory Host Scientist

Yves Bigot is a CNRS Research Director and the former Head of UMR CNRS 6239 (2000-2009). Since January 1st, 2012, he is the Head of the research team PGEP at PRC. His main international projects include: FP6: LSHB-CT-2005-018716, NSF: INT-9726818, AFM Franco-Swiss N°14020, 14509. He has published 97 papers in peer reviewed International journals, 11 book chapters, has given 49 oral communications (Congresses and workshops; 23 invitations), and holds 7 patents.

REVIEW OF TRANSPOSABLE ELEMENT TAXONOMY, IDENTIFICATION OF FLAWS IN THE CURRENT TAXONOMY AND FRAMEWORK FOR THE ESTABLISHMENT OF A REVISED TAXONOMIC SYSTEM

The ambitions of this project are vast. A formal taxonomic system for transposable element classification originated nearly 25 years ago with the work of D. J. Finnegan.

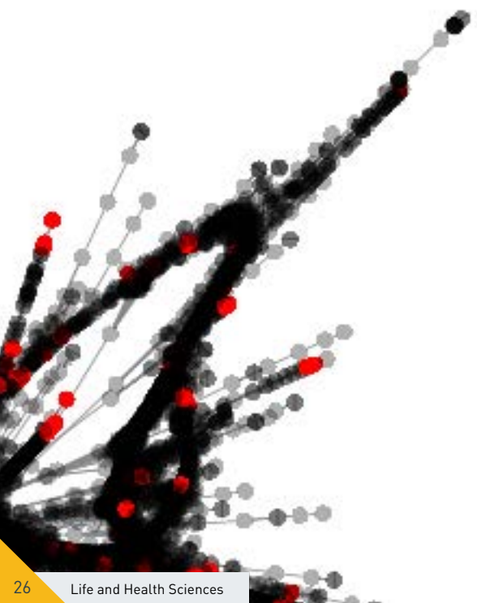
While this system has been updated and perfected over the years, the basic outlines of the Finnegan taxonomy are still in use today by nearly all researchers working on eukaryotic transposable elements.

However, a number of flaws in this taxonomic scheme have been identified over the years, particularly as new data have demonstrated that some of its fundamental assumptions are inconsistent with transposable element evolutionary history.

Therefore, one of the ambitions of this project is to identify and summarize the flaws of the existing transposable element taxonomy, and to propose a framework for the establishment of a new system, more closely reflecting evolutionary history, by groups of qualified researchers.

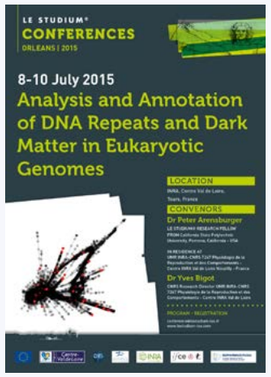
A manuscript describing the state of transposable element taxonomy today and a proposal for the establishment of a consortium to address the problems of current transposable element taxonomy has been prepared.

Furthermore, they have opened communication regarding the problem of transposable element taxonomy with several influential scientists in this field.



LE STUDIUM
CONFERENCES

Analysis and Annotation of DNA Repeats and Dark Matter in Eukaryotic Genomes



The objective of this international conference was to identify and summarize the flaws of the existing transposable element taxonomy and propose a framework for the establishment of a new system, more closely reflecting evolutionary history, by groups of qualified researchers

LE STUDIUM
LECTURES

Éléments transposables, la partie cachée des génomes

Peter Arensburger is Assistant Professor at the California State Polytechnic University in Pomona California, USA.

A general understanding of transposable elements, an important part of our genome, is fundamental to any intelligent citizen to better understand genetics at large.

This Public Lecture aimed at highlighting the relevance of the transposable elements study in the genomes.

AROUND THE PROJECT

Oral Communications

- Arensburger, P. - Éléments transposables, la partie cachée des génomes, LE STUDIUM Lectures, Tours (France), July 8, 2015.
- Piégu, B.; Bire, S.; Arensburger, P.; Bigot, Y. A survey of transposable element classification systems – A call for a fundamental update to meet the challenge of their diversity and complexity, LE STUDIUM Conference, Analysis and Annotation of DNA repeats and Dark Matter in Eukaryotic Genomes, Tours (France), July 10, 2015.

Scientific publications

- Piégu, B.; Bire, S.; Arensburger, P.; Bigot, Y. A Survey of Transposable Element Classification Systems - A Call for a Fundamental Update to Meet the Challenge of Their Diversity and Complexity, *Molecular Phylogenetics and Evolution*, **2015**, *86*, 90–109.

LE STUDIUM CONFERENCE

LE STUDIUM CONFERENCE

LE STUDIUM CONFERENCE

PR ROBIN BEECH

FELLOW

September 2013 to September 2014 and February 2015

FROM McGill University, Canada

IN RESIDENCE AT ISP, Nouzilly

Robin Beech graduated BSc in Genetics and Biochemistry, in Nottingham University, Scotland in1983. He was awarded his PhD in Molecular Population Genetics, in Edinburgh University, Scotland in 1987.

He then worked as a post-doctoral fellow at the University of Alberta and McGill through the years1987-1992 and 1992-1993. Since 1993, Robin Beech has been an Associate Professor, at the Institute of Parasitology, McGill University and is recognized as a leading expert in the fields of genetics and anthelmintic resistance in parasitic nematodes.

Dr Cédric Neveu

Laboratory Host Scientist

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

NICOTINIC RECEPTORS IN PARASITIC NEMATODES: A PHARMACOLOGICAL TARGET FOR NEXT GENERATION ANTHELMINTICS

Our goal was to combine bioinformatics, evolution, protein modelling and computer docking, cloning, *in vitro* expression and characterisation to build a new approach for identifying new, parasite specific drug targets from the acetylcholine receptors that respond to nicotine.

Computer models of three nicotine receptors and two morantel receptors were built and manual adjustment allowed predictions of nicotine and nornicotine binding that were proportional to the experimental EC_{50} values that estimate the strength of drug binding in the lab.

This was a major advance in a case where the crystal structure of a receptor protein is not yet available. To achieve this, the ACR-16 receptor was cloned and expressed in Xenopus ovocytes for three different related species of nematode parasite. We were also able to provide a structural explanation for why the morantel receptor can respond to morantel while other nicotinic acetylcholine receptors cannot.

The ACR-16 receptor from an additional four species has now been expressed and we continue to generate binding data for these receptors as well as new compounds for all the receptors we have in hand. Once the data is complete, this will be used to further refine the computer models ready for a computer screen for compounds likely to be specifically active against the parasite receptors in a library of nicotine derivative drugs synthesized at INRA.

A new innovation we were able to develop during the year was to use genome sequence data from more than 50 different species of nematode to identify evolutionary signals to provide guidance on the expression of functional acetylcholine receptors in target species.

We had previously cloned the ACR-21 receptor subunit but were unable to produce any functional receptor. We were able to identify the LGC-4 subunit as a likely candidate to form a combined receptor with ACR-21. Initial experiments confirmed

Robin Beech during his LE STUDIUM CONFERENCE

that indeed a new receptor is produced that has a unique profile of response to a panel of different anthelmintic drugs.

Previously, we had jointly identified a set of gene duplications that suggest an expanded set of potential drug target receptors in the parasites of farm animals, including sheep and goats. Extending our sequence-based analysis we were able to show that the evolutionary rate was significantly different among these copies. This novel approach matched data on receptor characteristics we generated in the laboratory. Together, this work shows a level of detail of nicotinic receptor function that was not possible before. We are now in a position to identify the sequence specific signals of receptor assembly. This is particularly important since we have recently shown that apparently similar receptors from closely related species show specific differences in receptor assembly that affect their response to different anthelmintic drugs.

This same approach has identified gene duplications in the filarial nematode parasites that cause disease in humans and companion animals and we are beginning to investigate these for their potential as new drug targets.

Picture of a Nematode

AROUND THE PROJECT

Oral Communications

- Beech, R. N.; Duguet, T.; Charvet, C.; Neveu, C. Evolutionary mechanisms and functional implications for ion-channel anthelmintic drug targets, Molecular and Cellular Biology of Helminth Parasites, Hydra (Greece), August 31 - September 5, 2015.
- Duguet, T.; Charvet, C.; Forrester, S.; Wever, C.; Dent, J.; Neveu, C.; Beech, R. N. Functional diversification of levamisole receptors in the trichonstrongylid nematode, Haemonchus contortus, Molecular and Cellular Biology of Helminth Parasites, Hydra (Greece), August 31 - September 5, 2015.
- Duguet, T.; Charvet, C.; Forrester, S.; Wever, C.; Dent, J.; Neveu, C.; Beech, R. N. Levamisole receptors: the impact of gene duplication in Haemonchus contortus, World Association for the Advancement of Veterinary Parasitology, Liverpool (UK), August 16-20, 2015.

Scientific publications

- Lynagh, T.; Beech, R. N.; Lalande, M. J.; Keller, K.; Cromer, B. A.; Wolstenholme, A. J.; Laube, B. Molecular basis for convergent evolution of glutamate recognition by pentameric ligand-gated ion channels, *Sci. Rep.*, **2015**, *5*, 8558.
- Beech, R. N.; Neveu, C. The evolution of pentameric ligand-gated ion-channels and the changing family of anthelmintic drug targets, *Parasitology*, **2015**, *142*, 303-317.
- Baur, R.; Beech, R. N.; Sigel, E.; Rufener, L. Monepantel irreversibly binds to and opens Haemonchus contortus MPTL-1 and Caenorhabditis elegans ACR-20 receptors, *Molecular Pharmacology*, **2015**, *87*, 96-102.

LE STUDIUM CONFERENCE in 2014

LE STUDIUM CONFERENCE in 2014

DR CHARLES SENNOGA

FELLOW

September 2013 to December 2015

FROM Imperial College of London, United Kingdom

IN RESIDENCE AT IC, Tours

Charles Sennoga read Chemistry at the University of London and obtained a PhD in the same subject from Imperial College London where he developed X-ray instrumentation for the time-resolved study of lyotropic systems. He has held adjunct postdoctoral positions at the Medical Research Council/Clinical Sciences Centre at the Hammersmith Hospital in London as well as the Chemistry and Bioengineering departments at Imperial College London. After his PhD his discipline hopped to the life sciences interface where his chemistry background allowed him to engineer diagnostic and therapeutic tools for the non-invasive investigations of cellular and molecular events involved in normal and pathologic processes. His current research interests focus on the characterisation of blood flow in brain aneurysms; the engineering, optimisation and implementation of macromolecular tools for targeted imaging; and noninvasive, site-specific drug and gene delivery using ultrasound and microbubbles.

Dr Ayache Bouakaz

Laboratory Host Scientist

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

TARGETED DRUG DELIVERY TO THE BRAIN

This project is concerned with the development of non-invasive, non-viral and site-specific drug delivery technologies for the treatment and/or therapeutic management of malignant brain tumours, neurodegenerative disorders (such as Alzheimer's and Parkinson's disease) and other disorders of the central nervous system for which drug transport from the bloodstream to the brain is a key limitation. In the present research, drug targeting technologies based on microbubbles (ca. 3/1000 of a millimetre in diameter) in conjunction with focused ultrasound have been developed, such that large (>50 kDa) drug molecules that are usually precluded from crossing the blood-brain-barrier (BBB) can be site-selectively and efficiently delivered, without the use of invasive craniotomy or viral vectors.

The BBB drug targeting technologies developed in this work involved the engineering of what can be described as «artificial viruses» comprising non-immunogenic lipids and targeting protein ligands, with the therapeutic drug packaged in the interior of the drug delivery vehicle, called PEGylated immunoliposomes (PILs).

These drug-carrying PILs are usually 1/10000 of a millimetre in diameter and, are relatively invisible to the body's immune system, which normally removes foreign particulates such as liposomes from the bloodstream.

The surfaces of our PILs are decorated with antibodies, peptides or small molecular (ligands) that recognise with high specificity, vascular receptors (such as transferrin and insulin) expressed on the BBB of individuals with brain disorders.

These ligands facilitate adhesion of PILs onto the BBB via specific ligand-receptor interactions. In our formulations hundreds of such PILs are tethered to gas-filled microbubbles.

Due to the compressibility of their gaseous interiors, microbubbles act as ultrasound contrast agents, when intravenous injected into the bloodstream, by allowing their location within the vasculature and that of the tethered drug carrying

Ultrasound imaging

PILs to be identified using ultrasound imaging. Perhaps most significantly, the technology we have developed allows us to elevate the ultrasound pressures used, which in turn, potentiates drug release from PILs and its transmigration, across the BBB into the brain tissue (via sonoporation processes) where the drug molecules can therapeutically act on the tumour or brain lesion targeted.

Targeting microbubbles decorated with PILs that are capable of selectively and specifically attaching to transferrin expressed on the BBB have been successfully developed using thiol-maleimide chemistry, which has advantages in terms of immunogenicity over biotin-streptavidin, used in most conjugation studies. PILs comprising non-immunogenic lipids and targeting ligands have been developed and subsequently loaded with Lucifer Yellow (LY) or FITC-dextran (FD).

Targeting microbubbles decorated with PILs loaded with LY have been optimised and evaluated for their ability to deliver variously sized molecules i.e., LY (0.45 kDa) or FD (9.4 kDa) across human Cerebral Microvascular Endothelial cell line (hCMEC/D3) following ultrasound activation. Finally, our highly promising drug delivery protocol has been trialled in the rat model which shows the targeted delivery of Evans Blue in the brain parechyma.

Dr Charles Sennoga during his LE STUDIUM CONFERENCE in 2014

AROUND THE PROJECT

Oral Communications

- Sennoga, C. A.; Zeghimi, A.; Ganeshamoorthy, K.; Couraud, P.; Romero, I.; Weksler, B.; Bouakaz, A. Optimisation of ultrasound-microbubble mediated drug transport in a new and realistic model of the human blood-brain barrier in vitro, IEEE International Ultrasonics Symposium, Taipei (Taiwan), October 20-24, 2015.
- Sennoga, C. A. Microbubble Contrast Agents: from laboratory bench to clinic, Bioinspired molecular assemblies as protective and delivery systems, LE STUDIUM CONFERENCES, Orléans (France), September 7-9, 2015.
- Kanbar, E. ; Fouan, D. ; Sennoga, C. A. ; Bouakaz, A. Observation d'un retard dans la réponse du sous-harmonique dans une population de microbulles, JAPSUS 2015 XIVèmes Journées d'Acoustique Physique Sous-marine et UltraSonore, Blois (France), June 24-26, 2015.
- Zeghimi, A.; Sennoga, C. A.; Couraud, P.; Romero, I. A.; Weksler, B.; Bouakaz, A. In vitro optimisation of Lucifer yellow transport in a new model of the human blood-brain barrier, International Society for Therapeutic Ultrasound, Utrecht (The Netherlands), April 15-18, 2015.

Posters

- Sennoga, C. A.; Kanbar, E.; Bouakaz, A. An ImageJ Plugin for the Sizing and Counting of Microbubbles, IEEE International Ultrasonics Symposium, Taipei (Taiwan), October 20-24, 2015.

Scientific Publications

- Auboire, L.; Tranquart, F.; Ossant, F.; Sennoga, C. A.; Bouakaz, A. Impact of sonothrombolysis on in vitro blood clot: pictographic validation with electron microscopy, *Ultraschall Med.*, **2015**, Sep 2.
- Jafar, F.; Leow, C. H.; Garbin, V.; Sennoga, C. A.; Tang, M. X.; Seddon, J. M. Surface charge measurement of SonoVue™, Definity® and Optison®: A comparison of laser Doppler electrophoresis and micro-electrophoresis, *Ultrasound Med. Biol.*, **2015**, *41*, 2990-3000.
- Yeh, J. S.; Sennoga, C. A.; McConnell, E.; Eckersley, R.; Tang, M. X.; Nourshargh, S.; Seddon, J. M.; Haskard, D. O. A targeting microbubble for ultrasound molecular imaging, Nihoyannopoulos P. *PLoS One*, **2015**, *10*, e0129681.
- Yeh, J. S.; Sennoga, C. A.; McConnell, E.; Eckersley, R.; Tang, M. X.; Nourshargh, S.; Seddon, J. M.; Haskard, D. O.; Nihoyannopoulos, P. Quantitative ultrasound molecular imaging. *Ultrasound Med. Biol.*, **2015**, *41*, 2478-96.

DR KATHLEEN CAMPBELL

FELLOW

February 2014 to December 2014 and November 2015

FROM University of Auckland, New Zealand

IN RESIDENCE AT CBM, Orléans

Kathleen Campbell is an Associate Professor in the Earth Sciences programme, School of Environment, University of Auckland, New Zealand. She was designated an "A" grade researcher in a national assessment. Her prestigious grant awards include those from the Royal Society New Zealand Marsden & Charles Fleming Senior Scientist funds; NZ Ministry for Business Innovation & Employment; The National Geographic Society; Petroleum Fund of the American Chemical Society; and Germany's national BMBF for marine geology research. She was voted the 2009 Hochstetter Lecturer (Geoscience Society of New Zealand) and 2011 Burbidge Lecturer (Astronomical Society of New Zealand). She has published 73 book chapters and international science journal articles. Kathleen Campbell has supervised 60 graduate students, delivered 60 invited lectures, and held 20 media interviews.

Dr Frances Westall

Laboratory Host Scientist

Frances Westall is a geologist with a 30-year experience working in the field of geomicrobiology and is interested principally in the oldest fossil traces of microbial life in terrestrial rocks and the search for traces of life (microbial) on the planet Mars. She has worked in a number of European countries and also the USA (NASA) and South Africa her place of birth. Since 2003 she is head of the Exobiology Research Group at the CNRS Centre de Biophysique Moléculaire. She now leads the group's activities in the field of prebiotic chemistry as well as in geology and geomicrobiology. Frances Westall has an international reputation for her work on the fossilization of microorganisms, the oldest traces of life on Earth, and life on Mars. She is frequently a member of international study groups and committees dealing with these subjects (e.g. ESA, NSF, ESF, EU) and is currently president of the European Astrobiology Network.

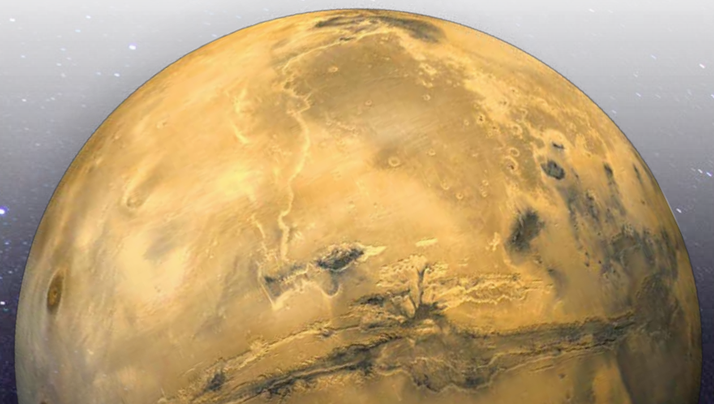
THE IMPORTANCE OF HYDROTHERMAL SYSTEMS FOR EARLY LIFE

The project seeks to answer the following questions.

