

BORDEAUX INP SUMMER SCHOOL June 27th to July 8th, 2016

Sustainability in Bordeaux City and Aquitaine

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Bordeaux INP AQUITAINE Revision

UN GROUPE DE **8 ÉCOLES D'INGÉNIEURS PUBLIQUES EN/AQUITAINE**

une classe prépa intégrée « La Prépa des INP » et un incubateur élève « SIT'INNOV »



A word from François CANSELL

Director general of Bordeaux INP



On behalf of all my colleagues, I am pleased to welcome you to Bordeaux, one of the most dynamic conurbations in France and the capital city of our new region called "Nouvelle Aquitaine".

We are happy to receive you at Bordeaux INP, the academic institution promoting the training of engineers in the South-Western part of France. Over the past two years we have worked very hard to develop the Bordeaux INP Summer School into what it is today. We now offer a 2 weeks-program designed to provide new knowledge and insights in sustainable development that may be needed in your future career. This particular theme has been a focus of concern for our institute for a number of years now.

Our summer course will include seminars and visits of industrial sites, and will be taught in English. Our experts will address the main challenges in relation with sustainable development and the consequences of global warming. We will give the floor to scientists and also to professors in charge of a number of innovative programs which better mobilize the academic and scientific actors, in order to enable more efficient and more visible development of policies, capacity and instruments relating to education, training and research for sustainable development. We would also like to acknowledge the valuable contribution of the Council for Sustainable Development (C2D) of Bordeaux Metropole who will show how the city has implemented a series of initiatives to become greener and provide a better quality of life for all its citizens.

Alongside the program we also offer exciting social activities which will show you the highlights of student life in Bordeaux. By its exceptional geography, historic heritage and the worldwide reputation of its wines, our city embodies a timeless way of life. To illustrate this point, I would like to mention that the city was recently elected best European destination in 2015. We hope you will enjoy the city, its emblematic buildings as well as our brand new Bordeaux-based wine museum and cultural center known as La Cité du Vin which recently opened its doors.

I wish you a very pleasant stay with us.

François Cansell Director general of Bordeaux INP

Timetable

Monady, Jone 27 m

- 8:30 **Opening** François Cansell, Director general of Bordeaux INP Claire Le Henaff, Delegate for International Affairs
- 9:00 Introduction French Course Room TD 28 - ENSEIRB-MATMECA - Bordeaux INP
- 10:00 « Domestic wastes : characteristics, waste prevention and social development » Sandrine Courvoisier (ENSEGID-Bordeaux INP) Amphi B - ENSEIRB-MATMECA-Bordeaux INP
- 12:15 LUNCH (CROUS)
- 2:00 « Contribution of multisource remote sensing for forest sustainable development » Nesrine Chehata (ENSEGID-Bordeaux INP) Amphi B - ENSEIRB-MATMECA-Bordeaux INP

6:00 WINE & CHEESE

Tuesday, June 28th

- 9:00 Introduction French Course Room TD 28 - ENSEIRB-MATMECA - Bordeaux INP
- 10:00 « Sustainable Management of Groundwater Resources » Alexandre Pryet (ENSEGID-Bordeaux INP) Amphi F - ENSEIRB-MATMECA-Bordeaux INP
- 12:15 LUNCH (CROUS)
- 2:00 VISIT : Ecosite du Bourghail, Pessac

Wednesday, June 29th

- 9:00 Introduction French Course Room TD 28 - ENSEIRB-MATMECA - Bordeaux INP
- 10:00 « Can rising CO₂ concentration in the atmosphere mitigate the impact of drought years on tree growth? » Jean-Christophe DOMEC (Bordeaux Sciences Agro*) Amphi F - ENSEIRB-MATMECA-Bordeaux INP
- 11:30 LUNCH (SANDWICHES)
- 2:00 VISIT : Lapouyade Centre de Stockage des Déchets Ultimes, Veolia

