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June 5th-6th • 2013 Road Structure Days in Dijon. Further information: actions-incitatives.ifsttar.fr/seminaires/joa/2013

June 5th-7th • Young Research Seminar 2013 in Lyon. Further information: www.ectri.org/YRS13

June 12th-14th • 4th summer school NEARCTIS on Assessment of ITS Solutions, in Marne-la-Vallée. Further information: www.nearctis.org


June 18th-19th • Conference on “Soil treatment for sustainable levelling works”, feedback from ANR TerDOUEST project, in Marne-la-Vallée. Further information: www.cnrs-imn.fr/TerDOUEST/

July 2nd • National technical day: “Detection and mapping of the pipe work system using the GPR technique” in Nantes, as the introduction of the 7th International Workshop on Advanced Ground Penetrating Radar - IWAGPR2013 - held on July 2-5, 2013, in Nantes (France). Further information: jnr2013.ifsttar.fr

July 3rd-5th • Annual International Association of Maritime Economists Conference (JAME2013), jointly organized by Euromed Management, IFSTTAR, the University of Genoa, and the University of Naples Parthenope, in Marseille (France). Further information: iame2013.org

IN BRIEF

IFSTTAR AND DLR HAVE SIGNED A FRAMEWORK AGREEMENT FOR CREATING AN INTERNATIONAL TEAM

During the Franco-German Week of Science and Alumni, a signature ceremony between French and German institutions took place on April 15th, 2013 at the Institute of France, attended by Geneviève Fioraso, French Minister of Higher Education and Research, and Johanna Wanka, German Minister of Education and Research. For this occasion, Hélène Jacquot-Guimbal, Managing Director of IFSTTAR, and Barbara Lenz, Head of DLR (Deutsches Zentrum für Luft-und Raumfahrt) Transport Institute, have signed a framework agreement for creating an international team joined together on freight transportation, DISTRANS.

TRA 2014: SAVE THE DATE!

The 2014 Transport Research Arena, a veritable European crossroads for research on ground transportation, organised by the Ministry of Transportation and IFSTTAR, will be held from April 14th to 17th, 2014 at the CNIT at La Défense.

www.traconference.eu

DISCOVER IFSTTAR’S NEW WEBSITE:

www.ifsttar.fr/en/home
Roads Technical Days
All about road conditions

For over twenty years, the Roads Technical Days (JTR) have been a key gathering for all those in France involved in public and private road construction, maintenance, monitoring and use: an opportunity to share their experiences, research and accomplishments – an undisputed success.

The JTR, organized by IFSTTAR and IDRRIM, gather together over 300 people each year in Nantes. On the program for 2013: an overview about the voluntary convention commitment signed four years ago by all the stakeholders in road construction and maintenance within the framework of the Grenelle Environment Forum, to preserve non-renewable resources, to support recycling, to reduce nuisances... Among the knowledge acquired: a set of technical guidelines on lukewarm and cold asphalt mixes and techniques for recycling them, progress on less energy-hungry road pavement materials, and software for comparing the environmental impacts of road building techniques².

Other current issues in the context of reduced budgets: road deterioration or road surveillance. “One of the priorities relates to measuring their compactness to replace the current nuclear methods with radar, X-rays, infra-red radars, etc.,” points out Michel Boulet, Deputy Manager of IFSTTAR in Nantes and JTR organizer. Among other measurements mentioned: structural behaviour, adherence, rolling friction, noise. Even more ambitious, the instrumentation of roads during their construction, tested on sections of the A10 and A75 motorways, is studied to obtain continual analysis and to remotely monitor its condition and load.

Speakers are beginning, in addition, to imagine industrial prototypes for testing the “5th Generation” road (an intelligent and communicative road) and the electric road (for producing energy, and fast or uninterrupted electric vehicle recharging) – numerous topics for the next JTR.