- What was the nature of microbial activity in the vicinity of the oldest known hydrothermal systems?
- Is it possible to document the distribution of different fossilized microbial life forms around such systems?
- Was there a relationship between hydrothermal systems and photosynthetic and chemotrophic communities?

We are using a dual approach to answer these questions through studies of geologically young, silicifying hydrothermal systems (New Zealand, Argentinean Patagonia) and comparisons with ~3.53Ga - old systems from Barberton, South Africa.

Our results also will be of interest in the search for traces of past and/or present life on Mars where recent finds of silica by the Mars Exploration Rovers (MERs) and by orbital measurements have been attributed to hydrothermal influences.



LE STUDIUM
WORKSHOP

Habitats and inhabitants on the early Earth and Mars

Geology and geochemistry provide the boundary conditions for our understanding of life on Earth. Central to this understanding are rock-water-carbon interactions between carbon and the environment.

This colloquium is being held to create an international think-tank to examine the origin(s) of life and evolution of early life, and specifically the influence and importance of hydrothermal activity on rock-water-carbon reactions. Understanding of the geological/ geochemical context for the origin of life and for early life on Earth will help concentrate and support efforts to find life elsewhere in the Solar System and even beyond.

These activities are timely given the upcoming European/Russian mission to Mars, Exomars 2018, whose objective is to search for traces of past life. Immediately following this mission is the first step in the multi-mission scenario for the return of samples coordinated by NASA for 2020.

LE STUDIUM
LECTURES

L'origine de la vie sur Terre et dans l'Univers

André Brack, Astrobiologist, Research Director Emeritus at CBM/ CNRS Orléans.

On Earth, life originated in water about 4 billion years ago with organic molecules that could self-replicate and evolve. Chemists have drawn up an inventory of primitive single molecules from the atmosphere, hydrothermal vents and underwater space, including comets. Hence the enormous interest in the Churyumov Gerasimenko comet. The Philae probe of the Rosetta mission managed to land and provided new information, realising a tremendous technological achievement. Scientists look for extraterrestrial sites rich in water and carbon chemistry. Other sites targeted and visited include Mars, Europa, Titan, Enceladus and extrasolar planets.

André Brack is honorary Director of Research at CNRS Orléans, where he created and led the astrobiology team. His scientific work focuses on the study of the chemical origins of life, its evolution and its distribution in the universe. Internationally recognised, he chaired the European Astrobiology Network founded in 2001, which currently includes astrobiologists from 19 European countries. He is also an honorary member of the Astrobiology Institute at NASA. He is honorary president of Centre-Sciences, the center for the popularisation of science in region Centre-Val de Loire, founded in 1990. André Brack has published 220 scientific articles in international journals, numerous popular articles and 10 books. He is regularly on radio and television and gives many lectures accessible to the general public and schools.

Philae, robotic lander over a comet

LE STUDIUM WORKSHOP

LE STUDIUM LECTURE

André Brack, LE STUDIUM LECTURE

LE STUDIUM LECTURE

DR MOHAMMED AYOUB

AGREENSKILLS FELLOW

July 2014 to June 2017

FROM King Saud University, Saudi Arabia

IN RESIDENCE AT PRC, Nouzilly

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

Dr Eric Reiter

Laboratory Host Scientist

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

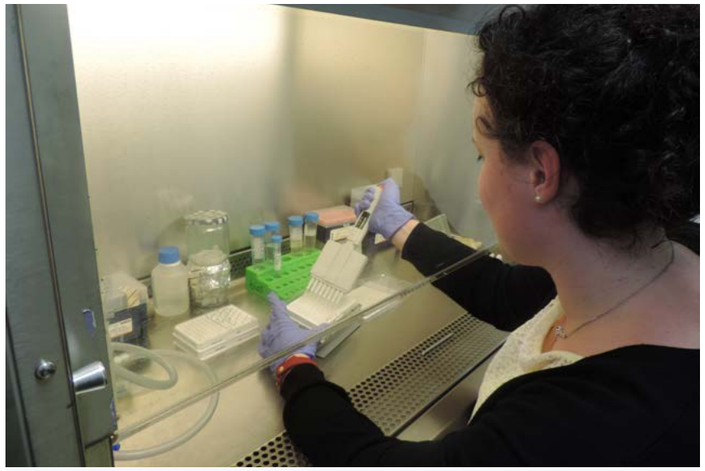
DEVELOPMENT AND CHARACTERISATION OF NEW GENERATION OF GPCR THERAPEUTICS TARGETING OF G PROTEIN-COUPLED RECEPTORS BY MODULATOR ANTIBODIES

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

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

Nanobodies will be selected using phage-display libraries generated in the BIOS group. Dr Ayoub is in charge of developing a battery of molecular, biochemical, and pharmacological assays that will be instrumental for both the screening and the detailed characterisation of the nanobodies. The selection of the nanobodies will be performed depending on the nature of the effect observed on the receptors. Thus, the GPCR activating (agonist) and inactivating (antagonist) nanobodies will be selected and tested both *in vitro* (in cell cultured in the laboratory) and *in vivo* (in animals) to assess their potential for clinical and agronomic applications. Bioinformatics will be a key element of the project since the BIOS group has developed a docking algorithm, which allows predicting with a great accuracy the epitope recognized by a nanobody, knowing only its nucleotidic sequence. Ongoing developments aim at taking advantage of the algorithm for in silico maturation of nanobodies (i.e. improving their selectivity and/or affinity).

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



Experiment at PRC Laboratory

Mohammed Ayoub, LE STUDIUM THURSDAY

AROUND THE PROJECT

Scientific Publications

- Gomes, I.; Ayoub, M. A.; Fujita, W.; Jaeger, W. C.; Pfleger, K. D.; Devi, L. A. G Protein-Coupled Receptors Heteromers, *The Annual Review of Pharmacology and Toxicology*, **2015**, *56*, 10.1-10.23.
- Ayoub, M. A.; Landomiel, F.; Gallay, N.; Jégot, G.; Poupon, A.; Crépieux, A.; and Reiter, E. Assessing Gonadotropin Receptor Function By Resonance Energy Transfer-Based Assays, *Frontiers in Molecular and Structural Endocrinology*, **2015**, *6*, 130.

Oral Communications

- Ayoub, M. A. Identification and Pharmacological Profiling of Selective Nanobodies Targeting G Protein-Coupled Receptors – Towards in vivo Applications, 3rd Agreenskills Annual Meeting, Barcelona (Spain), October 12-15, 2015.
- Ayoub, M. A. Nanobodies anti-CXCR4: nouveaux outils de ciblage et de modulation pharmacologique, Colloque Niche et Cancer 2015, Cancéropôle Grand Ouest and GDR3697 Micronit, Nantes (France), September 23, 2015.
- Ayoub, M. A. Modulation pharmacologique des récepteurs couplés aux protéines G par des fragments d'anticorps, 28ème colloque Biotechnocentre, Seillac (France), October 16, 2015.
- Ayoub, M. A. The Functional Screening Assays of Signaling Pathways using BRET/HTRF Approaches, The 3rd Annual Scientific Retreat of the French MAbImprove LabEx, Mont-Dore (France), March 16-19, 2015.

Posters

- Ayoub, M. A. Are LH and hCG naturally biased for ß-arrestin recruitment at the LHCGR? 4th Annual Meeting of the GDR 3545 (RCPG-PHYSIO-MED) - "From Physiology to Drugs", Toulouse (France), November 4-6, 2015.
- Ayoub, M. A. Two Negative Allosteric Modulators (NAMs) Display Diased Activities on FSH-induced ß-arrestin Recruitment at the FSHR, 4th Annual Meeting of the GDR 3545 (RCPG-PHYSIO-MED) - "From Physiology to Drugs", Toulouse (France), November 4-6, 2015.
- Ayoub, M. A. Identification and Functional Characterisation of GPCR-Selective Nanobodies, 3rd Agreenskills Annual Meeting, Barcelona (Spain), October 12-15, 2015.
- Ayoub, M. A. Two Negative Allosteric Modulators (NAMs) Display Diased Activities on FSH-induced ß-arrestin Recruitment at the FSHR, DiscoveRx and GDR-3545 European GPCR Technology Symposium, Cambridge (UK), May 12, 2015.
- Ayoub, M. A. Beta-arrestins interact directly to PKA, promoting its translocation to the nucleus and form a transcriptionnally active complex with CREB upon stimulation of Gs-coupled GPCRs, Connecting G Protein-Coupled Receptor Mechanisms to Physiological Functions, Ventura (USA), February 1 – 6, 2015.
- Ayoub, M. A. p70S6K and PKA docking on a common site on beta-arrestin 1 provides clues on the particular activation mode of p70S6K downstream of the FSH receptor, Connecting G Protein-Coupled Receptor Mechanisms to Physiological Functions, Ventura (USA), February 1 – 6, 2015.

DR JORGE GUTIERREZ

FELLOW

November 2014 to June 2017

FROM Columbia University. New York, USA

IN RESIDENCE AT N2C, Tours

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

Dr Philippe G. Frank

Laboratory Host Scientist

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

CHOLESTEROL AND CANCER LIPIDS AS MODULATORS OF THE RESPONSE TO BIODRUGS

The team's scientific project is multidisciplinary (biology, biochemistry, physiology, metabolism, nutrition and cancerology) and focuses on the transverse interaction of resources for research (medicine, pharmacology, sciences, University Institute of Technology).

We investigate the different modes of molecular and cellular actions and the impact of specific lipids on mitochondrial function, cancer cell lines, and the relationship between tumour and its host.

The goals of the project are to better understand the metabolism of cholesterol and use this knowledge to develop new methods to target the development of tumors.

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

During this year we started the development of a biopharmaceutical composed of apolipoprotein AI (ApoAI), phospholipids and cholesterol or phytosterols (PS), named reconstituted high-density lipoproteins (rHDL).

Given that breast cancer over-expresses the SR-BI receptor that specifically binds to ApoAI, this rHDL will be specifically delivered to breast cancer tumors. We hypothesise that PS will compete with endogenous cholesterol and interfere with key cellular processes, such as migration and proliferation. We were able to demonstrate that, two of our new rHDL were able to block breast cancer cell migration.

DR SOHAIL AKHTER

FELLOWSHIP

June 2015 to June 2017

FROM US Food and Drugs Administration, USA

IN RESIDENCE AT CBM, Orléans

Sohail Akhter is a professional pharmacy graduate specializing in Pharmaceutics Nanomedicine. The Council of Scientific and Industrial Research and the University Grant Commission of India has awarded him senior fellowships. Starting in the mid 1990s he was a Research Associate at the Utrecht Institute of Pharmaceutical Sciences, Utrecht University, Netherlands. Recently, Dr Akhter was a Senior Research Fellow at the USA Food and Drug Administration in the Center for Drug Evaluation and Research. While at the Food and Drug Administration, in 2015 he received a team excellence award for his research on Warfarin product quality. His research interests involve the application of bio-materials in drug delivery and targeting, development and characterisation of nanoparticulates and vesicular systems, biopharmaceutics and bioanalysis.

Pr Chantal Pichon

Laboratory Host Scientist

Chantal Pichon is a Professor in Molecular and Cell Biology at the University of Orléans. She is currently the head of the Institute of Life Sciences and Chemistry for Life at the University of Orléans. Chantal Pichon completed a PhD in Cellular Biology and Microbiology (1991) at the University of Aix-Marseille before spending 2 years at the AFRC (Cambridge, UK) as post-doc fellow. She was appointed an assistant professor in 1993 and Full Professor in 2005 at the University of Orléans. She is performing her research at the Center for Molecular Biophysics of CNRS (Orléans, France) where she is coordinating the research of Cell Biology and New therapeutic targets and co-leads the team Nucleic acids transfer by non-viral methods with Dr Patrick Midoux (Inserm Research Director, Deputy Director of CBM). The main focus of the team is the development of chemical-based vectors for DNA, RNA (messenger RNA, replicons) and siRNA. The team is pioneer of histidine-based nanomedicines for cellular transfection and has developed novel strategies to improve uptake by chemical targeting and/or ultrasound trigger, the nuclear import and the cytosolic diffusion.

AROUND THE PROJECT

Oral Communications

- Rahman, M.; Akhter, S.; Ahmad, M. Z.; Ahmad, J.; Addo, R. T.; Ahmad, F. J.; Pichon, C. Emerging advances in cancer nanotheranostics with graphene nanocomposites: opportunities and challenges, *Nanomedicine (Lond)*, **2015**, *10*, 2405-22.

SYNTHESIS AND BIOSYNTHESIS OF MOLECULES-DEVELOPMENT OF MRNA CELLULAR FACTORIES WITH A SPECIFIC AREA OF NUCLEIC ACIDS TRANSFER BY NON-VIRAL METHODS

Messenger RNAs or plasmid DNA that encodes tumour antigens have been found to be a safe mode of induction of tumour-specific immune responses after efficient transfection to dendritic cells (DCs). mRNA being translated in the cytosol, it does not need to be imported into the nucleus and allows better transfection efficiency than plasmid DNA. The loading of mRNA to the DCs is challenging and requires the development of robust and smart delivery systems capable of reducing mRNA doses and/or side effects. The potential immunogenic adverse effects associated with viral vectors is increasingly making non-viral gene delivery systems relevant for gene therapy.
The distinct advantages associated with the use of cationic lipids include their

1. robust manufacture,
2. ease in handling and preparation techniques,
3. ability to deliver large nucleic acids (NA) molecules, and
4. low immunogenic response.

Lipoplexes formed from cationic and zwitterionic helper lipids are known to improve RNA delivery by virtue of their capacity to complexed with highly anionic RNA, offering protection from degradation, fusing with the anionic cell membrane and transporting the NA into the cell cytoplasm. The efficiency of transfection using cationic lipids is improved by the presence of a zwitterionic helper lipid. In order to protect mRNA from hydrolytic digestion by enhanced endosomal release, our group is working on the design and synthesis of pH-sensitive, cationic lipids and polymers containing weakly basic lysosomotropic N-head groups.

In our study, we are screening the transfection efficiency of mRNA and DNA-lipoplexes made of different histidylated lipids to optimise a nanomedicine that can efficiently transfect and lead to high protein expression in large number of dendritic cells. The final aim of this project is to design mRNA and pDNA-loaded lipid and polymer based smart nanomedicines (called as lipoplexes, polyplexes and their combination-lipopolyplexes), which can be used for immediate *in vivo* transfection of DCs for therapeutic vaccination against cancer.

DR GYULA TIRCSÓ

FELLOW

January 2015 to January 2016

FROM University of Debrecen, Debrecen, Hungary

IN RESIDENCE AT CBM, Orléans

Gyula Tircsó gained his PhD from the University of Debrecen, studying under the supervision of Pr Ernő Brücher. In 2004 he joined the group of Pr Dean Sherry at the University of Texas at Dallas (Richardson, Texas, USA) as a postdoctoral research associate. After nearly four years in this post Gyula made a return to academic research at the University of Debrecen where he was appointed a junior lecturer in 2008 and Associate Professor in 2010. Gyula is an author of 38 journal publications, 2 book chapters and 2 patents. Gyula was awarded the following awards/scholarships: Bolyai Plakett of the Hungarian Academy of Sciences (2015), Publication Award of the University of Debrecen (2015), Outstanding Tutor of the Faculty of Science and Technology, University of Debrecen (2012) and the János Bolyai Research Scholarship of the Hungarian Academy of Sciences (2011-2014).

Dr Eva Jakab Toth

Laboratory Host Scientist

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

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

The main goal was to understand the mechanisms that govern the thermodynamic (stability) and kinetic properties (formation and dissociation kinetics) of metal complexes. These are important parameters to be considered for application of lanthanide(III) complexes in Nuclear Medicine. We are particularly interested in complexes formed with ligands belonging to a new class called "hybride" or "scorpionate type" chelators. In an effort to develop ligands with accelerated complexation kinetics toward metal ions used in radioimmunotherapy M. W. Brechbiel and co-workers have designed and studied some "hybride" ligands.

However, despite the very promising features displayed by these chelators, (rapid complex formation with important isotopes often used in radiopharmacy, excellent serum stability and fast clearance of the radiolanthanide chelates), the detailed equilibrium, kinetic and structural characterisation of the complexes are still missing. As a first step on this avenue, the DEPA ligand (which can be obtained as a result of "marriage" of the DO3A and the IMDA chelators) was synthesized by using a scheme that is similar to that in the literature. The detailed equilibrium studies performed on the complexes of some biogenic and Ln(III) ions indicate that the DEPA ligand forms slightly weaker complexes of [ML] composition than the parent DO3A ligand.

At the same time the [M(DEPA)] complexes were all found to form protonated complexes with protonation constants (log K[Gd(DEPA)]*H=7,34(3)relax, 7.18(8) pH) very similar to that of the free ligand (log K3H =7,80(1)pH) and they also were found to form dinuclear complexes with stabilities very similar to the corresponding IMDA complexes. In contrast to the published data it was proved by us using direct methods that the protonated [LnH(DEPA)] complexes (Ln=Ce^{3+} and Eu^{3+}) form 3-4 times faster than the corresponding [Ln(DO3A)] complexes. The kinetic inertness of [LnH(DEPA)] complexes (Ln=Ce^{3+}, Eu^{3+} and Yb^{3+}) were characterised by studying the rate of the metal exchange reactions occurring with Cu^{2+} ion. The results of these studies revealed that dissociation of [LnH(DEPA)] complexes occurs faster than the dissociation of the Gd complex formed with the parent DO3A ligand. Based on our results one can conclude that the IMDA "tail" in the DEPA ligand is not involved in the complexation as it remains protonated below pH=6.3 and thus it cannot have much effect on the kinetics of complexation.

On the other hand, the deprotonation of the given group opens up a possibility for the utilization [Gd(DEPA)] complex as a pH-responsive "smart" probe as its relaxivity responds to pH in the pH range of pH=7.18±1.0. The design and synthesis of a new ligand based on the rigid PCTA platform allowed us to shift the interval of the pH response by one pH unit lower which is more favourable for *in vivo* applications while the favourable thermodynamic and kinetic parameters were retained.

LE STUDIUM
CONFERENCES

Medicinal flavor of metal complexes: diagnostic and therapeutic applications

The conference brought together leading scientists working on metal complexes applied in various diagnostic and therapeutic applications with an aim to see and discuss how the achievements in one field can aid the research and development in the other field. We invited Pr Dean Sherry (University of Texas, USA) one of the best experts in the field of responsive MRI probes and CEST imaging; Pr Peter Caravan (Harvard Medical School, USA) one of the most prominent scientists working on responsive MRI probes as well as on probes for PET imaging; Pr Philip Blower (King's College London, UK), a well known researcher in the fields of radiopharmaceutical and bioconjugate chemistry, nuclear medicine and molecular imaging to give plenary lectures. This has facilitated building synergies between various diagnostic and therapeutic modalities. In addition, presentations were given by PhD students and early stage researchers to make a "bouquet" of presenters consisting of "old boys" and the next generation of researchers, to feed discussions and help to facilitate new collaborations/interplay between laboratories.