Thursday, June 30th

- 9:00 Introduction French Course Room TD 28 - ENSEIRB-MATMECA - Bordeaux INP
- 10:00 « Sustainability of wood production in the Landes Forest of maritime pines » Florian Delerue (ENSEGID-Bordeaux INP) Amphi F - ENSEIRB-MATMECA-Bordeaux INP
- 12:15 LUNCH (SANDWICHES)
- 2:30 VISIT : Station d'épuration Clos de Hilde, Bègles (SUEZ environnement)

Friday, July 1st

- 9:00 Introduction French Course Building A, Room 1 - ENSEIRB-MATMECA-Bordeaux INP
- 10:00 « Can batteries solve our energy problems ? » Jules Galipaud (ENSCBP-Bordeaux INP) Amphi F - ENSEIRB-MATMECA-Bordeaux INP

12:30 LUNCH (CROUS)

Monday, July 4th

- 9:00 Introduction French Course Building A, Room 1 - ENSCBP-Bordeaux INP
- 10:00 « Future of telecommunications » François Rivet (ENSEIRB-MATMECA-Bordeaux INP) Building A, Room 1 - ENSCBP-Bordeaux INP
- 12:15 LUNCH (CROUS)
- 2:00 « Recent development in photovoltaic cells » Laurence Vignau (ENSCBP-Bordeaux INP) Building A, Room 1 - ENSCBP-Bordeaux INP
- 3:30 **« Energy efficiency of buildings »** Bruno Agostino Walter (ISABTP*) Building A, Room 1 - ENSCBP-Bordeaux INP

Tuesday, July 5th

- 9:00 Introduction French Course Building A, Room 1 - ENSCBP-Bordeaux INP
- 10:00 « Life Cycle Assessment (LCA) : a holistic approach to assess the environmental impacts of products » Philippe Loubet (ENSCBP-Bordeaux INP) Building A, Room 1 - ENSCBP-Bordeaux INP

12:15 LUNCH (CROUS)

- 2:00 « Modified grape composition under Climate Change conditions requires adaptations in the vineyard » Cornelis van Leeuwen (Bordeaux Sciences Agro*) Building A, Room 1 - ENSCBP-Bordeaux INP
- 3:30 « Green Chemistry : New challenges for the Plastic Industry » Henri Cramail (Université de Bordeaux) Building A, Room 1 - ENSCBP-Bordeaux INP

Wednesday, July 6th

- 9:00 Introduction French Course Building A, Room 1 - ENSCBP-Bordeaux INP
- 10:00 « World Café » Damien Mouchague (C2D) & Antoine Legrand (Bordeaux INP) Building A, Room 1 - ENSCBP-Bordeaux INP
- 12:15 LUNCH (CROUS)

2:00 VISIT : Cité du Vin, Bordeaux

Thursday, July 7th

- 9:00 Introduction French Course Building A, Room 1 - ENSCBP-Bordeaux INP
- 10:00 « Electric Consumption and Human Behaviors at Home » Jean-Marc Salotti (ENSC-Bordeaux INP) Building A, Room 2 - ENSCBP-Bordeaux INP

12:15 LUNCH (CROUS)

- 2:00 « Groundwater management and remediation » Olivier Atteia (ENSEGID-Bordeaux INP) Building A, Room 2 - ENSCBP-Bordeaux INP
- 3:30 **« Energy transition. Potential role and challenges of energy storage »** Jean-Pierre Bedecarrats (ENSGTI*) Building A, Room 2 - ENSCBP-Bordeaux INP
- 6:00 Wine testing at the Ecole du Vin

Friday, July 8th

- 9:30 Introduction French Course Building A, Room 1 - ENSCBP-Bordeaux INP
- 10:00 « Waste and food » Claire Le Henaff (ENSCBP-Bordeaux INP) Building A, Room 1 - ENSCBP-Bordeaux INP
- 12:15 LUNCH (CROUS)
- 7:00 FAREWELL DINNER AT LE BISTROT REGENT

Sandrine COURVOISIER



Sandrine COURVOISIER-GOMBERT is a lecturer in Ecology/Human ecology at ENSEGID-Bordeaux INP. She is a researcher in the UMR ADES.