Find out everything about:
IDRRIM: http://www.idrrim.com
The schedule and the presentations for the JTR: http://jtr2013.ifsttar.fr/
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(1) Institute of roads, streets and infrastructure for mobility
(2) Seve or Ecorce, respectively developed by for USIRF (Trade Union of French road industry) and IFSTTAR

QUESTIONS FOR ÉRIC LE GUERN, vice President of IDRRIM

HOW CAN WE PRESERVE OUR ROAD INFRASTRUCTURE?

The French highway system suffered heavily during the winters of 2010 and 2011, because of repeated, alternating periods of rain and cold temperatures. The phenomenon was observed all across Europe and could happen more often in the future, due to climate change. This is especially alarming in the current context of reduced budgets. It was one of the subjects addressed during the JTR 2013. Though the cause has been identified (in a poorly maintained road, water penetrates and burst the asphalt when it freezes), the remedies remain exploratory. However, in the last twelve years, the surface of State roads in bad condition (according to the quality index of State roads) has increased from 7% to 15%. Our role is to alert the decision makers to keep the preventive strategies for road pavement maintenance in place. It is also a question of developing economic and sustainable solutions for road surfacing proposed by IFSTTAR and the road industry. The worst solution would be to return to only curative strategies, which are more expensive for, and more disruptive to, traffic. In this context, the reorganization of the scientific and technical network MEDDE, along with the imminent creation of CEREMA, bodes well.

(3) Ministry of Ecology and Sustainable Development
(4) Studies and expertise centre on risk, environment, mobility and land use
Reconciling urban freight distribution and quality of life

The aim of MetroFreight, a new international research centre “without walls”, is to rethink the transportation of goods in cities.

“From Los Angeles to Seoul, via New York and Paris, we want to measure the impacts of urban freight, through MetroFreight, to reconcile cities with their freight transport networks,” explains Laëtitia Dablanc, Research Director at the Production Systems, Logistics, Transport Organisation and Work-Freight laboratory (SPLOTT). Although freight is a source of congestion and pollution, research on freight transport does little to address environmental problems. Co-funded by Volvo Research and Education Foundation (VREF), MetroFreight has brought together a consortium of three American universities, IFSTTAR and the Korean Transport Institute around the problems in these four cities. Seven topics of research were established, specifically aiming at establishing databases on freight transport in cities, developing alternative modes of transport and intelligent transportation systems, or even at curbing pollution and CO₂ emissions linked to urban freight transport. The SPLOTT team will be in charge of mapping the layout and the installation of warehouses and other logistics centres in Île-de-France. The idea is to evaluate freight transport flows and their impact on urban pollution. Research will begin in June 2013, and will last five years.

Simulating drink driving

Inaugurated on March 1st at IFSTTAR’s Salon-de-Provence site, a driving simulator will make it possible to study realistically the effects of drink driving, along with other difficult situations.

“This automobile simulator is the only one in France able to perform research on the effects of drink driving,” proudly states Catherine Berthelon, Research Director at the Laboratory of Accident Mechanisms (LMA), who reminds us that alcohol is the first cause of road accidents, killing one out of four young drivers. Equipped with video and audio recorders, projected audio backgrounds, a field of vision extended to over 135° with five screens, interior and exterior rear-view mirrors: LMA researchers, assisted by the Laboratory for Road Operations, Perception, Simulators and Simulations – LEPSIS, have entirely revamped their old simulator, in order to completely immerse the driver in an interactive, virtual environment. Image quality was also improved, offering very realistic driving conditions. Catherine Berthelon would like to test the effects of alcohol on young drivers behind the wheel after eating, on a monotonous road: “We think that these conditions decrease more the performance and the attention of young drivers who have recently obtained their license, than those with a little more driving experience,” she indicates. Other situations just as dangerous, or uncommon, are also in the works: this is the only way to study them without making drivers take risks.
Analysing driving with electronic systems

Do today’s drivers know how to use the electronic systems that more and more vehicles are equipped with? To find out the answer, researchers at LESCOT studied how they use them.