LE STUDIUM
LECTURES

Les métaux et la vie

Clotilde Policar, Professor at the Ecole Normale Supérieure (ENS), works at the interface of physics, chemistry and biology to investigate the role of metal ions in living systems, since metal ions play essential roles in biochemical processes, but they are also very important in diagnostic and therapeutic medicine.

The presentation illustrated how metal ions are essential for life, science, industry, medicine, etc. How the growing demand for the metals (and their compounds) associated with increasing population can and will be satisfied in order to be able to provide sufficient amounts for various applications. The talk also focused on the other end of the story, on the environment, which receives as waste all these metal-based compounds in various forms. How they need to be handled in order to safe guard the environment for the generations to come.

AROUND THE PROJECT

Oral communications

- Nagy, V.; Kálmán, F. K.; Jakab-Tóth, E.; Tóth, I.; Tircsó, G. Preparation and coordination chemical properties of some „hybride" ligands, 2nd National Conference of the Hungarian Chemical Society (MKE 2. Nemzeti Konferencia), Hajdúszoboszló (Hungary), August September 28-1, 2015.
- Garda, Z.; Kálmán, F. K.; Tóth, I.; Laczovics, A.; Berényi, E.; Jakab-Tóth, E.; Tircsó, G. Mn(II) vs Gd(III): Are we getting closer to the MnCAs? COST TD1004 Final Annual Meeting, Belgrade (Serbia), September 10-11, 2015.

Scientific publications

- Bonnet, C.; Laine, S.; Buron, F.; Tircsó, G.; Pallier, A.; Helm, L.; Suzenet, F.; Jakab-Tóth, E. A pyridine-based ligand with two hydrazine functions for lanthanide chelation: remarkable kinetic inertness for a linear, bishydrated complex, *Inorg. Chem.*, **2015**, *54*, 5991–6003.

Clotilde Policar during LE STUDIUM LECTURE

LE STUDIUM CONFERENCE

LE STUDIUM CONFERENCE

PR LEANDROS SKALTSOUNIS

CHAIR

December 2015 to July 2016

FROM University of Athens, Greece

IN RESIDENCE AT ICOA, Orléans

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

Pr Claire Elfakir

Laboratory Host Scientist

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

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

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

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

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

RENCONTRES LEONARDO

RESEARCH ABOUT AUTISM IN THE REGION CENTRE-VAL DE LOIRE

17 February 2015

LOCATION Hôtel Dupanloup, Orléans

Organised in partnership with the Loiret Clubs of the International Rotary, the event aimed at sharing scientific knowledge with the general public and at supporting the fundraising operation for the Fédération pour la Recherche sur le Cerveau.

RENCONTRES LEONARDO

Pr BONNET-BRILHAULT, RENCONTRES LEONARDO

SPEAKERS

Dr Sylvain BRIAULT

Head of the Neurogenetic group at INEM, UMR 7355, CNRS/ University of Orléans

Autism and cognitive disorders: Towards targeted drug therapies?

Autism and cognitive disorders are a group of common clinical entities. Their impact is twofold, primarily at the affected individuals and their family environment but also at the social level, because of the additional societal costs incurred. These elements make the understanding of these diseases an important scientific and medical challenge, this understanding constitutes the first step towards appropriate care at lower cost.

In recent years, genetic approaches have helped to better understand the causes and mechanisms of onset of these diseases. More recently, the possibility of developing drug treatments for some forms of autism / cognitive impairment went from utopia to hope.

Through the fragile X-syndrome, a cognitive disorder that may accompany an autistic symptomatology, we illustrated the various steps taken from the identification of the causative gene to clinical trials in humans.

Pr Frédérique BONNET-BRILHAULT

Imaging and Brain, UMR U930, Inserm / University François-Rabelais of Tours

Autism affects one in 150 children and from the 600 000 people in France who have Autism and cognitive disorders, two thirds are adults. Behind these impressive numbers, is found in fact a wide variety of clinical forms of autism from children with severe autism and significant cognitive delay to individuals with unusual talent but with a significant social handicap. Over the last ten years, very significant progress has been made in this field of research. Among the major advances are those regarding early diagnosis, better understanding of features of brain function at the origin of this disorder, development of new interventions and prospects of drug discovery.

LE STUDIUM
CONSORTIUM

COSMO: COSMETICS IN ORLÉANS

16-20 February 2015

LOCATION Hôtel Dupanloup, Orléans

Pr Salvatore Magazu

Consortium coordinator

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

AROUND THE PROJECT

Scientific publications

- Calabrò, E.; Magazù, S. Interactions of bovine muscle tissue with 2450 MHz microwaves studied in the mid-infrared region, *International Journal of Food Properties*, **2015**, *19*, 1353-1361.
- Lombardo, D.; Kiselev, M.; Magazu, S.; Calandra, P. Amphiphiles Self-assembly: Basic Concepts and Future Perspectives of Supramolecular Approaches", *Advances in Condensed Matter Physics*, **2015**, *22*, 1516.
- Calabrò, E.; Magazù, S. Fourier –Self – Deconvolution Analysis of ß-sheet Contents in the Amide I Region of Haemoglobin Aqueous Solutions under Exposure to 900 MHz Microwaves and bioprotective effectiveness of sugars and salt solutions, Spectroscopy Letters: *An International Journal for Rapid Communication*, **2015**, *48*, 741.

PROJECT

The COSMO Consortium has enabled the formation of a virtual team of five internationally competitive researchers sharing the common research goal of planning and putting into action a series of initiatives to promote applied research at the interface with industries of the Pole of Competitiveness – Cosmetic Valley. It is well established that research plays a key role within Cosmetic Valley and in this framework COSMO closely interacts with actors from cosmetic enterprises and with research teams from universities. The basic assumption is that, in the cosmetics industry, innovation is in rapid turnover and only a structured research approach can allow the development of new cosmetic products that answer market needs while integrating the latest technological discoveries.

Cosmeceuticals comprise a new category of products that rely on advances in skin biology and nanotechnology to deliver clinically proven active ingredients to the skin. There is ongoing debate about the efficacy and the safety of these cosmeceuticals so it is clear that research is necessary to understand the mechanism of action of these products. In this frame, COSMO is mainly focused on the optimisation of innovative cosmetics and cosmeceutic products, to the clarification of therapeutic aspects in cosmetics, to the characterisation of biomarkers and to develop new types of drug delivery system.

As far as the research activities are concerned, these will follow these main lines:

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

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

Three COSMO meetings have been so far held in Orléans (14th-18th October 2013, 16th-20th June 2014 and 16th-20th February 2015) where research activities, instrumentation development, collaborations to be activated, dissemination activities, and International proposals for public / private funding prepared.

PARTNERS

Pr Chantal Pichon

is a Full Professor of Biotechnology, Molecular and Cellular Biology at the Centre de Biophysique Moléculaire, CNRS and University of Orléans, France; she has expertise in delivery systems by chemical vectors and the development of ultrasound based delivery method, which in the Consortium is used for vectorisation and targeting as well as for studies on stratum corneum lipids interactions and different types of formulations.

Pr Beata Vertessy

is a Full Professor at the Department of Applied Biotechnology, Budapest Technical University and Institute of Enzymology, Hungarian Academy of Sciences, Budapest, Hungary; she has expertise in biophysical, thermodynamic, enzyme kinetic characterisation of biomolecular systems (i.e. DNA damage recognition and repair, lipid biosynthesis), which in the Consortium is used for the characterisation of liposome formation and transient kinetics characterisation of the biophysical processes underlying micelle formation.

Pr Juergen Eckert

is a Full Professor at the Department of Chemistry of the University of South Florida, Tampa, USA; he has expertise in the molecular level characterisation of active sites, guest-host interactions and reactions in catalysts in systems of pharmaceutical and biological interest by combined application of computational methods, neutron scattering spectroscopy and other experimental methods, which the Consortium is using to understand the physico-chemical processes involved in the transformations of several systems used in pharmaceutics and in cosmetics.

Pr Emma Sparr

is a Full Professor of Physical Chemistry and Colloidal Biology at the Division of Physical Chemistry, Lund University, Lund, Sweden; she has expertise in the link between the material properties and the barrier function of stratum corneum membrane and on the effect on these properties of hydration in cosmetic or pharmaceutical formulations, which in the Consortium is used for formulations and humectants, and their interaction with the skin membrane.

AROUND THE PROJECT

Oral Communications

- Caccamo, M. T.; Magazù, S.; Migliardo, F. Multiresolution Analysis of Elastic Incoherent Neutron Scattering (EINS) Data on Polymeric Systems of Biophysical Interest, International Interdisciplinary Event "Science for Life 2015", Lampedusa (Italy), May 20-25, 2015.
- Coppolino, S.; Caccamo, M. T.; Mavilia, L.; Magazù, S.; Migliardo, F. Study of the Gaussian Approximation for MSD Evaluation from EINS Data by Using the Normalization, International Interdisciplinary Event "Science for Life 2015", Lampedusa (Italy), May 20-25, 2015.
- Calabrò, E.; Magazù, S. Transition from α-helix to ß-sheet structures occurs in myoglobin in deuterium oxide solution under exposure to microwaves (PD 044), 29th Annual Symposium of the Protein Society, Barcelona (Spain), July 22-25, 2015.
- Sparr, E. National interdisciplinary skin meeting, SkinResQ, Gothenburg (Sweden), October 8, 2015
- Sparr, E.; Collaborative research center on nanocarriers: achitecture, transport and topical applications of drugs for therapeutic use. Colloqium lecture at Freie Universität Berlin, Berlin (Germany), June 18, 2015.
- Sparr, E. Controlling the skin barrier through topical formulations, National meeting «Dermal Drug Delivery – from Molecule to Man», Malmö (Sweden), February 10-11, 2015.
- Sparr, E. Molecular dynamics and barrier property of stratum corneum in the presence of different molecules named as penetration enhancers, Gordon research conference «Barrier Function of Mammalian Skin», Waterville valley (USA), August 16-21, 2015.

Books and book chapters

- Caccamo, M. T.; Magazù, S.; Migliardo, F. Multiresolution Analysis of Elastic Incoherent Neutron Scattering (EINS) Data on Polymeric Systems of Biophysical Interest, p.108, in International Interdisciplinary Event "Science for Life 2015", Lampedusa (Italy), May 20-25 2015.
- Coppolino, S.; Caccamo, M. T.; Mavilia, L.; Magazù, S.; Migliardo, F. Study of the Gaussian Approximation for MSD Evaluation from EINS Data by Using the Normalization, p.112, in International Interdisciplinary Event "Science for Life 2015", Lampedusa (Italy), May 20-25 2015.
- Horváti, K.; Bacsa, B.; Szabó, N.; Fodor, K.; Balka, G.; Rusvai, M.; Kiss, É.; Mező, G.; Grolmusz, V.; Vértessy, B.; Hudecz, F.; Bősze, S. Antimycobacterial activity of peptide conjugate of pyridopyrimidine derivative against Mycobacterium tuberculosis in a series of in vitro and in vivo models, Tuberculosis, Vol. 95, Suppl. 1, June 2015, pp. S207-S211.
- Kerepesi, C.; Szalkai, B.; Grolmusz, V. Visual Analysis of the Quantitative Composition of Metagenomic Communities: the AmphoraVizu Webserver, Microbial Ecology Vol. 69 (2015) pp. 695-697.

LE STUDIUM
CONSORTIUM

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

4-7 May 2015 & 19-22 October 2015 | LOCATION | CESR, Tours

Pr Denis Mulleman

Consortium coordinator

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

PROJECT

Biopharmaceuticals, in particular monoclonal antibodies, have radically transformed the course of various conditions, from malignancies to inflammatory diseases. Considerable inter-individual variability in the clinical response has been documented. It has been shown that pharmacokinetics (drug concentration versus time) is highly variable between patients and is related to clinical response, patients with high concentrations of the drug being more likely to respond than those who have low concentrations. Pharmacokinetic and pharmacokinetic-pharmacodynamic (PK-PD) modelling allows a description of the dose-response relationship to identify the sources of inter-individual variability, for both PK and PD-PD relationship. The team is seeking to explain this variability by studing the sources of the inter-individual variability that is observed in the response to monoclonal antibodies. Our work is based on both *in vitro* and preclinical models and on patient studies. Mathematical models are also used to quantify the influence of the individual sources of variability, to describe biological phenomena, and to design personalized dosage regimens for therapeutic antibodies.

Over the last few years, academic groups have developed tools to monitor the pharmacological effect of therapeutic antibodies by means of measuring trough concentrations and biomarkers of disease activity. This practice called therapeutic drug monitoring (TDM), involves the measurement *in sera* of the concentration of the drug, often in combination with anti-drug antibodies (ADA) detection on the one hand, and the disease activity of patients on the other hand. TDM may help clinicians to adjust the dose regimen according to individual characteristics to improve clinical outcomes and avoid adverse events related to unnecessary overexposure. This strategy is relevant considering the economic burden of inflammatory chronic disease such as rheumatoid arthritis, Crohn's disease and multiple sclerosis. However, although TDM of biopharmaceuticals seems promising, its implementation in clinical settings deserves further research to develop reliable and standardized assays, mathematical modelling (population approaches to analyze databases, mechanistic PK-PD modelling, clinical trial simulation) and clinical expertise.

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

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

PARTNERS

The partners of the MAGE (Monitoring of Antibodies academic Group in Europe) have experience in clinical research on monoclonal antibodies and develop their research in academic laboratories. Given a strong expertise in pharmacology, immunology, and applied mathematics, the MAGE is gathering increasing scientific evidence to support a therapeutic drug monitoring of particular molecules in the field of inflammatory diseases. The MAGE consortium participants are at the crossover between

1. biology (assays, biomarkers),
2. clinic (patient cohorts and clinical trials),
3. mathematics (modelling).

Five institutions/laboratories constitute the MAGE whose representative are listed below

Dr Antonio Bertolotto
is Direttore dell'Unità Operativa di Neurologia 2 - Centro di Riferimento Regionale per la Sclerosi Multipla, Orbassano, Turin, Italy a large tertiary centre in charge of the clinical management of multiple sclerosis patients. The laboratory has an extensive experience in detection of binding antibodies in samples of patients treated with IFN beta and/or Natalizumab. This centre holds a large sample collection in a biobank as well as clinical and imaging data (MRI) of multiple sclerosis and related diseases.

Pr Ann Gils
is a PI in the Department of Pharmaceutical and Pharmacological Sciences, KU Leuven Belgium, Laboratory for Therapeutic and Diagnostic Antibodies. The core business of the laboratory is the generation, characterisation and application of monoclonal antibodies. The laboratory has developed a number of assays to perform therapeutic drug monitoring and immunogenicity of biologicals, has an intensive collaboration with both the department of dermatology and of gastroenterology of University Hospital of Leuven and is involved in pharmacometrics.

Dr Dora Pascual-Salcedo
is the head of autoimmune section in one of the biggest Hospitals in Spain, is an expert in autoimmunity at the University Hospital La Paz, Madrid. In her lab they perform test to identify and quantify autoantibodies in sera of patients with autoimmune diseases. She has excellent connections with rheumatologists, dermatologists and gastroenterologists. She has introduced in La Paz Hospital the systematic determination of drug and anti-drug antibody levels for all patients at every visit, for most used biological drugs. She will contribute with her expertise in performance and interpretation of drug and anti-drug antibody levels, her knowledge of the clinical response associated with these parameters, her capacity to provide serum samples (more than 30.000 stored), her expertise in guiding Therapeutic Drug Monitoring in her Hospital, her collaboration with the pediatric rheumatology department.

Dr Gert Jan Wolbink
is a rheumatologist and the PI of the Biologicals Research Unit at Jan van Breemen Research Institute/Reade, Amsterdam, The Netherdands, in the Rheumatology and Immunology Center investigating clinical strategies including therapeutic drug monitoring (TDM) for optimisation of treatment with biologicals. Together with Theo Rispens he heads the Biologicals Research Group at Sanquin Immunopathology, which focusses on basic and translational research in the field of immunogenicity and TDM.

AROUND THE PROJECT

Posters

- Pouw, M. F.; Mulleman, D.; Nurmohamed, M. T.; Rispens, T.; Paintaud, G.; Wolbink G.; Ternant D. Adalimumab Concentration at 16 Weeks of Treatment Is Associated with Treatment Discontinuation within One Year, ACR/ARHP Annual Meeting, San Francisco (USA), November 6-11, 2015.

Scientific publications

- Ternant, D. ; Bejan-Angoulvant, T. ; Passot, C. ; Mulleman, D. ; Paintaud, G. Clinical Pharmacokinetics and Pharmacodynamics of Monoclonal Antibodies Approved to Treat Rheumatoid Arthritis, *Clin. Pharmacokinet.*, **2015**, *54*, 11071123

EARTH, ECOLOGY & ENVIRONMENT SCIENCES

LABORATORIES IN EARTH, ECOLOGY & ENVIRONMENT SCIENCES

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

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

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

The mission of the laboratory is to study populations of forest insect pests and expansion of their range as a result of environmental changes, with the following objectives:

- Analysis of the mechanisms responsible for the success of biological invasions;
- Study of the genetics, physiology and behaviour of insect populations expanding with global warming or newly introduced in Europe;
- Estimation of the ecological and economical risks of invasive species and design management programs.

The URZF is recognized as a leading research unit in ecology and genetics of forest insect pests. It has been involved in a number of major European and international research projects on biological invasions funded by the European Community.

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

This unit brings together expertise in genetics, genomics and physiology applied to the study of forest trees. The research aims to develop forest genetic resources for sustainable production of timber and biomass taking into account the environmental impact on the ecosystem of domesticated populations and a changing climate context. The UAGPF conducts several tree breeding programs and invests in innovative strategies of selection and dissemination of genetic progress. The UAGPF is involved in the evaluation and management of genetic diversity as well as in the study of the interactions between improved varieties and natural populations, helping to define strategies for the management and conservation of forest genetic resources. The UAGPF is also developing basic research contributing to the study of mechanisms of adaptation to environmental variation, with a particular emphasis on the study of adaptation to climate change based on tree-ring analysis. To fulfill these objectives, an integrative biology approach is developed to better understand the genetic determinism of complex traits involved in tree development and in adaptation to environmental constraints.

DR NATALIA KIRICHENKO

FELLOW

January 2014 to May 2015

FROM Sukachev Institute of Forest & Siberian Federal University, Russia

IN RESIDENCE AT URZF, Ardon

Natalia Kirichenko is a forest entomologist at the V.N. Sukachev Institute of Forestry, Russian Academy of Sciences, Krasnoyarsk. Her interests are ecology, molecular genetics and systematics, and risk assessment of invasive forest and ornamental insect pests. She has carried out research in Asian and European botanical gardens to detect potentially harmful herbivorous pests and to study colonization of native and exotic plants by folivore insects. She has taken part in several EU FP6 and FP7 research projects and bilateral postdoctoral programs with German and Swiss agencies and l'Ambassade de France à Moscou. She is a deputy of the International Union of Forest Research Organisations working party «Population dynamics of forest insects» and «Forest health». She combines her research work with teaching and student supervision.

Dr Alain Roques

Laboratory Host Scientist

A forest entomologist with 32 years experience in the biology, ecology and behavior of forest insects. He studies mechanisms of biological invasions and the effect of global warming on the populations of insect pests. He has participated in many EU-funded projects on biological invasions.