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Domestic wastes : characteristics, waste prevention and social representation

By their consumption patterns, households generate wastes (biodegradable wastes, cartons, papers and plastics due to packaging, glass, textiles, electrical and electronic equipment waste,). In 2005, the French production of domestic waste reached 1kg/inhabitant/day.

Although waste management has become increasingly sophisticated, separate collection and recycling facilities have become commonplace, and landfill and incineration standards have become more rigorous, rising global consumption patterns are putting increasing pressure on natural resources, ecosystems and waste infrastructure. That is why the European Waste Directive (2008/98/ EC) introduces waste prevention at the top of the waste hierarchy and considers it as the favoured option. However, although waste policy aims encouraging behavioural change, changes towards proenvironmental behaviours are still low due to psychological barriers.

The course will deal with domestic waste, waste prevention and waste perception and obstacles to behavior changes.

Nesrine CHEHATA



Nesrine CHEHATA is a senior Lecturer at ENSEGID-Bordeaux INP. She is a researcher at EA « Géoressources et Environnement ».

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Remote sensing data helps monitoring forest at global, regional and local scales

This talk focuses on the local scale and presents different remote sensing techniques such as very high spatial resolution multispectral data, photogrammetry techniques or Lidar data and their contribution for classifying forest structure and stand ages, and for estimating forest biophysical parameters such as height, crown diameter, density that are vey useful for forest resources inventory and management. Examples will be shown on the forest of Landes de Gascogne, in south-western France which is the largest European maritime pine forest.

JUNE THE 27th - 2 PM

Alexandre PRYET



Alexandre PRYET is Assistant Professor in Groundwater Hydrology at ENSEGID-Bordeaux INP. His research projects focus the sustainable development and protection of groundwater resources.

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Groundwater is extensively used for irrigation and drinking water supply. In comparison with surface waters, subterranean water resources are of better quality and are resilient to climate fluctuations. Victim of its own success, this valuable resource is now threatened by depletion in numerous regions of the world. In this lecture, we present a framework to assess the degree of sustainability of groundwater withdrawals.

JUNE THE 28TH - 10 AM

Jean-Christophe DOMEC



Jean-Christophe DOMEC is a Professor in wood anatomy and tree ecophysiology at Bordeaux Sciences Agro*. He is a researcher in the UMR ISPA « Interactions Sol Plante Atmosphère » INRA/ Bordeaux Sciences Agro.

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Can rising CO_2 concentration in the atmosphere mitigate the impact of drought years on tree growth?

«Atmospheric CO, concentrations and nitrogen deposition rates have increased substantially over the last century and are expected to continue unabated. As a result, terrestrial ecosystems will experience warmer temperatures and some may even experience droughts of a more intense and frequent nature that could lead to widespread forest mortality. Thus there is mounting pressure to understand and predict how forest growth will be affected by such environmental interactions in the future. In this lecture we used tree growth and physiological data from the Duke Free Air CO, Enrichment (FACE) experiment to discuss the effects of elevated atmospheric CO, concentration (+200 ppm) and Nitrogen fertilization (11.2 g of N m-² yr-¹) on stem biomass increments, water use and carbon uptake of mature trees from 1996 to 2012.

Florian DELERUE



Florian DELERUE is a senior lecturer in ecology at ENSEGID-Bordeaux INP.

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«Sustainable management of the Landes de Gascogne maritime pine forest«

The « Landes de Gascogne » forest of maritime pine is the largest cultivated forest in Europe. During the last decades, wood production in this forest has largely increased thanks to profound changes in forestry practices. Nowadays, the demand for wood production is still increasing. However, as we will see in this lecture, satisfying this demand raises the question of the sustainability of such level of production. Pine trees grow on nutrient poor sandy soils. Thus, increasing wood production in the short term could jeopardize soil nutrient stocks and wood production in the long term. Finally, we will see that perspectives regarding climate change have also to be taken into account to ensure wood production in the region on the long term.