How, and in what contexts, do drivers use onboard electronic systems, and how much does it influence their driving? These were the goals of the European project INTERACTION, steered from 2008 to 2012 by LESCOT (Laboratory for Transport’s Ergonomy and Cognitive Sciences) and Europe Transport Research, a subsidiary of IFSTTAR. “What is original about INTERACTION is having joined together four methods,” specifies Corinne Brusque, Research Director at LESCOT. “Focus groups, Internet surveys and observations in natural driving conditions, as well as in test driving situations, for a better understanding on how European drivers use cruise control and the speed limiter, onboard GPS systems and cellular phones.” The results were fairly predictable: in natural conditions, some drivers, even equipped with a hands-free kit, use their telephone with their hands to send text messages or to answer calls. Others adjust their GPSs manually while driving. “Even if drivers enjoy the convenience of cruise control and speed limiters, some use them inappropriately from time to time; for example, in bad weather conditions, though it is not advised,” Corinne Brusque indicates. So, it is urgent that these results be taken into account by manufacturers and in road safety.

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Promoting waterway transportation in cities

In 2010, IFSTTAR launched a project for promoting freight transport via waterways in cities. The initial findings have just been published.

“Our objective was to find how the ports in Paris, Lyon, Lille and Strasbourg could be used to deliver goods to their urban areas, from the large international flows all the way to downtown distribution, within realistic economically and politically conditions,” explains Antoine Beyer, in charge of the FLUID project at SPLOTT (Production Systems, Logistics, Transport Organisation and Work-Freight laboratory). For three years, researchers analyzed all the elements in the transport chain, from the boatmen to town planning services, by way of port authorities. “We drew up a report on current conditions to better understand the logic of all those involved in the chain of fluvial transport,” he indicates. That entails both studying the shipping container market with surveys, taking into account lengthy port construction, and the comparison to other European experiments. This research allowed us to initiate numerous local synergies and to reignite the dialogue between researchers and the operators of a method experiencing a total revival. Members of FLUID expect to prolong all of these synergies.

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A fruitful co-operation with Brazil

Since January 2013, a new research project has been added to the long list of the Franco-Brazilian co-operations: the Re-MAUD project (Recycling Materials Aimed at Sustainable Urban Development) has just been accepted within the framework of the CAPES/Cofecub program, one of the co-operative projects between IFSTTAR and Brazil. The objective of this project, which involves IFSTTAR, the École des Mines in Alès and the Federal Universities of Rio Grande do Sul and of Pampa, is to limit the consumption of raw materials.

“Two other CAPES/Cofecub projects are also making headlines”, indicates Sylvie Proeschel, Deputy Director of the Department of European and International Affairs at IFSTTAR. Launched in 2012 for four years, the former has to do with modeling the behaviour of piles, also known as “screw piles”, especially used as foundations for towers, mast and gas pipelines in Brazil. Scientists from the Geotechnical Department at IFSTTAR, and the University of São Paulo, are leading it. The latter project, completed in 2012, develops tools for designing civil engineering structures with a low environmental impact (reducing energy expenditures, greenhouse gas emissions, and impacts on animal and plant life, etc.); the collaboration continues.

“Moreover, IFSTTAR currently has two co-operation agreements with the Federal Universities of Rio de Janeiro and of Santa Catarina in various areas of research: concrete, maintenance of the roads, lorries…” concludes Sylvie Proeschel.

WHAT ARE YOUR PROFESSIONAL CONNECTIONS WITH BRAZIL?

I hold a Franco-Brazilian Chair on the formulation of concrete, invited by the University of São Paulo (USP) for four months to perform my research, starting May 1st. This position is funded jointly by the USP and the French Consulate. Established three years ago, this chair program is aimed at professors or French researchers, regardless of their discipline. In addition, I am coordinating the Re-MAUD project, which includes other colleagues from the laboratory GPEM. This project will evaluate the results of two sorting operations intended to improve the quality of aggregates taken from concrete recovered at scrap yards. The first, the more prospective, is based on a technique whereby air blasts are incorporated in the crusher: it aims at eliminating granular elements that are too fine. The second employs an automatic sorting system via cameras, to get rid of the unwanted elements such as plaster, glass, brick, etc.