Dr Sylvie Augustin

Laboratory Host Scientist

A forest entomologist with 29 years experience in the biology, ecology and behavior of forest insects. Her research activity has been focused on the ecology and management of invasive insect species in Europe.

Dr Carlos Lopez-Vaamonde

Laboratory Host Scientist

An entomologist working on molecular and evolutionary ecology of forest insects.

DEVELOPMENT OF ADVANCED MOLECULAR TOOLS FOR IDENTIFICATION OF INVASIVE FOREST INSECTS

The number of new insects introduced into Europe is dramatically increasing. Remarkably, most of these invasive pests originate from Asia, either with ornamental plants, as stowaways inadvertently transported with the import of goods or on their own following an expansion of their geographic range. The fast and accurate identification of these invading insects is essential for effective plant protection and implementation of quarantine programs.

In this project, we used DNA barcoding, a tool for species identification based on the use of a single standard DNA marker, to genetically characterise leaf mining insects whose larvae feed internally within the host plant leaves. This is an important group of herbivores with several important pests and invaders that threaten forests, parks and gardens. Despite their economic importance, little is known about the potential of Asian leaf miners to damage European woody plants.

We aimed:

1. to create the first genetic database of leaf mining insects from North Asia for quick and reliable identification of potential pests and invaders at the immature stages;
2. to DNA-barcode Gracillariidae micromoths, an economically important group of leaf miners, which colonize woody plants in Europe; and
3. to study the phylogenetic structure of the highly invasive Phyllonorycter issikii in Eurasia in order to understand the mechanisms responsible for the success of invasions of leaf mining micromoths.

We have created the first DNA barcoding database for leaf mining insects colonizing native and alien woody plants in North Asia and significantly contributed to the genetic database of European micromoths of the family Gracillariidae. We have initiated several genetic libraries bearing genetic and ecological data of various groups of leaf miners on the genetic platform BOLD (http://www.boldsystems.org/).

These genetic libraries serve a valuable source of data to answer various questions linked to modern taxonomy, evolution, phylogeography and invasive ecology of leaf mining insects. Our data is a significant addition to the present international databases to cover potential forest insects that could expand their range beyond North Asia. During the course of study, we described two new species on leaf mining moths Gracillariidae from Europe and North Asia, revealed evolutionary links between the representatives of the family and explored the invasion history of some invasive leaf mining moths. Thus it has been an important step in the exploration of the leaf mining insect diversity on woody plants in Palearctics, which will give rise to other scientific discoveries.

Natalia Kirichenko during her LE STUDIUM CONFERENCE

LE STUDIUM CONFERENCE

AROUND THE PROJECT

Oral Communications

- Kirichenko, N. I.; Triberti, P.; Augustin, S.; Roques, A.; Lopez-Vaamonde, C. Genetic diversity of the highly invasive lime leaf miner in Eurasia: where do invasive haplotypes come from?, IUFRO Conference «Population dynamics and integrated control of forest defoliating and other insects», Sopot (Poland), September 28 – October 2, 2015.
- Kirichenko, N. I.; Akulov, E.; Ponomarenko, M.; Lopez-Vaamonde, C.; Tribetri, P.; Pustoshinskaya, N.; Babichev, N.; Petko, V. Molecular genetics for the rapid diagnosis of forest insect species: examples of leaf mining moths colonizing woody plants in Siberia, IV International conference "Conceptual and applied aspects of research and education in area of invertebrate zoology", Tomsk (Russia), October 26–28, 2015.
- Kirichenko, N.I.; Lopez-Vaamonde, C. DNA barcoding of potential forest insect pests in Siberia, 4th International conference on conservation of forest genetic resources in Siberia, Barnaul (Russia), August 24-29, 2015.
- Kirichenko, N.I. Molecular genetics for rapid diagnostics of forest insects and for study the invasion processes. Series of lectures «Modern methods of plant pathology, genomics and bioinformatics in studying and solving the problems of the Siberian Forests», Krasnoyarsk (Russia), June 3-4, 2015.
- Kirichenko, N. I.; Baranchikov, Y.; Tomoshevich, M.; Gorokhova, S.; Ostrogradskiy, P.; Kenis, M.; Roques, A.; Augustin, S.; Lopez-Vaamonde, C. Using arboreta in Asian Russia for early detection of potential insect pests & diseases, COST Action FP1401 A global network of nurseries as early warning system against alien tree pests (Global Warning), Trabzon (Turkey) March 24-25, 2015.
- Kirichenko, N. I. Invasive insects, a threat to our forests. Asian leafminers as an example, Interdisciplinary monthly seminar LE STUDIUM Thursday, Orléans (France), March 5, 2015.

Posters

- Kirichenko, N. I.; van Nieukerken, E. J.; Doorenweerd, C.; Lopez-Vaamonde, C. DNA barcoding campaign of Lepidopteran leaf miners in Siberia, XIXth European Congress of Lepidopterology, Radebeul (Germany), September 27 – October 2, 2015.

Scientific publications

- Kirichenko, N. I.; Huemer, P.; Deutsch, H.; Triberti, P.; Rougerie, R.; Lopez-Vaamonde, C. Integrative taxonomy reveals a new species of Callisto (Lepidoptera, Gracillariidae) in the Alps, *Zookeys*, **2015**, *473*, 157-179.
- Kirichenko, N. I.; Petko, V. ; Magnoux, E.; Lopez-Vaamonde, C. Leaf mining insects on birches in Siberia: taxonomic diversity and distribution. *Siberian Journal of Forest Science*, **2015**, *6*, 214.

DR ALEJANDRO MARTINEZ

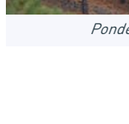
FELLOW

January 2014 to January 2015

FROM Instituto Nacional de Tecnologia Agropecuaria (INTA) Bariloche, Argentina

IN RESIDENCE AT UAGPF, Ardon

Alejandro Martinez-Meier started his career in forest tree breeding and improvement in the Forest Genetics Groups at Instituto Nacional de Tecnologia Agropecuaria (INTA) Bariloche, Argentina. Together with his PhD which he completed in Orléans in 2009 he received the "Medaille des thèses de l'Académie d'Agriculture de France". His research work focuses on forest genetic improvement, quantitative genetic, phenotypic plasticity and tree adaptation to climate change using wood properties as a record of tree response to climatic variation. In Argentina he created a new research group at INTA Bariloche, to study adaptation of forest trees to climate and initiated new collaborations with other INTA laboratories, universities in Argentina and between private forest associations and development and management state agencies, by organising and promoting forest and wood filial and public conferences in collaboration with the departmental forestry agencies in Argentina.



Dr Philippe Rozenberg

Laboratory Host Scientist

Philippe Rozenberg has taken part in ten European projects, eight national projects and three bilateral projects. He has coordinated a European project (Alfa GEMA - GEnetica de la MAdera), bilateral projects (Canada, Mexico, Portugal, Spain and Argentina) and French research projects (Inra - Écologie des Forêts, Prairies et milieux Aquatiques (EFPA) 2005, Ministère de l'Agriculture 2007, Région Centre 2009 and Ministère de l'Ecologie 2011). He is or has been a member of scientific committees and organiser or co-organiser of four international conferences and workshops. He is the leader of the 'Adaptation' group of the AGPF unit of Inra Orléans, a member of the scientific council of this unit and of that of the EFPA department of Inra.

Ponderosa pine El Manzano

ADAPTATION OF FOREST TREES TO CLIMATE WARMING: A CASE STUDY ON DOUGLAS-FIR

Forest species can be pushed over the limit of their capacity to adapt to extreme heat and drought events, increasing forest mortality due to increased temperature and/or water stress. The study of adaptation mechanisms requires the measurement of the variation of tree response to drought not only at the species level but also at the intra-species level. In Douglas-fir, high wood density is related to high resistance to cavitation in tree conduits. Douglas-fir tends to keep stomata open, which maximizes carbon fixation. Therefore its resistance to drought relies on xylem resistance to cavitation. Other species have drought-response mechanisms enabling them to maintain their hydraulic integrity at the expense of carbon fixation.

We took advantage of forest dieback, in the context of climate change, to compare wood morphological traits of surviving and dead trees after a drought and therefore to identify putative adaptive traits. We used microdensity profiles to predict the survival capacity of trees to climatic constraints.

In the framework of this project, we have incorporated two complementary species: the "cipres de la cordillera" (Cypress) and the Ponderosa pine. The first is an endemic drought-avoiding conifer species of the Patagonian region in Argentina and Chile with a distribution area covering a vast latitudinal gradient. The second is a drought-avoiding species introduced in the same ecotone region, the Cypress in Argentina, a native of western North America with an extended natural area covering variable climates. During the last 50 years the climate in Patagonia has become drier and warmer than during the preceding 250 years. The results found in this study infer the existence of an adaptive potential in trees exposed to dryer climatic conditions. In Douglas-fir, there is a positive relationship between wood density and resistance to drought. In Cypress this relationship is negative. The hypothesis is that in Douglas-fir a higher wood density confers a higher resistance to cavitation during drought, while in Cypress a lower wood density corresponds to an improved drought recovery. The Ponderosa pine is a species that avoids drought so we expected similar results to that of Cypress: higher wood density in dead trees. However, results were not as expected and a higher wood density may confer Ponderosa pine a greater resistance to drought, similar to the case of Douglas-fir. Our multidisciplinary approach incorporating ecophysiological sciences has proved to be very useful in the study of adaptation.

PR STEPHEN FOSTER

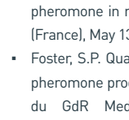
GUEST FELLOW

December 2014 to December 2015

FROM North Dakota State University, USA

IN RESIDENCE AT IRBI, Tours

Stephen Foster's research is broadly concerned with insect chemical ecology at the University of North Dakota. Specific areas of interest in this field are insect chemical communication (pheromones), especially chemical identification and physiological regulation of production, and the use of stable isotope tracers for studying insect metabolism. Pr Foster's contribution to the interdisciplinary field of chemical ecology has been recognized through various awards (e.g., New Zealand Ministerial Award for Excellence in Scientific Research), through invitations to serve on international, national and regional grant and research review panels, being an Associate Editor of the Journal of Chemical Ecology and serving as President (2014/15) of the International Society of Chemical Ecology.



Dr David Giron

Laboratory Host Scientist

The research of David Giron focuses on understanding the adaptive significance and evolution of plant 'reprogramming' life history modes by studying the intimate physiological, biochemical and molecular mechanisms used by leaf-miner and gall-inducer insects to manipulate their host-plant environment and successfully invade the plant. Publications in high quality peer-reviewed journals ranging from field-oriented (e.g. Journal of Insect Physiology) to more general journals (e.g. Nature; Proceedings of the Royal Society London B) reflect the integrative approach characterising his research. D. Giron was promoted in 2015 as a CNRS Research Director and, starting in January 2016, is the head of the IRBI. He received several awards including the Perry Adkisson Award (from University of Texas A&M) for his outstanding research in Entomology and the British Ecological Society JBS Haldane Prize.

AROUND THE PROJECT

Oral Communications

- Foster, S. P. Stable isotope tracer-tracee approaches for studying metabolism in insects: production of sex pheromone in moths, Invited seminar to IRBI, Tours (France), May 13, 2015.
- Foster, S.P. Quantitative chemical ecology: moth sex pheromone production as an example, 2nd Journees du GdR MediatEC, Banyuls-sur-Mer (France), October 28, 2015.
- Foster, S.P. Stable isotope tracer-tracee approaches for studying metabolism in insects: production of sex pheromone in moths, Seminar to Inra, Versailles (France), December 1, 2015.
- Foster, S.P. Chemical communication and insects, Le Studium Thursday, Tours (France), December 3, 2015.

DEVELOPING A MORE QUANTITATIVE APPROACH TO CHEMICAL ECOLOGY/PHYSIOLOGY

In the laboratory we worked on developing the concept of 'quantitative chemical ecology' through researching literature on problems and methods used to tackle chemical ecology problems quantitatively, albeit in an *ad hoc* way. Progress on this was given as an invited presentation to the 2nd Journees du GdR MediatEC, Banyuls-sur-Mer France, 28 October, 2015. Additionally, we are writing a conceptual manuscript addressing the problem of why moths use small amounts of sex pheromone in their communication, using some of the principles of 'quantitative chemical ecology' we have formulated. We worked on four diverse projects with the aim of demonstrating the importance of quantitative analysis for a systems approach understanding. Three of these projects will continue after my return to the USA, further cementing the strong collaborations that have been developed during my stay as a LE STUDIUM Guest Fellow.

Project 1: Development of quantitative methods for collecting and analysing changes in apple leaf volatiles following attack by the apple leaf miner Phyllonorycter blancardella. A recirculating pumping system, using Tenax Gc as an adsorbent, was successfully developed that allowed trapping of the small quantities of apple leaf volatiles, which were subsequently desorbed and analyzed by gas chromatography/mass spectrometry.

Project 2: Development of minimally invasive tests for reiterative sampling of feeding status of predatory carabid beetles in an Agroforestry system. Small sample hemolymph (blood) tests for analysing fats, sterols and sugars were developed. A proof-of-concept experiment was conducted that showed that the carabids could be sampled and analysed reiteratively.

Project 3: Development of a method for quantitatively analysing energy cost of excreta from the parasitoid wasp Eupelmus vuilletti. A test for analysing the amount of uric acid excreted by adult female E. vuilletti was successfully developed.

Project 4: Development of a model for quantitatively modelling nutrient use for sex pheromone production in moths. A dynamic model has been formulated and upcoming experiments planned for acquiring the requisite dynamic data for refining and testing the model.

PR MARION HARRIS

FELLOW

December 2014 to December 2015

FROM North Dakota State University, USA

IN RESIDENCE AT IRBI, Tours

Marion Harris studies antagonistic interactions between crops and pests. Her expectation is that better understanding of biology will eventually lead to the development of more sustainable and environmentally-friendly methods for managing pests. In a 2015 review published in the Journal of Experimental Botany, she proposed shifting some of the world's current focus on model plants like Arabidopsis thaliana to crop plants like wheat to begin understanding how agricultural plants integrate responses to biotic stress. An unanswered question is: to what degree can plant breeding optimise plant defense against a single pest or pathogen without harming other essential plant processes? She is a member of the Executive Committee of the Wheat Initiative's Expert Working Group on Control of Pathogens and Pests. The Wheat Initiative, centered in Versailles and created in 2011 following endorsement by the G20 Agriculture Ministries, is responsible for developing strategic research and organisation priorities for global wheat production.

Dr David Giron

Laboratory Host Scientist

The research of David Giron focuses on understanding the adaptive significance and evolution of plant 'reprogramming' life history modes by studying the intimate physiological, biochemical and molecular mechanisms used by leaf-miner and gall-inducer insects to manipulate their host-plant environment and successfully invade the plant. Publications in high quality peer-reviewed journals ranging from field-oriented (e.g. Journal of Insect Physiology) to more general journals (e.g. Nature; Proceedings of the Royal Society London B) reflect the integrative approach characterising his research. D. Giron was promoted in 2015 as a CNRS Research Director and, starting in January 2016, is the head of the IRBI. He received several awards including the Perry Adkisson Award (from University of Texas A&M) for his outstanding research in Entomology and the British Ecological Society JBS Haldane Prize.

INSECT REPROGRAMMERS: FROM STRATEGIES FOR MANIPULATING PLANTS TO AGRICULTURE

The project was designed to create building blocks for the establishment of an interdisciplinary and integrative international consortium of laboratories working on plant-manipulating organisms including insects, nematodes and pathogens. Integrate research on biotic stress in crop plants, bringing together entomologists, plant pathologists, nematologists, and plant scientists to start discussing options for breeding resistant plants.

To feed the human populations expected in the year 2050, global food organisations have set a goal of increasing agricultural production by 60%. Plant biotic stress creates challenges for achieving this goal. A major challenge comes from the fact that crop species are attacked by a diverse set of organisms. Each organism often requires a unique set of defence responses by the plant. Protecting the plant is made more complex if there is a trade-off between the defence mechanisms targeted at different plant parasites.

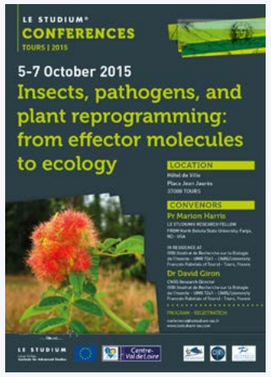
Researchers who each search for answers to their own particular questions are beginning to understand that we need to 'come together' to understand how plant defence works within the context of everything the plant must do in order to produce a crop for humans. Within the framework of LE STUDIUM Fellowship, the goal is to be part of this 'coming together' by starting conversations about shared features of plant-parasite interactions between previously separated research groups.

I established a colony of a US population of Hessian fly at IRBI. Expanded population from 1000 Hessian flies orginally received from USA to many thousands of flies. Having reared six generations continously at IRBI for use in experiments and for cold storage. These flies will be used for future experiments, after I leave France. We undertook experiments to test if French wheat cultivars are resistant to Hessian fly and on the phytohormone responses of susceptible and resistant wheat. I was involved in a field trip to survey of wheat insects and pathogens with International Maize and Wheat Improvement Center (CIMMYT) entomologists and plant pathologists in Mid-Atlas Mountains of Morocco.

Contacts with industry included meetings with researchers from Limagrain in Clermont-Ferrand where we discussed ideas for integrated research on biotic stress in wheat and the future of genetically-modified wheat in USA and Europe and with research staff at ARVALIS - Institut du végétal, a farmer supported organisation in Clermont - Ferrand that monitors pests and pathogens of wheat. Staff took us to the field that was destroyed by Hessian fly in 2014. We sampled wheat winter plants and brought them back to the lab. Many plants were infested with insects, primarily fly pests. We did not find Hessian fly.

LE STUDIUM
CONFERENCES

Insects, pathogens, and plant reprogramming: from effector molecules to ecology



Objectives

- To bring together entomologists, nematologists, and plant pathologists
- To find common ground in terms of how plant parasites manipulate plant hosts and how plants defend against various forms of manipulation
- To identify opportunities for future research collaborations and networking

Outcomes

Special Issue on Plant-manipulating organisms in Journal of Insect Physiology (publication date- January 2016).

LE STUDIUM
LECTURES

Insectes et plantes: le secret de la jeunesse éternelle

Dr David Giron, Research Director at CNRS

The world's rapidly expanding populations have created a sense of urgency regarding global agricultural output, which needs to expand by approximately 60% by the year 2050. Plants will provide a significant proportion of the world's food supply. The research topics addressed in the public lecture focused on a group of plant enemies that have a unique style of attack. Instead of simply removing plant tissue, survival, growth and reproduction are enhanced by manipulating the plant to create specialised nutritional resources. This attack strategy can have serious consequences for both natural and agro- ecosystems. Knowledge gained on mechanisms of reprogramming host plants will contribute to new ideas for using natural plant traits to protect agricultural plants from biotic stress.