Jules GALIPAUD



Jules GALIPAUD is a post-doctoral fellow at ICMCB-ENSCBP-Bordeaux INP. His research is focused on miniaturized energy conversion systems such as all solid state microbatteries and microsupercapacitors.

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Can batteries solve our energy problems?

Energy demands are growing and expected to do so throughout the century. Yet, greenhouse gases emitted from our current energy consumption generate climate changes affecting humans through natural disasters, droughts, sea level rise, etc. This is the energy dilemma we are facing. New strategies of energy production, storage, and conversion are needed to tackle this global challenge. In this perspective, electrochemical devices to store and convert energy such as batteries, fuel cells and supercapacitors have great potential and a review of newest technologies in the field will be presented.

JULY THE 1st - 10 AM

François **RIVET**



Dr. Francois RIVET received the phD degree in 2009 from the University of Bordeaux, France. He joined the French Research Agency (CNRS) in 2005 as a PhD student in the microelectronics laboratory of the University of Bordeaux. His research is focused on the design of RFICs. He developed a Sampled Analog Signal Processor (SASP) dedicated to Software Radio applications. He is a member of the STMicroelectronics-IMS joint research laboratory, and of several Technical Program Committees (RFIC, MWSCAS, SBCCI, ...). In February 2010, he co-founded as CEO, Atlantic Innovation – Electronic Solutions. His company is specialized in research in any electronic topics. Since June 2010, he is tenured as Associate Professor

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Future of communications : faster, smarter, greener

at IMS Lab and Bordeaux INP.

How does my smartphone works ? Why am I running out of battery within a day ? Why my communications can be so slow... This lecture will introduce you to the challenges in telecommunications by drawing researches perspectives in the coming future for faster, smarter and greener handsets. We will discover the evolution of telecommunications, how a circuit is design and fabricated, why it consumes so much power and how we can solve these issues by proposing disruptive solutions. Cellphone use will be allowed during presentations !

Laurence VIGNAU



Laurence VIGNAU is a Professor at ENSCBP-Bordeaux INP. She carries out her research on Organic Electronics at the Laboratory of the Interaction from Materials to Systems (IMS), Bordeaux INP/University of Bordeaux

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Recent development in photovoltaic cells

Currently, around 80% of the energy supply worldwide is based on fossil fuels like coal, oil or gas. Renewable energies represent the key to greater independence from fossil fuels. Up to now, only a very small percentage of the energy production comes from the sun, mainly because of the relatively high cost of the silicon-based solar cells. Organic photovoltaic cells are viewed as promising candidates for low cost solar cells because of the possibility of a production on flexible and large-area substrates by solution processing that should dramatically reduce the manufacturing costs. The talk will present all types of photovoltaic cells and will focus on Organic Solar Cells.

JULY THE 4TH - 2 PM

Bruno AGOSTINO WALTER



Bruno AGOSTINO WALTER is a PhD student at ISABTP* (University of Pau & Pays de l'Adour). He is working in the laboratory SIAME (Laboratoire des Sciences de l'Ingénieur Appliquées à la Mécanique et au Génie Electrique).

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Energy efficiency of buildings

After a brief introduction of ISA BTP "Graduate School Construction Industry and Civil Engineering" and its training programme, the present talk introduces to the necessity of studying the energy efficiency of buildings. The main objectives of this study are to reduce energy consumptions related to the residential sector and to increases indoor comfort of buildings. Also, this talk presents available tools to evaluate the energy efficiency of buildings: from labels (LEED, BREEAM, HQE, ...) and to current norms. The talk shows also an application case in which the thermal comfort of an existing building is taken into account by developing a dynamic thermal simulation (DTS). Finally, the talk concludes by presenting how innovative and biosourced materials can regulate the variations of relative humidity of indoor climate, thus reducing the need of air conditioning.