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While flowing on cities, rain carries many pollutants. What becomes of them? What consequences for the quality of water and soil? How do we reduce this environmental impact? Many emerging issues explored by researchers from IFSTTAR’s Laboratory for Water and Environment are exploring just these questions, and many more.

Road traffic hydrocarbons, heavy metals from street furniture and roof tops, herbicides sprayed in the vicinity of roads, components and particles emitted from heating systems and industry… In cities, many pollutants are likely to be found in rainwater runoff and soil. “At the Laboratory for Water and Environment (LEE), we are trying to measure this phenomenon and understand its mechanisms better,” explains Claude Joannis, who leads this lab, one of the biggest in this field of expertise. “The 32 LEE researchers and technicians, at the IFSTTAR site in Nantes, also study the efficiency of techniques implemented to reduce these risks, as well as new solutions.” Focus on such research dedicated to preserve our urban environment.
To reduce the pollution of rainwater and soil efficiently in an urban environment, one must have a clear picture of the pollutants at stake and the factors affecting their presence: sources of pollution, progression and flows of rainwater, local weather conditions, etc.

“To follow these indicators over several years, LEE manages the Urban Environment Observatory in Nantes (ONEVU) since 2006, a federative research project set up by the Institute for Research on Urban Sciences and Techniques (IRSTV), a research federation founded by CNRS, dedicated to urban environment, and financed by the Pays de la Loire region,” indicates Véronique Ruban, researcher at the LEE and head of the ONEVU. The technical system is able to meet such challenges: flowmeters, pluviometers, piezometers; humidity, temperature and wind captors; automatically collected samples… all the way to onboard cameras in planes to map urban area which are source of pollution! In 2011, ONEVU was approved by the CNRS to be part of a national network1 including twenty or so French laboratories working on the theme of urban environment. Claude Joannis, the director of the LEE, is the head of this network.

Among the several projects led by the ONEVU, IFSTTAR, for example, is undertaking an ambitious project2 supported by the French National Research Agency (ANR). Launched in 2010 for three years, its objective is to follow very closely no less than 80 pollutants in rainwater found on three sites: the observatory in Nantes, and two similar observatories in Paris and Lyon (the Observatory of Urban Pollutants and the Field Observatory for Urban Water Management). Metallic trace elements (lead, zinc, copper, chrome, cadmium, nickel, etc.) are thus analysed, along with hydrocarbons, pesticides, and chemical substances produced by street furniture, roof tops, roads, cars, etc. The LEE is in charge of the study in the Nantes area. Its chemistry laboratory (see inset “Emerging pollutants”) performs all of the analyses to discover the presence of metallic trace elements, whether samples have been collected in Nantes, Paris or Lyon. “The final results will be presented in December 2013, with recommendations for the local authorities concerned,” indicates Véronique Ruban.

Some previous research done by the ONEVU has already suggested some trends. In the area of Pin Sec located northeast of Nantes, the researchers have shown, for example, that the primary pollutants are zinc, copper and lead. These come mainly from the runoff of urban surfaces (roof tops, street furniture) or vehicle wear and tear (tyres, brakes, etc.). Their results also highlight a decrease in the concentration of glyphosate herbicides, probably mainly due to resorting more frequently to thermal weeding by highway maintenance services, an alternative to chemical weeding.

As the results become known, this research allows the decision makers to take the best measures. The range of action levers is vast: less polluting urban materials, maintenance practices of urban surface more respectful to the environment, alternative techniques of rainwater management, etc.

(1) Network of Observation and Experimentation Systems for Environmental Research (SOERE)
(2) Innovation for the Sustainable Management of City Water project (INOGEV)
they will be treated before being discharged into receiving environment, and of transporting the rainwater all the way to specific upstream release points, often urban or suburban rivers.”