AROUND THE PROJECT

Oral Communications

- Harris, M.O. Dissecting and Deploying Resistance to Biotic Stress in Wheat, International Center for Agricultural Research in the Dry Areas (ICARDA), Rabat (Morocco), June 4, 2015.
- Giron, D.; Harris, M. O. Insect reprogrammers: from strategies for manipulating plants to agriculture, Le Studium Scientific Council, Orléans (France), June 18, 2015.
- Harris, M. O. Feeding the World – the New Imperative for Interdisciplinary Systems Science, LE STUDIUM Thursday Series, Tours (France), September 3, 2015.
- Harris, M. O. Grasses and Gall Midges- What We Hope to Know Someday, Le Studium Conference "Insects, Pathogens, and Plant Reprogramming: from Molecules to Ecology", Tours (France), October 6, 2015.
- Giron, D. Converging strategies in plant manipulating insects: insect induced effects on plants and possible mechanisms used by leaf-miner insects to manipulate their host-plant, Le Studium Conference "Insects, Pathogens, and Plant Reprogramming: from Molecules to Ecology", Tours (France), October 6, 2015.
- Giron, D.; Harris, M. O. Insect reprogrammers and associated bacterial symbionts: from strategies for manipulating plants to agriculture, COST meeting, Turin (Italy), September 14-15, 2015.

Posters

- Harris, M. O. Finding a place to begin integrating research on plant biotic stress, Plant Protection Congress, Berlin (Germany), August 24-27, 2015.
- Guiguet, A.; Dubreuil, G.; Appel, H. M.; Schultz, J. C.; Harris, M. O.; Pereira, M. H.; Giron, D. Shared weapons of blood- and plant-feeding insects: surprising commonalities for manipulating hosts, Le Studium Conference, Tours (France), October 5-7, 2015.
- Zhang, H.; Dugé de Bernonville, T.; Body, M.; Glevarec, G.; Reichelt, M.; Unsicker, S.; Bruneau, M.; Renou, J. P.; Huguet, E.; Dubreuil, G.; Giron, D. Leaf-mining by *Phyllonorycter blancardella* reprograms the host-leaf transcriptome to modulate phytohormones associated with nutrient mobilization and plant defense, Le Studium Conference, Tours (France), October 5-7, 2015.
- Fléchon, L.; Dubreuil, G.; Sallé, A.; Cambier, S.; Drezen, J. M.; Hano, C;, Gayral, P.; Huguet E.; Whiteman, N.; Giron, D. Search for candidate effectors in five plant manipulating insects, Le Studium Conference, Tours (France), October 5-7, 2015.
- Faivre, N.; Gayral, P.;, Harichaux, G.; Labas, V.; Giron, D.; Dubreuil, G. Identification of effectors involved in the adaptation to the host environment in the leaf-miner *Phyllonorycter blancardella*, Le Studium Conference, Tours (France), October 5-7, 2015.

Scientific publications

- Harris, M. O.; Friesen, T. L.; Xu, S. S.; Chen, M. S.; Giron, D.; Stuart, J. J. Pivoting from Arabidopsis to wheat to understand how agricultural plants integrate response to biotic stress, *Journal of Experimental Botany*, **2015**, *66*, 513-531.
- Gramig, G.; Harris, M. O. Plant photosynthesis responses during insect effector-triggered plant susceptibility and immunity. *Environmental Entomology*, **2015**, *44*, 601-609.

LE STUDIUM
CONSORTIUM

ECOLOGICAL ADAPTATION TO DESERT ENVIRONMENT (EADE)

16-20 February 2015

LOCATION 2 Lions & CESR, Tours

Pr Raphael Boulay

Consortium coordinator

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

PROJECT

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

This genus, which is distributed along the palearctic deserts, constitutes a particularly interesting model system to investigate organisms' adaptation to hot environments. Our aim is to bring together the information collected over the past 20 years by each laboratory on this genus and to develop coordinated investigations in order to better understand the evolution of life history traits in response to selection pressures exerted by extremely hot and dry environments.

Hot deserts are among the harshest environments on Earth, imposing extreme temperatures, temperature variations, and hydric stresses on organisms. Human-driven climate change is now altering many temperate and sub-tropical habitats in arid and desert areas, making life increasingly difficult for local populations. In response to these new selection pressures organisms adapt, migrate or become extinct, which greatly transforms local ecological communities. Identifying species' adaptations to warm and dry habitats and determining the processes by which they evolve, constitutes an important question in biodiversity studies. Cataglyphis ants, because of their extraordinary mode of life, are a perfectly suited model system to study ecological adaptation to heat.

The objectives of our consortium are to:

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

PARTNERS

Dr Xim Cerdà
is a field Ecologist at the Estación Biológica de Doñana (Spain), specialist of ant behavior and interaction with their environment in Mediterranean ecosystems.

Pr Abraham Hefetz
is a Zoologist at the University of Tel Aviv (Israel), a specialist in behavioural and chemical ecology. He is also involved in Nature preservation in Israel.

Pr Serge Aron
is a molecular ecologist and sociobiologist, at the University of Brussels (Belgium). He is particularly interested in the evolution of social organisation of ants, using several genera as model systems. He has been working on Cataglyphis desert ants for several years in Iran, Israel, Morocco and Spain.

Pr Paul Graham
is at the University of Sussex (UK). His main expertise resides in the analysis of insect navigation and orientation using experimentation, simulation and artificial intelligence techniques. His field of research is at the frontier between biological and computer science.

Consortium members

Saharan Silver Ants Erg Chebbi (Bjørn Christian Tørrissen)

COMPUTER SCIENCE, MATHEMATICS & MATHEMATICAL PHYSICS

LABORATORIES IN COMPUTER SCIENCE, MATHEMATICS AND MATHEMATICAL PHYSICS

MATHÉMATIQUES - ANALYSES, PROBABILITÉS ET MODÉLISATION (MAPMO) - UMR 7349 - UNIVERSITÉ D'ORLÉANS, CNRS

In 1996, with the creation of a joint unit, MAPMO has focused on probability, statistics and mathematical models while being underpinned by fundamental mathematics. Initially, MAPMO aimed to promote collaboration between applied mathematicians and physicists. Over time, the collaborations have evolved to become strong collaborations with researchers in the physical and social sciences. As a result, MAPMO participates in numerous programmes of research by interacting with the many the laboratories on the CNRS-University of Orléans campus, on problems related to mathematical modelling. In 2006, MAPMO together with LMPT of the University Françoise-Rabelais of Tours, which includes the team of theoretical physicists, created the Federation Denis Poisson. The MAPMO laboratory of the University of Orléans and CNRS, has a long history of experience in problems related to harmonic analysis, C*-algebras, statistics, partial differential equations, probability theory and statistics, image analysis, dynamics, control and spectral theory. In particular, MAPMO also has an internationally recognized expertise in various areas of analysis of dynamical systems including potential theory, conformal methods and random geometry, harmonic measure and percolation.

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

The Laboratoire d'Informatique Fondamentale d'Orléans (LIFO) is a laboratory of the Université d'Orléans and the INSA Centre-Val de Loire, officially recognized and supported by the French Ministry of Research. The laboratory is located in Orléans an in Bourges in order to develop its collaborations and to offer a window to the research in computer science in region Centre-Val de Loire, LIFO created a research federation, Fédération Informatique Centre-Val de Loire, together with the Laboratoire d'Informatique from the University François-Rabelais of Tours.

LIFO is a computer sciences research laboratory. Research projects conducted at LIFO include algorithmics, scientific visualization, machine learning, massive parallelism, model checking and system security.

To provide another approach to the laboratory and to foster inter-team cooperation, the following cross-laboratory thematics are put forward:

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

LABORATORIES IN COMPUTER SCIENCE, MATHEMATICS AND MATHEMATICAL PHYSICS

LABORATOIRE DE MATHÉMATIQUES ET PHYSIQUE THÉORIQUE (LMPT) - UMR 7350 - UNIVERSITÉ FRANÇOIS-RABELAIS DE TOURS, CNRS, FÉDÉRATION DENIS POISSON

The emergence of LMPT started in the 1970s with arrival of Professors Barrabes and Boisseau, both theoreticians interested in gravitational physics. As the group expanded, in the late 1980s the idea to create a CNRS laboratory was proposed to unify the theoretical physics group with the group of mathematicians. In the early 1990s the two groups became a CNRS laboratory under the name LMPT. Since then the laboratory has grown to be one of the largest theory groups in France. LMPT is a unique pluridisciplinary UMR laboratory on the University Francois-Rabelais of Tours campus in France. It unifies two groups, one working in mathematics and one in theoretical physics. The research in theoretical physics is focused on gravitation, classical and quantum field theory and integrable models. On the other hand, research in mathematics is focused on algebra, non-linear analysis and partial differential equations, Riemann geometry and, probability and ergodic theory. The mission of the laboratory is to provide an excellent education program in mathematics and theoretical physics and to conduct research on the front line of modern physics and mathematics.

PR GARY GIBBONS PROFESSOR

March 2015 to May 2015

FROM University of Cambridge, United Kingdom

IN RESIDENCE AT LMPT, Tours

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

Pr Sergey Solodukhin

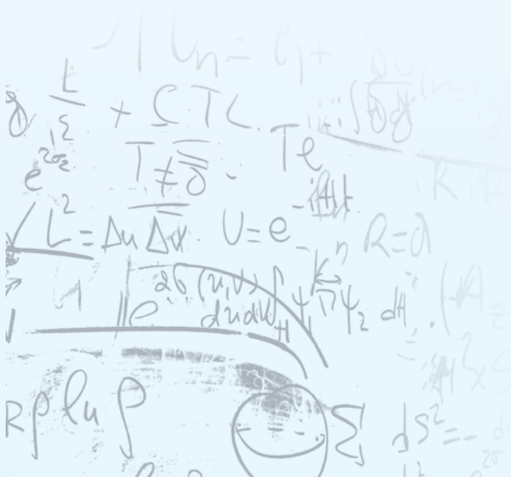
Laboratory Host Scientist

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

CLASSICAL AND QUANTUM SPACE-TIME AND ITS SYMMETRIES

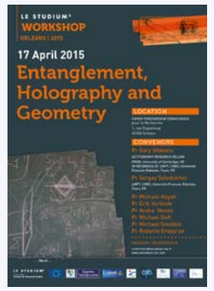
In this project we study theoretically both the classical and quantum properties of space-time and its symmetries. In particular, we formulated certain inequalities for the geometric quantities characterising causal diamonds in curved and Minkowski spacetimes. These inequalities involve the redshift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

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



LE STUDIUM
WORKSHOP

Entanglement, Holography and Geometry



The workshop focused on the important role played by the quantum entanglement in fundamental physics and the applications to geometry. In recent years, entanglement entropy has been shown to be instrumental in many fields of physics from quantum computers to black holes. We discussed recent progress and outline possible directions for the future. One particular goal for the workshop was to exchange views on the role of mathematics in the existing and developing theories in physics. It gathered famous scientists among with: Pr Michael Atiyah, Pr Erik Verlinde, Pr Andre Neves, Pr Michael Duff, Pr Michael Smolkin, Pr Roberto Emparan...

PR KARI ASTALA

CHAIR

September2014 to April 2015

FROM University of Helsinki, Finland

IN RESIDENCE AT MAPMO, Orléans

Kari Astala, Professor at University of Helsinki, Finland, received the Salem prize in 1994 and the Finnish Cultural Foundation prize of recognition in 2011. In 2006-2011 he was nominated as an Academy Professor by the Academy of Finland.
He is working in pure mathematics, and internationally known for his work on geometric analysis, partial differential equations, quasi-conformal mappings, complex and harmonic analysis, and other related fields in mathematics.

HARMONIC ANALYSIS, CONFORMAL STRUCTURES AND RANDOM GEOMETRY

Conformal and quasi-conformal maps are basic tools in harmonic analysis and in the study of elliptic operators. Besides their own fundamental properties, they provide a key ingredient in a large number of modern and classical topics in mathematics.

Conformal invariance is for instance, a fundamental property of Brownian motion, optimal transport, and percolation and of many random growth processes (SLE, DLA). More recently, these tools have been applied in image processing through the inverse Calderon problem.

In general, the project studied different mathematical structures, where a common theme is conformal invariance in its various appearances. The goals of the project included topics in complex dynamics, random structures arising form statistical physics as well as themes in geometric analysis and in harmonic analysis. An interesting new theme is the multifractal analysis for objects with two-dimensional range. Here completely new ideas and methods were to be developed.

Dr Athanasios Batakis

Laboratory Host Scientist

is an Assistant professor at the MAPMO laboratory of the University of Orléans since 1998. His research topics touch the domains of potential theory, geometric measure theory, dynamical systems and multifractal analysis. During the last years he has been interested in the stochastic modeling of natural and social phenomena such as city growth and diffusion in porous materials. He prepared his PhD under the direction of Alano Ancona at Orsay (France) and his HDR in Orléans in 2010. He completed his graduate studies at the Universities of Crete, Paris VI, Paris XI where he also undertook teaching activities. Since 2011 Dr Batakis is at the Head of the mathematics department of the University of Orléans.

Pr Michel Zinsmeister

Laboratory Host Scientist

Michel Zinsmeister was Senior Lucturer in Rouen, then Professor in Bordeaux and Orléans since 1992. He was invited Professor at the University of Michigan (USA), at the University of Warsaw (Poland) and the Academy of Sciences of China. Following his PhD on harmonic analysis matters, he worked on conformal representations of rectifiable areas properties on holomorphic dynamics. He recently specialized on Schramm-Loewner process. The common interest of all his works concerns complex analysis and geometric theory of functions.

LE STUDIUM
CONFERENCES

Conformal Methods in Analysis, Random Structures & Dynamics

Conformal or scale invariant phenomena arise naturally in a wide spectrum of topics of current mathematical study. These include, for instance, models in statistical physics such as SLE, random graphs, quantum gravity and geometric properties Brownian motion. Conformal invariance is similarly a key to understanding in detail geometric features of complex dynamics, Julia sets and Fatou sets.

On the other hand, geometric and harmonic analysis with PDE's have developed strong methods to make use of conformal and quasiconformal invariance in various settings. The aim of this conference was to shine light on current and emerging research trends on questions related to conformal invariance in mathematical analysis, random structures, complex dynamics and related fields, by gathering together internationally acknowledged specialists of these areas.

LE STUDIUM
LECTURES

La Géométrie du Hasard

Dr Bertrand Duplantier, Director of Research at the Institute of Theoretical Physics in Saclay, Paris

Pascal wrote in 1654: "By linking the theories and equations of mathematics to the uncertainty of chance, and reconciling what appears contrary, this art assumes rightly the amazing title: Random Geometry."

This lecture traces the genesis of the notion of chance, illustrating it by the natural phenomenon of Brownian motion, from its observation by the botanist Robert Brown in 1827 until its vital role today in physics and mathematics.

Example of fractal (wikipedia)

LE STUDIUM CONFERENCE

LE STUDIUM CONFERENCE

Bertrand Duplantier, LE STUDIUM LECTURE

PR ERIC GOLES

PROFESSOR

January 2015 to April 2015
FROM Adolfo Ibáñez University, Chile
IN RESIDENCE AT LIFO, Orléans

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

Pr Nicolas Ollinger

Laboratory Host Scientist

Nicolas Ollinger is a theoretical computer scientist who joined LIFO in the University of Orléans in September 2011. His field of research includes theoretical computer science to discrete mathematics, covering topics like combinatorics on words, models of computation and complexity and decision problems for cellular automata and tiling.

He connects to the complex systems community through his research both on classification of cellular automata according to their dynamics (bulking) and on decision problems on abstract formal discrete dynamical models, providing formal proofs of unpredictability. He was a PhD student in Lyon in research team MC2 when the IXXI Institute emerged, then a founding member of the team Escape (équipe systèmes complexes, automates cellulaires et pavages) in Marseille where he participated to the national ANR projects Sycamore and EMC devoted to the relation in between computational models and discrete complex systems. Since 2008, he is the scientific secretary of International Federation for Information Processing (IFIP) working group on Cellular Automata and Discrete Complex Systems.

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

Complex systems analyses investigate the emergence of complex global behavior through the local interactions of a large collection of well understood components. Interdisciplinary by nature, it encompasses problems encountered in the diverse disciplines of physics, economics, biology, mathematics, computer sciences, linguistics from which it borrows both models and tools.

Discrete models of complex systems provide formal models that can be used both as modeling tools convenient for computer simulation to study particular complex systems and as a simple framework to study, define and characterise fundamental properties of complex systems.

Theoretical Computer Science, through the theory of computation, provide valuable tools to design efficient algorithms or, when not possible, prove unpredictability or characterise the inherent difficulty of predictability in discrete models of complex systems like cellular automata, boolean or regulatory genetic networks, social science models, sand piles and Ising like models.

The purpose of this project is to contribute to the organisation and development of the emerging research community on complex systems in the Loire Valley, disseminate tools and models from theoretical computer science among that interdisciplinary community and to confront other models to widen the scope of application of these tools.

During his stay in 2015, Professor Eric Goles worked with his host scientist, Professor N. Ollinger, about freezing automata with PhD students from LIFO and DISC in Chile, on a model related with the origins of synonyms.

He participated as a keynote speaker at the fisrt Atelier MISC (Maison Interdisciplinaire des Systèmes Complexes) in Orléans in January 2015.

DR CRISTIANO DE MICHELE

PRESTIGE FELLOW

December 2015 to December 2016
FROM "Sapienza" University of Rome, Italy
IN RESIDENCE AT CBM, Orléans

Cristiano De Michele is assistant professor at the Physics Deptartment of «Sapienza» University of Rome doing research in the field of Theoretical Physics of Matter. He received his Master in Physics from the University of Pisa in 1998 (summa cum laude) and his PhD from University of Naples-Federico II in 2003.

After having worked on glassy and colloidal systems, recently he has started studying both theoretically and numerically the aggregation processes and liquid crystal phases of DNA-based colloids using suitable coarse-grained models.
His position as a LE STUDIUM Research Fellow his cofunded by the PRESTIGE Programme (Marie Skłodowska-Curie Actions COFUND).

Pr Francesco Piazza

Laboratory Host Scientist

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

AROUND THE PROJECT

Scientific publications

- Bucciarelli, S.; Casal-Dujat, L.; De Michele, C.; Sciortino, F.; Dhont, J.; Bergenholtz, J.; Farago, B.; Schurtenberger, P.; Stradner A. Unusual Dynamics of Concentration Fluctuations in Solutions of Weakly Attractive Globular Proteins, *The Journal of Physical Chemistry Letters*, **2015**, *6*, 4470-4474
- Nguyen, K. T., Battisti, A.; Ancora, D.; Sciortino, F.; De Michele, C. Self-Assembly of mesogenic bent-core DNA nanoduplexes, *Soft Matter*, **2015**, *11*, 2934-2944

COARSE-GRAINED MODELS OF BIOLOGICAL SYSTEMS

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

Thanks to the most recent technical advances in imaging and single-particle tracking techniques, paralleled by tremendous progress in computational approaches, it is now generally believed that the environment itself is a key factor in shaping the biochemical processes that it hosts. However, it is very difficult to interpret experiments on biomolecular transport and association performed in living cells, due to the plethora of unknown and spurious effects that are likely to affect the measurements, arising from all the processes running in parallel to the one under scrutiny and most probably intertwined with it in unknown ways. The common solution to these strongly impeding disadvantages is the test tube. However, in order to perform experiments under the required conditions, one pays the price of studying a pale copy of the process of interest, distilled to such dilute and controlled conditions to become with great probability an utterly different process.