JULY THE 4TH - 3.30 PM

Philippe LOUBET

Bordeaux IN



Philippe LOUBET is an associate Professor in environmental evaluation at ENSCBP-Bordeaux INP. His research focuses in the improvement of the Life Cycle Assessment (LCA) methodology and its application to Green Chemistry, Agri-Food and Water Management.

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A product, or a service, generates environmental impacts through all its life cycle stages, i.e., from raw material extraction through materials processing, manufacture, distribution, use and disposal or recycling. These impacts are diverse as they refer to pollution (global warming, toxicity, eutrophication, acidification, etc.) or resources use (fossil and metal depletion, water deprivation, etc.).

In order to ensure sustainable production, decision makers need tools to quantify these impacts in a holistic way. In this context, LCA is an efficient method that enables to assess most of the environmental impacts of a product from cradle to grave. It allows identifying pollution shifting between impact categories, between life cycle stages or between different locations. This lecture will introduce the main concept of LCA, its application for eco-design, environmental labeling, industrial ecology and so on. Examples within the French or Aquitaine context will also be presented.



Cornelius VAN LEEUWEN is a Professor in Viticulture at Bordeaux Sciences Agro*. He is a researcher at UMR EGFV 1287 « Ecophysiologie et Génomque Fonctionnelle de la Vigne» at the Vine and Wine Institute of Bordeaux (ISVV)

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Modified grape composition under Climate Change conditions requires adaptations in the vineyard

Major effects of Climate Change are an increase in temperatures, a modification in rainfall patterns and an increase in incoming radiation. Vines are highly sensitive to climatic conditions. Hence, vine development, grape ripening and grape composition at ripeness are modified by Climate Change. Some of these changes are already visible and will be amplified over the coming decades; other effects, although not yet measurable, can be predicted by modeling. This will induce major modifications in wine quality and typicity worldwide. Vine phenology is driven by temperatures. A significant advance in is observed since the early 1980's in most winegrowing regions. The combined effect of advanced phenology and increased temperatures results in warmer conditions during grape ripening. In these conditions, grapes contain more sugar and less organic acids. Composition in secondary metabolites, and in particular aromas and aroma precursors is dramatically changed. Increased drought, because of lower summer rain and/or higher reference evapotranspiration, induces earlier shoot growth cessation, reduced berry size, increased content in skim phenolic compounds, lower malic acid concentrations and modified aroma and aroma precursor profiles. Increased UV-B radiation enhances the accumulation of skin phenolics and modifies aroma and aroma precursor profiles. Changes in grape composition modify wine quality and typicity. However, these modifications can be limited through adaptations in the vineyard. Major adaptations can be reached though modifications in plant material, vineyard management techniques or site selection.



Pr Henri CRAMAIL is Full Professor at the University of Bordeaux and is heading the group 'Biopolymers and bio-sourced polymers' at LCPO. His current research interests include the coordinative polymerization of olefins and cyclo-olefins, the step-growth polymerizations in bulk and in dispersed media, and the design of new bio-based polymers from renewable resources

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*BORDEAUX Green Chemistry: New challenges for the Plastic Industry

Both a context of limited and so uncertain supply and costs of fossil resources, and meanwhile the environmental impacts of the consumption of non-renewable resources and greenhouse gas emissions lead to a growing interest for the use of renewable resources as potential fossil substitutes in the polymer and material fields. This strategy open new opportunities to obtain innovative properties, but the range of known properties in current polymers is also required. In this presentation, the potential of biomass (vegetable oils, cellulose, lignin, terpens, etc.) as a source of drop-in or new plastics will be highlighted and discussed. (1,2)

 L. Maisonneuve, T. Lebarbé, E. Grau and H. Cramail, Polymer Chemistry, 2013, 4, 5472
F. H. Isikgor and C. R. Becer, Polymer Chemistry, 2015, 6, 4497

Damien MOUCHAGUE



Damien MOUCHAGUE is the Head of the « Conseil de développement durable » from The Bordeaux Métropole





World Café

What can be done to involve people into political, technical, development... issues ?