Alternative techniques allow a more local management of rainwater, with the objective of reducing flows downstream and their environmental impact. For example, this is the case for containment basins that stock water temporarily and at the bottom of which you find polluting particles. Other systems, like infiltration basins, porous pavements or planted ditches allow rainwater to infiltrate the soil, which acts as a natural filter. What is the actual efficiency of these techniques? Might they not generate water disturbances if this infiltration becomes systematic or even local pollution of soil and water tables?

To know more about it, the LEE is conducting several experiments. For example, researchers have studied the transfer of pollutants in the soil at the bottom of infiltration basins for urban waters. “The specific characterisation of the contaminated soils and of the potential for migration of pollutants confirm that soil does act as a filter for pollution,” reveals Béatrice Béchet, researcher at the LEE who took part in this work. However, a question is raised regarding the length of soil filtration capacity, especially when structures are subject to higher underground water levels. Other research on the preservation of urban soils is pursued within the federative research program: IRSTV’s Urban Soils, launched in 2012.

The impact of plants on the ONEVU urban experimentation zone is being studied for another IRSTV project. The LEE experts are interested in planted ditches, for example. For the past ten years, more and more of them have been created in new districts or housing estates, but we don’t yet know much about how they function or how efficient they are. “We are conducting field experiments to determine the impact of planted ditches on flows, on the quantity of water in soils and water tables, on the reduction of problems observed downstream…” explains Fabrice Rodriguez, researcher at the LEE. “We are also modelling the way they function in order to simulate their effect on a neighbourhood scale.” Working in partnership with IRSTV laboratories, expert in micro-climatology, the LEE also studies the capacity of planted roof tops (more and more common, especially in green districts) to absorb rainwater and improve thermal comfort, while cooling down the atmosphere within an urban environment.

(3) POLESUR Project (POLlution of Water and Soil in URban Environments), completed in mid-2012
(4) VegDUD Project

**STUDYING THE IMPACT OF ALTERNATIVE TECHNIQUES RELATED TO RAINWATER MANAGEMENT**

Today, rainwater is generally collected in a dedicated sewage system, consisting of underground pipes that collect and carry it away towards a river or the sea. “This distinctive system has the advantage of transporting the used water to water treatment plants, where 

**« WE DON’T YET KNOW HOW PLANTED DITCHES WORK OR IF THEY ARE EFFICIENT »**

**« USING SOIL AS A NATURAL FILTER »**
DEFINING THE SOIL(S) IN URBAN GARDENS

The lab in Nantes is also leading research on the soil quality in community gardens, within the scope of a convention signed with Nantes’ City Hall. For example, in one of these gardens, researchers have been able to precisely determine the origin and the distribution of an anomaly regarding lead and arsenic. “Our work has shown that the pollution came from bedrock located under the cultivated soil, and around which samples reached up to 500 mg per kg of soil,” points out Béatrice Béchet. “We have also precisely determined the levels of lead and arsenic in the different plots of land. After this thorough analysis, healthy soil has been added in some places, and the ban on cultivating was lifted for half the plots of land.” To reach this diagnosis, the team has been using some high-tech equipment: a portable X-ray fluorescence spectrometer, able to estimate soil contamination in metals, therefore optimizing samples collection and analysis costs; highly accurate satellite-based GPS tracking to obtain the coordinates of zones where soil samples have been taken: analysis at the chemistry lab with high-end market spectrometers (see inset: “Emerging pollutants”), etc.

Simultaneously, under the IRSTV banner, the LEE is part of a vast project on urban community gardens, launched in January 2013 and supported by the ANR. “We are in the process of selecting five gardens in Nantes, in which we will perform research on soil quality, biodiversity, social mechanisms, and the use of plants associated with bacteria able to extract metallic pollutants in contaminated soils,” explains Béatrice Béchet. With all of these projects, IFSTTAR is clearly the frontrunner of emerging research on water and soil pollution in urban environments. The underlying and constant leitmotiv: to improve people’s quality of life in cities, while preserving their environment.