The present project aims at taking an intermediate step from the test-tube to the cell stopping half-way, in the realm of colloids. Drawing on concepts and methods from the physics of colloids, we will build computational tools to simulate biomolecular association in complex environments. Biomolecules will be modelled as hard convex objects (HCO) or collections of freely hinged HCOs. The environment will be replenished of crowding agents of different shape (shape matters), size (exploring the effect of specific mixes) and concentration (crowding). Enthalpic interactions will be allowed for through sticky spots (local piece-wise constant potentials), thus enabling us to explore crowding effects on biomolecular association along the brim of subtle enthalpy/entropy trade-offs.

LE STUDIUM
WORKSHOP

PREMIER ATELIER MISC (MAISON INTERDISCIPLINAIRE DES SYSTÈMES COMPLEXES)

9 January 2015 | LOCATION | Hôtel Dupanloup, Orléans

Pr Gerald Kneller

Workshop convenor

Gerald Kneller is a Professor of Physics at the University of Orléans, Director of MISC and group leader at the Centre de Biophysique Moléculaire of the CNRS.
A specialist in statistical physics, theoretical biophysics, and computer simulation he develops multi-scale models for the structure and dynamics of biomolecular systems.

PROJECT

The Maison Interdisciplinaire des Systèmes Complexes (MISC) is a research platform, which is financed by the Region Centre-Val de Loire and the Universities of Orléans and Tours for the period 2014-18.

Its main mission is to foster collaborative research projects on the modelling of complex systems in all scientific disciplines and to organise accompanying scientific conferences. Selected projects can be supported through a full-time position for a research engineer. The MISC project is endorsed by 15 laboratories and institutions in Orléans and Tours.

OBJECTIVE

The workshop was a brainstorming meeting, where representatives of all supporting laboratories could express their expectations and ideas for collaborative research projects on the modelling of complex systems. The meaning of "complexity" in the different disciplines, ranging from pure mathematics to linguistics, was particularly emphasized.

These discussions, including the MISC steering committee, lead to the selection of three research projects for the first year: a) the importance of reproducibility in interdisciplinary research projects, b) a project on the function of "real" neural networks, and c) a project in linguistics on the literacy of university students. The participants appreciated the constructive atmosphere of the meeting.

LE STUDIUM
WORKSHOP

RETOUR D'EXPÉRIENCES SUR LA RECHERCHE REPRODUCTIBLE (R4)

3-4 December 2015 | LOCATION | Hôtel Dupanloup, Orléans

Convenors

Dr Konrad Hinsen
is a researcher at the Centre de Biophysique Moléculaire (CBM) in Orléans, working in the field of computational biophysics.

Dr Andrew Davison
is the leader of the neuroinformatics group at the Unité de Neuroscience, Information et Complexité (UNIC) in Gif sur Yvette.

Dr Christophe Pouzat
is a neurophysiologist specializing in data analysis at the Mathématiques Appliquées à Paris 5 (MAP5) laboratory.

Pr Gerald Kneller
is a Professor of physics at the University of Orléans and Director of MISC.

Pr Jean-Louis Rouet
is a Professor of physics at the University of Orléans and Director of CaSciModOT.

R4 WORKSHOP

R4 WORKSHOP

PROJECT

The CaSciModOT federation (Calcul Scientifique et Modélisation Orléans Tours) has been supporting computational science in the region since 2004. It organises regular workshops that unite the transdisplinary community of computational scientists, and it has contributed to the creation of more focused organisations such as the CCSC (Centre de Calcul Scientifique en région Centre) and the MISC.

OBJECTIVE

Computers have revolutionized scientific research, allowing us to work with much more complex models and much larger datasets than before. However, the rapid evolution and the low reliability of software have contaminated the scientific results that were obtained. It is very difficult today to reproduce the result of a computation to the last bit a few months later, and it is nearly impossible to verify a computational result published in the literature.

The Reproducible Research movement aims at improving the situation through transparence and provenance tracking for scientific data. While this is simple in principle, there are numerous practical obstacles that must be overcome. In this workshop, pioneers of Reproducible Research shared their experience with the wider scientific community, with the goal of increasing the reliability and thus the credibility of all research that relies on computers.

HUMAN & SOCIAL SCIENCES

LABORATORIES IN HUMAN & SOCIAL SCIENCES

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

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

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

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

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

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

PR ERMINIA ARDISSINO

FELLOW

December 2014 to December 2015

FROM University of Torino, Italy

IN RESIDENCE AT CESR, Tours

Erminia Ardissino (PhD, Yale University; Dottorato di Ricerca, Universita Cattolica, Milan) is Associate Professor at the University of Turin. Her research deals with Italian literature from Dante to the seventeenth century, with particular attention to the relationship with the history of ideas and religious experience. Currently she is exploring poetry in form of prayer, a genre present in Italian literature from its origins to the present, but never investigated as such, and Biblical reading and writing in Italian Renaissance, focusing especially on women interpretative communities in Venice and Florence. She has received numerous awards, including Newberry Library Weiss-Brown Subvention Award; Renaissance Society of America Fellowship; Italian Academy for Advanced Studies at Columbia University (NY) Fellowship; Fulbright Distinguished Lecturership at the University of Chicago.

Dr Elise Boilet

Laboratory Host Scientist

Élise Boillet is a CNRS researcher at the CESR of Tours. Her field of research is Italian Renaissance religious culture. She first dealt with lay authors actives in Venice in the years 1530s (she was awarded the 'Prix Marie-Louise Arconati-Visconti de la Chancellerie des Universités de Paris' for her doctoral thesis on the subject). She is the author of L'Arétin et la Bible (Genève, Droz, 2007) and the scientific editor of Antonio Brucioli. Humanisme et évangélisme entre Réforme et Contre-Réforme (Paris, Champion, 2008). She is currently dealing with vernacular books on the psalms printed in XVIth century Italy. At the CESR, she coordinates the multiplidiscinary activities connected with the theme 'Profane and Sacred'. She is also a coordinator of a Working Group within the COST Action IS1301 'New Communities of Interpretation: Contexts, Strategies and Processes of Religious Transformation in Late Medieval and Early Modern Europe' (2013-2017).

THE LAITY AND THE BIBLE: RELIGIOUS READING IN EARLY MODERN EUROPE

The aim of the project is to investigate the connection between the laity and the Bible in Europe and especially in Italy in the period between 1470 and 1600, which saw several dramatic cultural and religious changes: the development of the printing, the literary affirmation of vernacular languages, the spreading of new religious doctrines and the formation of various confessional identities.

Recent research has demonstrated that participation of the laity in biblical culture was wide in Medieval and Early Modern Europe and has challenged the traditional view of scholars, its ideological paradigms and its chronological turning points. The research project is in direct connection with these results and will add to them new insights, with a focus on Italy, where the Roman Catholic Church had a particular weight and influence. Indeed, even if decisive studies have highlighted the complex and non-linear history of ecclesiastical censorship against vernacular biblical books, vernacular biblical culture, and literature remain largely under explored.

In order to have a clear understanding of the phenomen, we decided to create a catalogue of Biblical literature in Early Modern Italy. Such a catalogue will assist any future research in the field and will have a big impact for scholarship. The catalogue will represent the evolution of biblical culture in the long term, which goes from the beginning of the printing era (i.e. long before the spreading of Luther's thought in Italy in the years 1520s) to the middle of the seventeenth century (i. e. long after the creation of the Roman Inquisition in 1542, the end of the Council of Trent in 1563, and of the Clementine Index issued in 1596).

This investigation crosses historical, bibliographical and literary methods, combining a quantitative approach with a qualitative one. The catalogue considers a wide range of texts (translations, commentaries, paraphrases, anthologies, devotional writings, poetry and dramatic works), as all these genres were not independent from each other and most texts overlapped in terms of authorship and readership, genre and style. Paying attention to both the apparatus and the text itself, the research project will contextualise and clarify the participation of laypeople answering questions on authors, purposes, readers, genres and contents, forms, etc. The aim was to reconstruct the possibilities and impossibilities of access for laity to biblical books and the multiple aspects of the lay participation to the religious culture and the formation of Italian and European modern identities.

LE STUDIUM
CONFERENCES

Lay readings of the bible in early modern Europe

To explore how Biblical readings by laics determined the ethical, cultural, social, literary, epistemological evolution in early modern Europe. We invited the renowned scholars interested in the topic working in different fields in order to have an extended view of the problem. We wanted to be able to compare the different cultural and confessional situation according to the most recent research and to start exploring how the Bible influenced different disciplinary domains, such as medicine, political science, natural history, education. We think that the study of these issues could establish a new paradigm in European history, which considers the importance of religious attitudes in professional and social terms, not only in the spiritual and devotional terms. The CESR is a renowned centre of research, therefore scholars are eager to participate in events and activities in which it is involved or organised. The topic of the conference is important as it involves a milestone of European culture and of early modern history, such as the Bible. Especially it is considered in relationship with readership and lay people, aspects of our past not yet well explored by scholarship. Futhermore, the perspective of how modernity was determined by Biblical knowledge is a peculiar one, and may have solicited the interest of scholars invited.

LE STUDIUM
LECTURES

Sous le signe de Jonas : Bible et civilisation européenne

Élise Boillet is a CNRS researcher at the CESR in Tours.

Although over the last two hundred years, the West has largely undergone a process of secularisation that has tended to exclude religion from most cultural and civic expressions, recent decades have also seen a significant upsurge in religion. Any aspect of the religious past seems of interest for people now. Especially the topic of how religion created a unified Europe is important.

AROUND THE PROJECT

Oral Communications

- Ardissino, E. Women interpretative communities: Venice, Renaissance Society of America Annual Convention, Berlin (Germany), March 26-28, 2015.
- Ardissino, E. Italian Biblical Poems, The Same and the Different: Strategies of Retelling the Bible within the New Communities of Interpretation (1350-1570), Prague (Czech Republic), March 19-20, 2015.
- Ardissino, E. Domenica de Paradis entre mystique et predication, Les femmes prophètes et mystiques : entre sainteté et hérésie du XIIIe au XVIIe siècle, Tours (France), Juin 18-19, 2015.
- Ardissino, E. Literary and emblematic Versions of a Domestic Devotion: The Rosary in Renaissance Italy, Domestic Devotions in Early Modern World, Cambridge (UK), July 9-11, 2015.
- Ardissino, E. Italian Biblical Readings. Religious Transformations Suggested by a Catalogue: Genres and Gender in Biblical Literature, in Religious Transformation in Late Medieval and Early Modern Europe Bridging the chronological, linguistic, confessional and cultural divides (1350-1570), COST ACTION 1301, Tours (France), October 15-17, 2015.

Pr Erminia Ardissino & Dr Elise Boilet

Luther's translation of the Bible from 1534

DR PETER BENNETT

PRESTIGE FELLOW

August 2015 to August 2016

FROM Case Western Reserve University, United Kingdom

IN RESIDENCE AT CESR, Tours

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

Pr Philippe Vendrix

Laboratory Host Scientist

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

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

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

This research focuses on what then happened in the cathedral, in terms of the music performed, the liturgy followed, and their significance. The project does this by following several lines of enquiry. Firstly, specific details of the ceremony in the cathedral are very rare so the initial phase of the project surveyed the available printed and manuscript descriptions to collate the information on the music and liturgy performed. Secondly, a parallel investigation surveys other types of materials that might provide information on the liturgy and music, in particular the local liturgical books that may now be preserved in municipal libraries: since many of these entrées took place in the Loire Valley, the libraries and archives of Tours, Orléans, Angers, Poitiers and Le Mans are a particularly rich source of information of this kind.

Having established the basic content of the ceremony, the third part of the project involves recreating as much of the music as possible through the editing of important manuscript sources in Tours and Paris, and through the reconstruction of fragmentary printed sources in the Bibliothèque Nationale de France and elsewhere. Finally, the project seeks to assess the significance of the music and liturgy by setting it in the wider historical, institutional, and political context of early 17th century France: at a time when jurists and clerics around Louis XIII were seeking to redefine the nature of kingship itself, Louis's participation in these sacred events, and the texts that were highlighted through musical settings, may have played a significant, and as yet overlooked, role in projecting and cementing his status as monarch.

DR ANDREA GRIGNOLIO

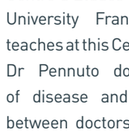
FELLOW

November 2015 to October 2016

FROM University of Rome La Sapienza, Italy

IN RESIDENCE AT VALLOREM & CESR, Tours

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



Pr Véronique Des Garets

Laboratory Host Scientist

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

Dr Concetta Pennuto

Laboratory Host Scientist

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

THE ACCEPTABILITY OF BIOMEDICAL INNOVATION: HISTORICAL APPROACH

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

A primary research goal is the analysis and acceptability of the original economic costs and social acceptability of biomedical innovations. This research offers a historical perspective of the social perception of risk applied to biomedical innovation. In the peer reviewer literature, education and income correlate to longevity, suggesting a positive effect on health outcomes. In particular, more educated individuals have a better understanding of, and more rapidly absorb, information about medicine and health care. Less is known about the underlying mechanism through which these associations are causal. The controversy raised by vaccination against measles, mumps, and rubella provides a useful case for studying individual behavioural responses to new information about risks or new medical technologies, suggesting that information processing rather than simply access to education and income is the key driver. Evidence shows that more educated and seldom richer parents are more selective and more often choose not to vaccinate their child. The second part of this research looks at why individuals making decisions under uncertainty and risk give undue weight to information indicating risk. Finally, a review of the biomedical literature to analyse the risk perception of biopharmaceuticals will be undertaken.

An analysis of the literature concerning vaccines discovery and production is the start. First scrutiny of the archives at Sapienza University of Rome and at the State Archives in order to find documents of the link between the Chaumier's laboratory and his Italian counterpart, the hygienist Dante De Blasi (1873-1956). Followed by a review of the biomedical literature to analyse the risk perception of biopharmaceuticals.

LE STUDIUM
CONSORTIUM

POWER AND THE PARATEXT IN THE MEDIEVAL MANUSCRIPT CULTURE

8-12 June 2015

LOCATION Hôtel Dupanloup, Orléans

Pr Rosalind Brown-Grandt

Consortium coordinator

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

PROJECT

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

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

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

PARTNERS

Pr Iolanda Ventura
is Associate Professor in History of Sciences and Technologies, as well as Chair of Excellence in the History of Scientific Knowledge in the Middle Ages at the Université d'Orléans/CNRS, France. Her particular expertise is in the study of medical and scientific manuscripts.

Pr Anne D. Hedeman
is Judith Harris Murphy Distinguished Professor of Art History in the Kress Foundation Department of Art History at the University of Kansas, USA. Her research specialism is the study of political and historical texts of the later Middle Ages.

Pr Gisela Drossbach
is Professor of Medieval Canon Law in the Leopold-Wenger-Institut fur Rechtsgeschichte at the Ludwig-Maximilians-Universitat Munchen, and is also affiliated to the University of Augsburg, both in Germany. Her particular expertise is in the field of medieval canon law.

Dr Patrizia Carmassi
is Research Fellow in the Zentrum fur Mittelalterund Fruhneuzeitforschung at the Georg-August- Universitat Gottingen, working on a project which is a collaboration with the Herzog August Bibliothek in Wolfenbuttel, Germany. Her research specialism is the study of liturgical texts and works in the classical tradition.

AROUND THE PROJECT

Articles/book chapters

- Gisela Drossbach, "Bologna – München – Halberstadt: Die Collectio Halensis – ein Werk des Johannes Teutionicus? (Halle, ULB, Ye 20 80)", in Rechtshandschriften des deutschen Mittelalters. Produktionsorte und Importwege, ed. Patrizia Carmassi and Gisela Drossbach, = Wolfenbütteler Mittelalter-Studien 29, Wiesbaden, 2015.
- Gisela Drossbach, "Historische Situierung des Liber Regulae zwischen Rom, Assisi und Avignon", in Caritas im Schatten von Sankt Peter. Der Liber Regulae des Hospitals von Santo Spirito in Sassia: eine Prachthandschrift des 14. Jahrhunderts, ed. Gisela Drossbach and Gerhard Wolf (Studien zur Geschichte des Spital-, Wohlfahrts- und Gesundheitswesens 11; zugleich eine Publikation des Kunsthistorischen Instituts in Florenz, Max-Planck-Institut) Regensburg: Verlag Ferdinand Pustet, 2015.

AROUND THE PROJECT

Scientific activities

- Exhibition curated by P. Carmassi and C. Heitzmann on "Herzog August Bibliothek: Gedanken am Rande. Marginalien in Bild und Text 800-1800", (3 May-15 November 2015).
- International conference organised by P. Carmassi and G. Toussaint at the Herzog August Bibliothek on "Codex und Material – Jenseits von Text und Bild?", (7-9 October 2015); as part of the programme, Patrizia Carmassi gave a paper entitled "Welche Materialität? Beispiele und Überlegungen anhand der mittelalterlichen Codices in der Sammlung Marquard Gude (HAB)".
- "Late Medieval France and Burgundy: Disciplines in Dialogue" symposium organised by R. Brown-Grant at the University of Leeds, on 21 November 2015, to feature a workshop on Brotherton Library Ms 100, a History Roll, in which A.D. Hedeman has given a presentation on its paratextual features.

Oral communications

- Carmassi, P. Theological issues and traces of controversies in manuscripts which transmit works of the church fathers, International congress 'Namque ego suetus eram hos libros legisse frequenter': Early Medieval Practices of Reading and Writing», The Hague (The Netherlands), June 3-5, 2015.
- Hedeman, A. D. Le pouvoir des images saintes dans les Grandes chroniques de France: le cas de Saint Louis, Seminar "Quand le livre fait la norme", Paris (France), March 19, 2015.
- Hedeman, A. D. Imagining the Past: Interplay between Textual and Visual Imagery in late Medieval France, York Medieval Seminar, York (UK), November 17, 2015.
- Drossbach, G. Äbte – Konvente – Kapitel: Verfassungsstrukturen bayerischer religiöser Institutionen im Mittelalter, Congress "Herrschaftsteilung in der Frühen Neuzeit", Kloster Banz (Germany) February 12, 2015.