How to enhandle their tribute to projects ?

As several democratic societies, France has to notice a transition that emphasises democratic innovations. Those innovations are no longer top down but rather bottom up. And first take place in local government areas before spreading through cities and world-citizens networks.

The new tools imagined to make people participate are faster, funnier, no longer ashamed by hierarchies. One of the more famous and used process is World Café : speach tables, small groups, turning every quarter hour.

Beyond the products (more effective and inclusive) those process reframe the scene of powerness and skillness. How can engineers redraw their own process to take account of these renewal of leading projects ? How do they want to involve themselves ?

Bordeaux



Jean-Marc SALOTTI is Professor at ENSC-Bordeaux INP, and member of the Intégration du Matériau au Système laboratory. He is specialized in artificial intelligence and cognitive human engineering with applications in the habitat domain, in collaborative robotics and in manned space missions.

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Electric Consumption and Human Behaviors at Home

In France, domestic electric consumption represents 70% of the total consumption. The current trend is to use technological tools to reduce that consumption. However, real consumptions are far from expectations because of habits, poor user-friendrly interfaces, inappropriate tools and other human factors reasons. This course provides some keys to understand the main issues.

Olivier ATTEIA



Olivier ATTEIA is Professor in georessources and environment at ENSEGID-Bordeaux INP.

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Groundwater management and remediation

Soil contamination becomes a widespread question in towns for water quality but also for re-building of old industrial zones. This talk first presents some exemples showing the extent of contamination in some cities, and then details the specificities of the contaminants and the underground medium that renders the decontamination so difficult. In parallel, the risk of such contaminated zones towards the groundwater and the air can be estimated through different conceptual models. Combining risk assessment and the details of the contamination might a possibility to alleviate the costs of terrain reconstruction and thus allow sustainable development in towns.

JULY THE 7th - 2 AM



Jean-Pierre BÉDÉCARRATS is a full professor at the ENSGTI* which is an engineering school specialized in industrial technology. He teaches heat transfers, applied thermodynamics and energy storage. He is also deputy director of the Laboratory of Thermal energy, Energetics and Processes (LaTEP). After carrying out a phD on the supercooling (delay at the liquid-solid transition) of the Phase Change Materials (PCMs), he works on the various applications of PCMs and especially on the latent heat energy storage. He also worked on Ice slurries composed of ice crystals dispersed in an aqueous solution as secondary refrigerants used in indirect cooling systems. His research activities, begun more than 20 years ago, constituted of experimental and numerical studies, have allowed him to specialise in the field of the solid–liquid phase change.

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Energy transition. Potential role and challenges of energy storage.

Energy transition is driven by the demands of development combined with the constraints posed by climate change and energy supplies. Over the last few years, a lot of countries have seen many significant changes in energy use. Energy transition is made possible by improved technologies which are generally flexible regarding the fuels that can be used, and which offer significant efficiency improvement in many cases. This presentation examines the energy transition in developed countries and in France in particular. The analysis focuses on the provision of energy services to consumers. The factors that led to the replacement of one fuel by another, or one technology by another, are discussed, as well as the overall market conditions that led themselves to energy transition. The use of renewable energies is highlighted. The analysis also explores instances in which storage technologies are essential. A particular focus will be made on heat storage technologies which are one of the solutions to develop the use of intermittent sources of renewable energies.

Claire LE HENAFF



Claire LE HENAFF is a Professor in Food Microbiology at ENSCBP-Bordeaux INP, and Delegate for International Affairs at Bordeaux INP. Her current research interests include the development of ecofriendly strategies to limit undesirable bacteria in food ecosystems.

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Food and waste

Around 88 million tonnes of food are wasted annually in the EU, with associated costs estimated at 143 billion euros. The presentation will cover the main actions to tackle food loss and waste. It will focuse on household wastes and examine ways to improve the use of date marking by actors in the food chain and its understanding by consumers, in particular «best before» labelling.

JULY THE 8TH - 10 AM

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