A LABORATORY ENABLING THE ANALYSIS OF EMERGING POLLUTANTS

The LEE has a chemistry laboratory for analysing samples collected in the field: rainwater, groundwater, soil… “In 2012, we analysed more than 1,100 samples,” indicates Dominique Demare. This lab has specialised in studying metal trace elements and has a keen interest in platinum, as well as other chemical elements in the same family called PGMs (platinum group metals): palladium, rhodium, etc. “Emitted in very low quantities out of catalytic exhaust pipes since the beginning of the 90s, we are finding them more and more in the environment,” points out Michel Legret, researcher at the LEE. “However, serious research has not yet been performed on their impacts on the environment and health.” To detect these pollutants present in very small quantities, the lab has, for example, a high-tech spectrometer able to measure concentrations to the scale of nanograms per litre! Apart from these chemical analyses, we are studying the mechanisms of pollution, through to small-scale experiments/testing. The lab takes part in collecting samples at testing sites and takes measurements in situ.
IFSTTAR WILL SOON HAVE A NEW STRUCTURAL TEST PLATFORM

Built in Champs-sur-Marne, this equipment will allow IFSTTAR and its partners to study the resistance and the functioning of civil engineering structures on very large scale.

600 vertical tonnes
100 horizontal tonnes

That’s the force which the ground and two reaction walls of the test slab, built on a multi-alveolar reinforced concrete chamber, will be able to resist without deformation.

60 metres long by 10 metres wide, the latest test slab will be twice as large as the previous one. Launched in 2010 inside the Bienvenûë building in Champs-sur-Marne, the construction site for this equipment should be completed by summer. It will replace the previous installation on Lefebvre Boulevard in Paris, closed last December when relocating the teams.

Like the previous one, it will be used for studying structural resistance and functioning, such as beams or piles used in the construction of bridges, tunnels or other structures. The future platform was designed “in order to make it possible for researchers to increase effectiveness and flexibility,” explains Pierre Marchand, head of the Experimentation and Modeling of Materials and Structures laboratory at IFSTTAR. The scientists of IFSTTAR, just as their partners, will be able to handle more bulky objects (15 to 20 metres in length). They will also be able to mount actuators and testing rigs on the slab or on two five-metre high reaction walls, used to exert mechanical loads and to measure strains and deformations. That’s enough to satisfy all of the teams’ needs at the Paris-Est Cluster. Especially since the architecture of the new building features integrated ergonomic aspects, enabling them to easily make trips back and forth between laboratories and workshops.

“...For those who have been working with IFSTTAR for many years, the reconstruction of its test slab in Champs-sur-Marne will lead to many benefits. On top of the fact that it will be much closer geographically to our own buildings, the new installation will have increased capabilities. That will enable us, not only to carry out more complex and more sophisticated tests on a larger scale, but also, thanks to a series of new laboratories which will be set up in the vicinity, to be able to work concurrently on smaller samples, which we would like to analyze or age artificially. We have already planned for an experimental program such as this, within the framework of the so-called “Badifops” project, dedicated to studying seismic behaviour of high-performance, reinforced concrete structures. At this site, we will carry soon out an extended series of tests on life-sized models.”

ALAIN SIMON
is in charge of Special Engineering Structures at the Directorate of Technical Management at Eiffage Travaux Publics in Noisy-le-Grand.

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“As IFSTTAR, this is our first Contract of Objectives and Performance (COP),” stresses Jean-Paul Mizzi, Deputy Managing Director. “It’s a 4-year commitment (2013-2016) with the Ministries in charge of Sustainable Development (MEDDE) and Research (MESR) touching upon each of the Institute’s missions, with specific objectives. We were able to realise it rapidly by drawing upon all of the work undertaken within our scientific strategy, developed in mid-2012 after almost two years of reflection and discussion.”