Books

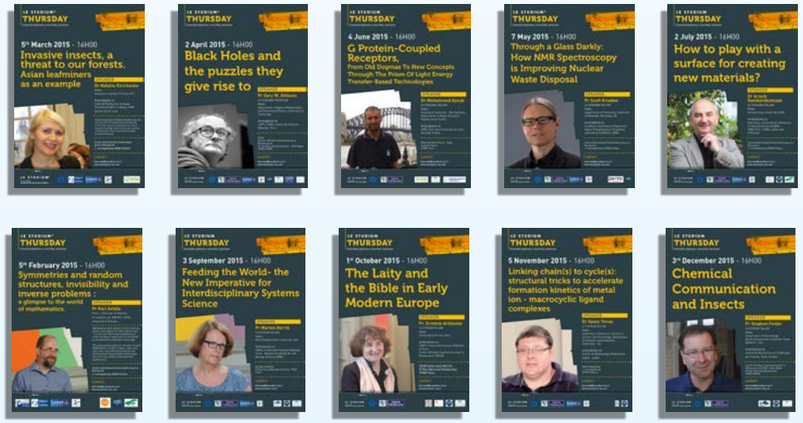
- Rechtshandschriften des deutschen Mittelalters. Produktionsorte und Importwege, ed. P. Carmassi and G. Drossbach, = Wolfenbütteler Mittelalter-Studien 29, Wiesbaden 2015
- Textual and Visual Representations of Power and Justice in Medieval France: Manuscripts and Early Printed Books, ed. R. Brown-Grant, A.D. Hedeman and B. Ribémont, ? Farnham, Surrey/ Burlington VT, 2015
- Text/Image Relations in Medieval French and Burgundian Culture (Fourteenth-Sixteenth Centuries), ed. R. Brown-Grant and R. Dixon, Turnhout, 2015
- Caritas im Schatten von Sankt Peter. Der Liber Regulae des Hospitals von Santo Spirito in Sassia: eine Prachthandschrift des 14. Jahrhunderts, ed. G. Drossbach and G. Wolf (Studien zur Geschichte des Spital-, Wohlfahrts- und Gesundheitswesens 11; zugleich eine Publikation des Kunsthistorischen Instituts in Florenz, Max-Planck-Institut), Regensburg, Verlag Ferdinand Pustet, 2015.

TRANSDISCIPLINARY APPROACH

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

These cross-disciplinary meetings take place every first Thursday of the month, gathering LE STUDIUM Research Fellows in residence, their laboratory hosts and guests from the scientific, industrial and institutional sectors.

All international researchers visiting the region Centre-Val de Loire are welcome to attend these international meetings.



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

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

In Orléans where LE STUDIUM headquarters are located, Research Fellows are welcomed in the heart of the city since December 2013 in the prestigious Hôtel Dupanloup, which was renamed the International University Centre for Research. This 16th century former bishop's residence has been brightly renovated to offer a prestigious modern and ancient decor for all scientific events.

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

GOOD NEWS STORIES IN 2015

PROFESSOR CHRISTOPHE SINTUREL, INTERFACES, CONFINEMENT, MATÉRIAUX ET NANOSTRUCTURES (ICMN) - UMR 7374 - CNRS, UNIVERSITY OF ORLÉANS

I was the host scientist for Professor Marc Hillmyer, University of Minnesota, USA and LE STUDIUM Research Fellow 2012-2013. We have in common the study of nano-structured polymers such as block polymers that can be used in novel state of the art applications such as microelectronics or nanofluidics.

In 2008, I was an invited professor to the laboratory of Professor Hillmyer in order to develop a new method for the production of block polymer thin films with extremely well controlled morphology. We were immediately interested and motivated in sharing the complementary expertise of our research groups to cross-fertilize new and exciting areas of research. From this starting point, we decided to push forward our collaboration and proposed to LE STUDIUM a new topic of research requiring the close interaction of our two groups and the team of Professor David Grosso based in the Collège de France in Paris. This project, to create porous networks bearing nanopillar arrays for nanofluidic applications, was awarded funding for a LE STUDIUM Research Fellowship.

The fellowship year of Professor Hillmyer was extremely creative and successful, resulting in the publication of peer reviewed papers and the organisation of a great international LE STUDIUM Conference. And then came new ideas! We envisioned the use of a new class of block-polymers, called "high-chi/low-N", that could be used as a serious alternative to the optical lithography process in the microelectronic industry. With financial support from the Semiconductor Research Corporation I was able to move to the University of Minnesota for one year, from September 2014 to August 2015.

Moving to a foreign country for an extended period of time is a career adventure often associated with challenges for the researcher's family. Bank account, accommodation, children's schooling, medical insurance ... for all of this and more LE STUDIUM was a great help for Professor Hillmyer and his family. But LE STUDIUM is much more. Since I contacted Professor Hillmyer nearly 10 years ago, without the support of LE STUDIUM we would not have pushed our joint research to the exciting point we have now reached. For the research group in Orléans, it has been a unique opportunity to strengthen our research activity, with a well-established position in the national and international polymer scene, with positive benefits for the ICMN laboratory.

This journey has certainly facilitated new research activities and has enabled new collaborations with groups and companies within the region Centre-Val de Loire. It has been and continues to be a fantastic scientific and human adventure.

PROFESSOR CLAUDIO LAZZARI, INSTITUT DE RECHERCHE SUR LA BIOLOGIE DE L'INSECTE (IRBI) - UMR 7261 - UNIVERSITY FRANÇOIS-RABELAIS OF TOURS, CNRS.

I was the host scientist for Professor Marcos Pereira, Universidade Federale de Minas Gérais, Brazil and LE STUDIUM Research Fellow 2012-2013. We started our research collaboration many years ago and belong to the same global scientific community. In 2003 I left Argentina, to move to France. LE STUDIUM has made it possible for me to crystalize and deepen my collaboration with Professor Pereira. Our research is in the haematophagous way of life, which includes the morphological, physiological and behavioural adaptations of arthropods that enable them to feed on the blood of vertebrate hosts. Both of us focus our research on the insect vectors of major human diseases, such as Malaria, Dengue, Chagas disease and Leishmaniasis.

Professor Pereira's fellowship made it possible to formalise our collaboration and catalyse our scientific activities. The fellowship included an international LE STUDIUM Conference and a 3-month visit of a Brazilian funded PhD student from Professor Pereira's laboratory. As a result, we were able to work towards a larger and more ambitious programme that integrated the participation of colleagues from the Oswaldo Cruz Foundation (FIOCRUZ), Brazil. This initiative made possible the continuity and extension of our bilateral research, training and teaching activities. This project is funded by the "Science without Borders" action of the Brazilian CNPq, 2013-2016. I am involved as a "Special Visiting Scientist" and I visit Brazil on a yearly basis to conduct research, give lectures and seminars as well as collaborate in the training of students at both, the University of Minas Gerais and FIOCRUZ.

The programme "Science without Borders" has been a unique opportunity to establish enduring links between scientists in Brazil and in the region Centre-Val de Loire. The programme supports a one-year post-doc position in Brazil and a mission of 3 months for a foreign scientist every year. Since 2013, I visit once or twice a year the University of Minas Gerais and the FIOCRUZ to do research, give courses and seminars and collaborate in the training of students and identify candidates to come to Tours.

LE STUDIUM nurtures the links with former fellows to create and maintain a "sense of belonging" to the region Centre-Val de Loire.

ARAYIK HAMBARDZUMYAN, LE STUDIUM RESEARCH FELLOW 2014-2015

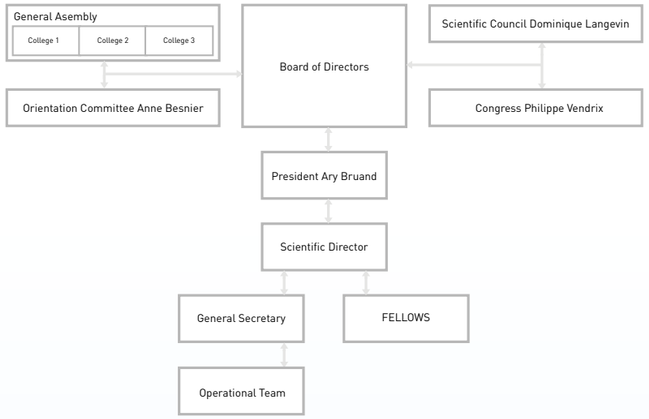
The surface and interface phenomenon between two non-miscible phases is at the center of my research activities. My early research was on the preparation of composite materials with lignocellulosic polymers (lignin, cellulose...). This work resulted in top-tier journal publications and a patent, which served as a solid basis to present a research project to LE STUDIUM for a research Fellowship. The goal of this research was the study of the polymer adsorption layer structure and chemical composition on the stability (UV protection) and evaporation control of products (perfume) encapsulated in emulsions. The research results have enabled two patents to be lodged, aided by the office of Service de Valorization et de Partenariat CNRS in Orléans.

Eco-friendly formulations of emulsions with a natural polymer from the plant cell wall (lignin), which is biodegradable, harmless to the human skin and to the environment are very attractive for diverse inter-sectorial enterprises including the cosmetic industry. A number of meetings with various enterprises have enabled the negotiation of agreements to utilize the fundamental knowledge of emulsion formulation using lignin to evaluate commercial applications and test industrial scale production facilities. The Cosmetic Valley pole has played an essential role in the establishment of intra-sectorial contacts with various cosmetic enterprises located in region Centre-Val de Loire as well as in other parts of France. The intense interest manifested by intra- and inter-sectorial enterprises in this research has the potential to deliver significant socioeconomic benefits for the region Centre-Val de la Loire and beyond.

LE STUDIUM facilitated, in the context of the ARD 2020 LAVOISIER programme, an extension to my contract by working with ICMN and CNRS. This project will see the transfer of fundamental scientific knowledge across industrial sectors, presenting value-added opportunities for regional development. The LAVOISIER proposal will utilize the introduction of cellulose nanocrystals to enhance the mechanical properties of polymer films used in fuel cell production.

LE STUDIUM fellows participate in numerous scientific networking meetings, to diversify their global research networks and discuss with Fellows specialized in various scientific fields, which nurtures a culture of innovation and social responsibility.

GOVERNANCE



LE STUDIUM Loire Valley Institute for Advanced Studies is a non-profit organisation of Law 1901 registered in 1996 in Orléans, France. It is administered by a General Assembly of Members, a Board of Directors, an Orientation Committee and a Management team. The General Assembly of members is composed of 3 collegia:

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

and meets annually to review the year's activities. Every four years, this General Assembly reviews the composition and elects a Board of Directors. Local and regional institutions are represented at LE STUDIUM Orientation Committee. The Board of Directors and the Orientation Committee meet 3 to 4 times a year to review the activities and prepare reports and orientation decisions for the General Assembly.

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

Scientific Council meeting - June 2015

SCIENTIFIC COUNCIL

LE STUDIUM Scientific Council recommends fellowship awards. It is composed of independent external researchers who gather once a year in June to analyze the scientific reviews provided by a pool of more than 450 experts and to finalize the selection of the Smart Loire Valley General Programme fellows who will next come in residence. The Scientific Council members are also regularly consulted for their expertise to perform independent evaluations in the course of required recruitments occurring across all programmes.

For the campaign 2015-2016, LE STUDIUM Scientific Council members were:

PRESIDENT

- Yves FARGE, Academy of Technologies, Paris
- Yves-Michel GINOT, Director of Analytical Division, Servier Group, Orléans. (Interim President)

MEMBERS

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

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

- Christian ANDRES, Inserm Scientific Correspondent.
- Catherine BEAUMONT, Regional Delegate Centre Inra Val-de-Loire, represented by Jean-Charles Bastien.
- Eric BUFFENOIR, CNRS District Centre- Poitou-Charentes.
- Jean-Marie CASTELAIN, Director, INSA Centre-Val de Loire, represented by Guy Feuillard.
- Philippe SIMONNETTI, CEA, the Ripault, Tours.
- Youssoufi TOURÉ, President of the University of Orléans, represented by Christine Rousselle.
- Patrice PIANTONE, Research Branch, BRGM, Orléans.
- Loïc VAILLANT, President of University François-Rabelais of Tours, represented by Emmanuel Lesigne.
- Jacques VARET, Treasurer of LE STUDIUM, former BRGM, Orléans.
- Patrick RIEHL, Vice-President Region Centre-Val de Loire (2004-2015).
- Nicolas DUBOULOZ, Director of Higher Education, Research and Technology Transfer, Region Centre-Val de Loire.

LE STUDIUM EVENTS IN 2015

CONFERENCE THURSDAY PUBLIC LECTURE WORKSHOP CONSORTIUM

JANUARY

6-9 **e-Solid State Nuclear Magnetic Resonance**
Dr Pierre Florian & Dr Sylvian Cadar (CEMHTI)

8 **e-Solid State Nuclear Magnetic Resonance**
Dr Sylvian Cadar (CEMHTI)

9 **1er Atelier MISC - Maison Interdisciplinaire des Systèmes Complexes**
Pr Eric Goles (LIFO) & Pr Nicolas Olinger (LIFO) Pr Gerard Kneller (CBM)

MARCH

5 **Invasive insects, a threat to our forests. Asian leafminers as an example**
Dr Natalia Kirichenko (URZF)

MAY

4-7 **Monitoring of monoclonal Antibodies Group in Europe (IMAGE) for inflammatory diseases**
Pr Denis Mulleman (GICC)

7 **How NMR Spectroscopy is Improving Nuclear Waste Disposal**
Pr Scott Kroeker (CEMHTI)

27-29 **Nuclear Waste Disposal: Designing Materials For the End of Time**
Pr Scott Kroeker & Dr Pierre Florian (CEMHTI)

27 **Vitrification des déchets nucléaires**
Pr Etienne Vernaz (CEA)

JULY

2 **How to play with a surface for creating new materials?**
Dr Arayik Hambardzumyan (ICMN)

8-10 **Analysis and Annotation of DNA Repeats and Dark Matter in Eukaryotic Genomes**
Dr Peter Arensburger & Dr Yves Bigot (PRC)

8 **Éléments transposables, la partie cachée des génomes**
Dr Peter Arensburger

8 **Nanotaxi to unlock the discovery of antibodies against difficult targets**
Dr Bruno Pitard (InCellart)

SEPTEMBER

3 **Feeding the World- the New Imperative for Interdisciplinary Systems Science**
Pr Marion Harris (IRBI)

7-9 **Bioinspired molecular assemblies as protective and delivery systems**
Dr Arayik Hambardzumyan & Dr Samuel Guillot (ICMN)

7 **Qualités et facteurs de qualité du champagne**
Dr Roger Douillard

NOVEMBER

5 **Linking chain(s) to cycle(s): structural tricks to accelerate formation kinetics of metal ion - macrocyclic ligand complexes**
Dr Gyula Tircsó (CBM)

17-18 **Habitats and inhabitants on the early Earth and Mars**
Dr Kathleen A. Campbell & Dr Frances Westall (CBM)

17 **L'origine de la vie sur Terre et dans l'Univers**
Dr André Brack

24-26 **Lay Readings of the Bible in Early Modern Europe**
Pr Erminia Ardissino & Dr Elise Boilet (CESR)

24 **Sous le signe de Jonas: Bible et civilisation européenne**
Dr Elise Boillet (CESR)

FEBRUARY

5 **Symmetries and random structures, invisibility and inverse problems - a glimpse to the world of mathematics**
Pr Kari Astala (MAPMO)

16-20 **COSMetics in Orléans**
Pr Salvatore Magazu & Pr Chantal Pichon (CBM)

16-20 **Ecological Adaptation to Desert Environment**
Pr Raphaël Boulay (IRBI)

17 **La Recherche sur L'Autstime - Opération Espoir en Tête**
Pr Frédérique Bonnet-Brilhault (IC) & Dr Sylvain Briault (INEM)

APRIL

2 **Black Holes and the puzzles they give rise to**
Pr Gary Gibbons (LMPT)

12-16 **Loire Valley Workshop on Conformal Methods in Analysis, Random Structures and Dynamics**
Pr Kari Astala & Dr AthanasiosBatakis & Pr Michel Zinsmeister (MAPMO)

15 **La Géométrie du Hasard**
Pr Bertrand Duplantier

17 **Entanglement, Holography and Geometry**
Pr Gary Gibbons & Pr Sergey Solodukhin (LMPT)

JUNE

4 **G Protein-Coupled Receptors**
Dr Mohammed Ayoub (PRC)

8-12 **Power and the paratext in the medieval manuscript culture**
Pr Rosalind Brown-Grant & Pr Iolanda Ventura (IRHT)

AUGUST

OCTOBER

1 **The Laity and the Bible in Early Modern Europe**
Pr Erminia Ardissino (CESR)

5-7 **Insects, Pathogens, and Plant Reprogramming: From Effector Molecules to Ecology**
Pr Marion Harris & Dr David Giron (IRBI)

5 **Insectes & Plantes: le secret de la jeunesse éternelle**
Dr David Giron

19-22 **Monitoring of monoclonal Antibodies Group in Europe (MAGE) for inflammatory diseases**
Pr Denis Mulleman (GICC)

DECEMBER

3-4 **Retour d'expériences sur la Recherche Reproductible**
Dr Konrad Hinsen (CBM) & Pr Gerald Kneller (CBM) & Jean-Louis Rouet (ISTO)

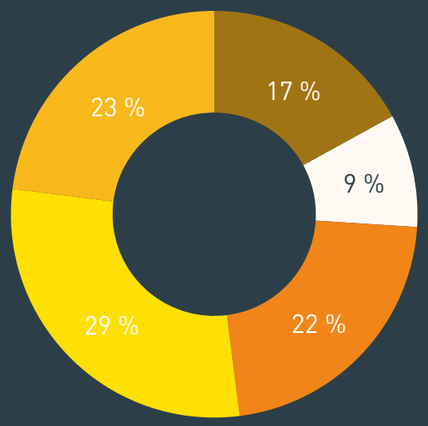
3 **Chemical Communication and Insects**
Pr Stephen Foster (IRBI)

7-9 **Medicinal flavor of metal complexes: diagnostic and therapeutic applications**
Dr Gyula Tircsó & Dr Eva Jakab Toth (CBM)

7 **Les métaux et la vie**
Pr Clotilde Policar

ORIGIN OF LE STUDIUM RESEARCH FELLOWS IN REGION CENTRE-VAL DE LOIRE SINCE 1996

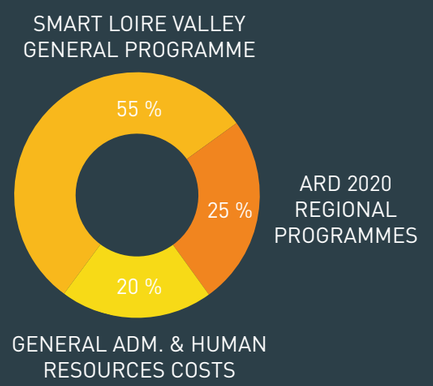
THEMATICS REPARTITION



- MATERIALS AND ENERGY SCIENCES
- LIFE AND HEALTH SCIENCES
- EARTH, ECOLOGY AND ENVIRONMENTAL SCIENCES
- HUMAN AND SOCIAL SCIENCES
- COMPUTER SCIENCE, MATHEMATICS AND MATHEMATICAL PHYSICS

2015 FINANCIAL DATA

2015 EXPENDITURES REPARTITION



2015 RESOURCES	1 919 483 €
REGION CENTRE-VAL DE LOIRE	64,6%
EUROPEAN REGIONAL DEVELOPMENT FUNDS	19,5%
LOIRET	4,3%
UNIVERSITY FRANÇOIS-RABELAIS OF TOURS	3,8%
AGGLO Orléans	2,5%
Inra AGREENSKILLS	1,6%
PRIVATE CONTRIBUTIONS	1,6%
PRESTIGE Programme - MSCA COFUND	0,7%
VARIOUS	0,8%
CITY OF Orléans	0,5%

LIST OF RESEARCHERS IN RESIDENCE IN 2015

SMART LOIRE VALLEY GENERAL PROGRAMME

PR LEANDROS SKALTSOUNIS

Application of state-of-the-art green technology for the development of high added value cosmeceuticals based on plant natural products
- December 2015 – July 2016
- In residence at: Institut de Chimie Organique et Analytique (ICOA) – UMR 7311 – Université d'Orléans, CNRS
- Host scientist: Pr Claire Elfakir

DR PETER BENNETT

Music, liturgy and power: Louis XIII's Paris and provincial entrées, 1610-43
- August 2015 – August 2016
- In residence at: Centre d'Études Supérieures de la Renaissance (CESR) - UMR 7323 - Université François-Rabelais de Tours, CNRS
- Host scientist: Pr Philippe Vendrix

DR PETER ARENSBURGER

Impact of space segregation between micro and macrochromosomes on distributions of both kinds of transposable elements in avian genomes
- December 2013 - September 2014 & June 2015 – September 2015
- In residence at: Physiologie de la Reproduction et des Comportements (PRC) - UMR 085 - Centre Inra Val de Loire, Université François-Rabelais de Tours, CNRS, Institut Français du Cheval et de l'Équitation
- Host scientist: Dr Yves Bigot

PR GARY GIBBONS

Classical and Quantum Space-Time and Its Symmetrics
- March 2015 – May 2015
- In residence at: Laboratoire de Mathématiques et Physique Théorique (LMPT) - UMR 7350 - CNRS, Université François-Rabelais de Tours
- Host scientist: Pr Sergey Solodukhin

DR GYULA TIRCSÓ

Rational design, synthesis and study of new macrocyclic ligans for biomedical and radiopharmaceutical application
- January 2015 – January 2016
- In residence at: Centre de Biophysique Moléculaire (CBM) - UPR 4301-CNRS
- Host scientist: Dr Eva Jakab Toth

PR ERMINIA ARDISSINO

The laity and the Bible: Religious reading in early modern Europe
- December 2014 – December 2015
- In residence at: Centre d'Études Supérieures de la Renaissance (CESR) - UMR 7323 - Université François-Rabelais de Tours, CNRS
- Host scientist: Dr Elise Boillet

PR MARION HARRIS

Insect Reprogrammers: From Strategies for Manipulating Plants to Agriculture
- December 2014 – December 2015
- In residence at: Institut de Recherche sur la Biologie de l'Insecte (IRBI) - UMR 7261 - Université François-Rabelais de Tours, CNRS
- Host scientist: Dr David Giron

PR SCOTT KROEKER

High temperature nuclear magnetic resonance spectroscopy of devitrification process in nuclear waste glasses
- September 2014 – September 2015
- In residence at: Conditions Extrêmes et Matériaux: Haute Température et Irradiation (CEMHTI) - UPR 3079 - CNRS
- Host scientist: Dr Pierre Florian

PR KARI ASTALA

Conformal Methods in Random Geometry
- September 2014 – May 2015
- In residence at: Mathématiques - Analyses, Probabilités et Modélisation (MAPMO) - UMR 7349 - CNRS, Université d'Orléans
- Host scientist: Dr Athanasios Batakis & Pr Michel Zinsmeister

DR ARAYIK HAMBARDZUMYAN

The impact of adsorption layer structure and chemical composition on the stability of encapsulated production emulsions
- September 2014 – August 2015
- In residence at: Interfaces, Confinement, Matériaux et Nanostructures (ICMN) - UMR 7374 - CNRS, Université d'Orléans
- Host scientist: Dr Samuel Guillot

DR NATALIA KIRICHENKO

Development of advanced molecular tools for identification of invasive forest insects
- January 2014 - May 2015
- In residence at: Unité de Recherche Zoologie Forestière (URZF) - UR 0633 – Centre Inra Val de Loire
- Host scientist: Dr Alain Roques, Dr Sylvie Augustin & Dr Carlos Lopez-Vaamonde

DR ALEJANDRO MARTINEZ-MEIER

Adaptation of forest trees to climate warming: a case study on douglas-fir
- January 2014 - January 2015
- In residence at: Unité de Recherche Amélioration, Génétique et Physiologie Forestières (UAGPF) - UR 0588 - Centre Inra Val de Loire
- Host scientist: Dr Philippe Rozenberg

PR ROBIN BEECH

Nicotinic receptors in parasitic nematodes: A pharmacological target for next generation anthelmintics
- September 2013 to September 2014 and February 2015
- Infectiologie Animale et Santé Publique (ISP) - UMR 1282 - Centre Inra Val de Loire - Université François-Rabelais de Tours
- Host scientist: Dr Cédric Neveu

DR CHARLES SENNOGA

Targeted drug delivery to the brain
- September 2013 to December 2015
- In residence at: Imagerie et Cerveau (IC) - UMR U930 - Inserm, Université François-Rabelais de Tours
- Host scientist: Dr Ayache Bouakaz

DR KATHLEEN CAMPBELL

The importance of hydrothermal systems for early life
- February 2014 to December 2014 and November 2015
- In residence at: Centre de Biophysique Moléculaire (CBM) - UPR 4301 – CNRS
- Host scientist: Dr Frances Westall

PR STEPHEN FOSTER

Developing a more quantitative approach to chemical ecology/ physiology
- December 2014 to December 2015
- In residence at: Institut de Recherche sur la Biologie de l'Insecte (IRBI) - UMR 7261 - Université François-Rabelais de Tours, CNRS
- Host scientist: Dr David Giron

PR ERIC GOLES

Discrete models of complex systems: computational complexity and (un)predictability, theory and applications
- January 2015 to April 2015
- In residence at: Laboratoire d'Informatique Fondamentale d'Orléans (LIFO) – EA 4022 – Université d'Orléans, INSA Centre Val de Loire
- Host scientist: Pr Nicolas Ollinger

DR CRISTIANO DE MICHELE

Coarse-grained models of biological systems
- December 2015 to December 2016
- In residence at: Centre de Biophysique Moléculaire (CBM)-UPR 4301-CNRS
- Host scientist: Pr Francesco Piazza

PROGRAMME ARD 2020 BIOPHARMACEUTICALS

DR SOHAIL AKHTER

Synthesis and Biosynthesis of molecules – Development of mRNA cellular factories
- June 2015 - June 2017
- In residence at: Centre de Biophysique Moléculaire (CBM), UPR 4301, CNRS
- Host scientist: Pr Chantal Pichon

DR MOHAMMED AYOUB

Targeting of G protein-coupled receptors by modulator antibodies
- July 2014 - June 2017
- In residence at: Physiologie de la Reproduction et des Comportements (PRC) - UMR 085 - Centre Inra Val de Loire, Université François-Rabelais de Tours, CNRS, Institut Français du Cheval et de l'Équitation
- Host scientist: Dr Eric Reiter

DR JORGE L. GUTIERREZ

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

DR ANDREA GRIGNOLIO

The acceptability of biomedical innovation: historical approach
- November 2015 – October 2016
- In residence at: Laboratoire Val de Loire Recherche en Management (VALLOREM) – EA 6296 – Université d'Orléans, Université François-Rabelais de Tours & CESR UMR 7323
- Host scientist: Pr Véronique Des Garets (VALLOREM) & Dr Concetta Pennuto (CESR)

PROGRAMME ARD 2020 LAVOISIER

DR ARAYIK HAMBARDZUMYAN

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

DR CHADRASEKARAN RAMASAMY

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

CONSORTIUM MEETINGS

E-SOLID STATE NUCLEAR MAGNETIC RESONANCE

- 5-9 January 2015
- Hôtel Dupanloup, Orléans
- Dr Pierre Florian & Dr Sylvian Cadar (CEMHTI)

COSMETICS IN ORLÉANS

- 16-20 February 2015
- Hôtel Dupanloup, Orléans
- Pr Salvatore Magazu & Pr Chantal Pichon (CBM)

ECOLOGICAL ADAPTATION TO DESERT ENVIRONMENT

- 16-20 February 2015
- 2 Lions & CESR, Tours
- Pr Raphaël Boulay (IRBI)

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

- 4-7 May 2015
- CESR, Tours
- Pr Denis Mulleman (GICC)

POWER AND THE PARATEXT IN THE MEDIEVAL MANUSCRIPT CULTURE

- 8-12 June 2015
- Hôtel Dupanloup, Orléans
- Pr Rosalind Brown-Grant & Pr Iolanda Ventura (IRHT)

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

- 19-22 October 2015
- CESR, Tours
- Pr Denis Mulleman (GICC)

CONFERENCES & WORKSHOPS IN 2015

LOIRE VALLEY WORKSHOP ON CONFORMAL METHODS IN ANALYSIS, RANDOM STRUCTURES AND DYNAMICS.

- 12-16 April 2015
- Domaine de Chalès, Hôtel Dupanloup Orléans
- Pr Kari Astala & Dr Batakis (MAPMO)

ENTANGLEMENT, HOLOGRAPHY AND GEOMETRY

- 17 April 2015
- Hôtel Dupanloup, Orléans
- Pr Gary Gibbons & Pr Sergey Solodukhin (LMPT)

NUCLEAR WASTE DISPOSAL: DESIGNING MATERIALS FOR THE END OF TIME

- 27-29 May 2015
- Hôtel Dupanloup, Orléans
- Pr Scott Kroeker & Dr Pierre Florian (CEMHTI)

NANOTAXI TO UNLOCK THE DISCOVERY OF ANTIBODIES AGAINST DIFFICULT TARGETS

- 8 July 2015
- Faculté de Médecine, Tours
- Dr Bruno Pitard (InCellart)

ANALYSIS AND ANNOTATION OF DNA REPEATS AND DARK MATTER IN EUKARYOTIC GENOMES

- 8-10 July 2015
- Lycée Descartes, Tours
- Dr Peter Arensburger & Dr Yves Bigot (PRC)

BIOINSPIRED MOLECULAR ASSEMBLIES AS PROTECTIVE AND DELIVERY SYSTEMS

- 7-9 September 2015
- Hôtel Dupanloup, Orléans
- Dr Arayik Hambardzumyan & Dr Samuel Guillot (ICMN)

INSECTS, PATHOGENS, AND PLANT REPROGRAMMING: FROM EFFECTOR MOLECULES TO ECOLOGY

- 5-7 October 2015
- Hôtel de Ville, Tours
- Pr Marion Harris & Dr David Giron (IRBI)

HABITATS AND INHABITANTS ON THE EARLY EARTH AND MARS

- 17-18 November 2015
- Hôtel Dupanloup, Orléans
- Dr Kathleen A. Campbell & Dr Frances Westall (CBM)

LAY READINGS OF THE BIBLE IN EARLY MODERN EUROPE

- 24-26 November 2015
- CESR, Salle Rapin,Tours
- Pr Erminia Ardissino & Dr Elise Boilet (CESR)

MEDICINAL FLAVOR OF METAL COMPLEXES: DIAGNOSTIC AND THERAPEUTIC APPLICATIONS

- 7-9 December 2015
- Hôtel Dupanloup, Orléans
- Dr Gyula Tircsó & Dr Eva Jakab-Toth (CBM)

THURSDAY MEETINGS IN 2015

E-SOLID STATE NUCLEAR MAGNETIC RESONANCE

- 8 January 2015
- Hôtel Dupanloup, Orléans
- Dr Sylvian Cadar (CEMHTI)

SYMMETRIES AND RANDOM STRUCTURES, INVISIBILITY AND INVERSE PROBLEMS - A GLIMPSE TO THE WORLD OF MATHEMATICS.

- 5 February 2015
- Hôtel Dupanloup, Orléans
- Pr Kari Astala (MAPMO)

INVASIVE INSECTS, A THREAT TO OUR FORESTS. ASIAN LEAFMINERS AS AN EXAMPLE

- 5 March 2015
- Hôtel Dupanloup, Orléans
- Dr Natalia Kirichenko (URZF)

BLACK HOLES AND THE PUZZLES THEY GIVE RISE TO

- 2 April 2015
- Arcades Insitute, Tours
- Pr Gary Gibbons (LMPT)

HOW NMR SPECTROSCOPY IS IMPROVING NUCLEAR WASTE DISPOSAL

- 7 May 2015
- Hôtel Dupanloup, Orléans
- Pr Scott Kroeker (CEMHTI)

G PROTEIN-COUPLED RECEPTORS, FROM OLD DOGMAS TO NEW CONCEPTS THROUGH THE PRISM OF LIGHT ENERGY TRANSFER-BASED TECHNOLOGIES

- 4 June 2015
- Salle Anatole France, Mairie de Tours, Tours
- Dr Mohammed Ayoub (PRC)

HOW TO PLAY WITH A SURFACE FOR CREATING NEW MATERIALS?

- 2 July 2015
- Hôtel Dupanloup, Orléans
- Dr Arayik Hambardzumyan (ICMN)

FEEDING THE WORLD- THE NEW IMPERATIVE FOR INTERDISCIPLINARY SYSTEMS SCIENCE

- 3 September 2015
- Arcades Insitute, Tours
- Pr Marion Harris (IRBI)

THE LAITY AND THE BIBLE IN EARLY MODERN EUROPE

- 1 October 2015
- CESR, Salle saint martin, Tours
- Pr Erminia Ardissino (CESR)

LINKING CHAIN(S) TO CYCLE(S): STRUCTURAL TRICKS TO ACCELERATE FORMATION KINETICS OF METAL ION - MACROCYCLIC LIGAND COMPLEXES

- 5 November 2015
- Hôtel Dupanloup, Orléans
- Dr Gyula Tircsó (CBM)

CHEMICAL COMMUNICATION AND INSECTS

- 3 December 2015
- CESR, Salle Rapin, Tours
- Pr Stephen Foster (IRBI)

LECTURES IN 2015

LA GÉOMÉTRIE DU HASARD

- 15 April 2015
- Dr Bertrand Duplantier - Director of Research Institute of Theoretical Physics in Saclay, Paris

VITRIFICATION DES DÉCHETS NUCLÉAIRES

- 27 May 2015
- Pr Etienne Vernaz - Director of Research CEA (Marcoule) - Institut National des Sciences et Techniques Nucléaires (INSTN)

ÉLÉMENTS TRANSPOSABLES, LA PARTIE CACHÉE DES GÉNOMES

- 8 July 2015
- Dr Peter Arensburger - California State Polytechnic University, Pomona, USA

QUALITÉS ET FACTEURS DE QUALITÉ DU CHAMPAGNE

- 7 September 2015
- Dr Roger Douillard

INSECTES & PLANTES: LE SECRET DE LA JEUNESSE ÉTERNELLE

- 5 October 2015
- Dr David Giron - IRBI, CNRS Research Director, Tours

L'ORIGINE DE LA VIE SUR TERRE ET DANS L'UNIVERS

- 17 November 2015
- Dr André Brack - Research Director Emeritus at CBM, CNRS Orléans

SOUS LE SIGNE DE JONAS: BIBLE ET CIVILISATION EUROPÉENNE

- 24 November 2015
- Dr Elise Boilet - CESR, Tours

LES MÉTAUX ET LA VIE

- 7 December 2015
- Pr Clotilde Policar, Ecole Normale Supérieure (ENS), Paris

AFFILATED EVENTS

PREMIER ATELIER MISC (MAISON INTERDISCIPLINAIRE DES SYSTÈMES COMPLEXES)

- 9 January 2015
- Hôtel Dupanloup, Orléans
- Pr Gerald Kneller (CBM)

SATELLITE MEETING OF MNPS 2015

- 24 June 2015
- INSA Centre-Val de Loire, campus of Bourges
- Pr Sergey Traytak

RETOUR D'EXPÉRIENCES SUR LA RECHERCHE REPRODUCTIBLE

- 3-4 Decembre 2015
- Hôtel Dupanloup, Orléans
- Dr Konrad Hinsen (CBM), Dr Andrew Davison (UNIC), Dr Christophe Pouzat (MAP5), Pr Gerald Kneller (CBM), Pr Jean-Louis Rouet (ISTO)

RENCONTRES LEONARDO

LA RECHERCHE SUR L'AUSTIME

- 17 February 2015
- Dr Sylvain Briault (INEM) & Pr Frédérique Bonnet-Brilhault (IC)

SMART LOIRE VALLEY GENERAL PROGRAMME AWARDS CAMPAIGN 2015/2016

LE STUDIUM RESEARCH PROFESSORSHIP

PR YIMING CHEN

- From: Yanshan University, China
- Project: Observer design for distributed-parameter systems
- Host Scientist: Pr Driss Boutat, PRISME, Université d'Orléans / INSA Centre Val de Loire.

LE STUDIUM RESEARCH FELLOWSHIP EXTERNAL APPLICATIONS

DR FERENC KRISZTIAN KALMAN

- From: University of Debrecen, Hungary
- Project: Mn(II)-based smart contrast agents: synthesis and physico-chemical characterisation
- Host Scientist: Dr Eva Jakab-Toth, Centre de Biophysique Moléculaire (CBM), CNRS.

DR MIKHAIL ZUBKOV

- From: Institute for Theoretical and Experimental Physics, Russia
- Project: Establishing links between gravity, field theory and condensed matter: Dirac and Weyl semimetals, superfluids, composite Higgs bosons
- Host Scientist: Dr Maxim Chernodub, Laboratoire de Mathématiques et Physique Théorique (LMPT), Université François-Rabelais Tours / CNRS.

LE STUDIUM RESEARCH FELLOWSHIP – LABORATORY APPLICATIONS

DR CHRISTELLE BRIOIS

Very high resolution mass spectrometry for space applications

- Host Laboratory: Laboratoire de Physique et Chimie de l'Environnement et de l'Espace (LPC2E), Université d'Orléans / CNRS.

PR CHIARA LASTRAIOLI

The Italian Editorial Production in Jean Calvin's Geneva (1541-1564): an Inventory and a Linguistic-Stylistic Study

- Host Laboratory: Centre d'Etudes Supérieures de la Renaissance (CESR), Université François-Rabelais Tours / CNRS.

PR JACQUES POIRIER

Refractory corrosion

- Host Laboratory: CEMHTI, CNRS

LE STUDIUM RESEARCH CONSORTIUM

DR AYACHE BOUAKAZ (PAST LE STUDIUM FELLOW)

- Project: Sonoporation for therapy: from *in-vitro*, to *in-vivo* to patients
- Host Laboratory: Imagerie et Cerveau (IC), Université François-Rabelais Tours, Inserm.

DR PHILIPPE ROZENBERG

- Project: Dynamics of wood formation and adaptation of forest trees to climate variation
- Host Laboratory: Amélioration Génétique et Physiologie Forestières (UAGPF), Centre Inra Val de Loire

PR KARL MATTHIAS WANTZEN

- Project: Ecohydraulics and dam removal
- Host Laboratory: CITERES, Université François-Rabelais Tours, CNRS.

DR MAGNUS WILLIAMSON (PAST LE STUDIUM FELLOW)

- Project: SOUNDING SPACE: Acoustic Experience and Ritual Contexts (1300-1700)
- Host Laboratory: Centre d'Etudes Supérieures de la Renaissance (CESR), Université François-Rabelais Tours / CNRS.

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