“This COP provides a roadmap for our activities,” he explains. “It was created in a concerted manner, not only with line ministries and the head offices of the MEDDE and the METL, but also with IFSTTAR’s teams, which are committed to results as well as to time constraints. As for the development of the scientific strategy, we sought additional opinions externally.”

“Five strategic objectives are reaffirmed,” details Jean-Paul Mizzi: “Scientific excellence in the fields of Transport, Civil Engineering and the Territories; European leadership, an international expertise in support of public authorities and manufacturers; an openness to society; a governance furthering creativity.”

This contract lists the objectives in terms of research and teaching, entirely in keeping with the four challenges in ten years specified in the scientific strategy (sustainable mobility, infrastructures, natural risks and environmental impacts, cities and territories). “We listed them in the form of 4-year objectives,” specifies Mizzi, “on top of which are added the transverse objectives concerning the quality of our scientific creation, our contributions to doctoral training, and transferring our results.”

As for the expertise, IFSTTAR has committed itself as far as certification and testing, development of regulatory standards and standard practice are concerned. In a more cross-disciplinary way, the objectives have also been defined regarding the support for research (management, computer science and network) and the management of the Institute. It’s a question of optimizing how resources are used in order to improve the quality of the service given to research.

The Scientific Council of the Institute validated the COP, followed by approval of its Board of Directors, at the beginning of December 2012. It will be soon signed by the line ministries and will then undergo an annual report.

“We have set up a specific system of organisation internally to ensure that all will go smoothly, specifically involving those in charge,” concludes Mizzi.

(1) Contracts of Objectives and Performance, established at the beginning of 2000, are commitments made by structures with respect to their government line ministries.
Interview with Giulia Cernicchiaro

Giulia Cernicchiaro, Italian Ph.D. student at the Economic and Social Dynamics of Transport Laboratory (DEST) in Marne-la-Vallée, received her thesis last January on the dynamics leading households to replace their vehicle. She is continuing her studies as part of a post-Doctoral program at Singapore-MIT Alliance for Research and Technology (SMART).

HOW DID YOU COME TO STUDY THIS SUBJECT?

I earned a Bachelor’s in Mathematical Sciences for Engineering at the Polytechnic University of Turin, where I was born. In my third year, fascinated by statistics courses, I chose to write my thesis on a modeling tool for tourist flows in the French Riviera. I always wanted to live in France, so I came to Paris to get a Master's Degree in Demography at Paris I University. My statistics professor, who was also working at IFSTTAR, suggested that I follow a training course with Jimmy Armoogum at DEST, to work on the National Survey on Transport and Travel (ENTD), an enquiry in French households on their mobility patterns, a topic which mixes demography, statistics and economy, all at the same time.

HOW DID YOU MEASURE THE MOTIVATION OF THE HOUSEHOLDS?

I noticed that in most enquiries measuring households’ choices, the purchase price, the cost of maintenance and use, or the type of vehicle are brought up, without ever taking into account the drivers’ preferences or tastes, as well as the fact that a household can anticipate its choices according to possible changes in the automobile industry or its own home. I thus applied a more dynamic system of modeling, taking several criteria into account: distance travelled, household incomes, how many cars they have, etc. To do that, I used data from the Parc Auto panel, created by IFSTTAR and SOFRES, focusing on the years 2002 to 2008 with a sample of 310 to 4,226 households.

WHAT IS YOUR RESEARCH TOPIC IN SINGAPORE?

It’s no longer related to transport, but to urbanisation: I am interested in what motivates companies to set up their business in a given environment. The issues are different, but I am rediscovering the same dynamics of interdisciplinarity as I did at IFSTTAR, between statisticians, sociologists, and demographers. And the methods of econometric modeling that I learned and tested at DEST are now essential to me.

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UPON WHICH CRITERIA DID THE HOUSEHOLDS THEN MAKE THEIR CHOICES?

The age of the vehicle, naturally: the older the vehicle is, the more households want to change it, except in the case of families having several cars. In this case, the oldest car seems to be used less often but kept for a longer period of time. But the main criteria is the resale price: a low-income family will more quickly replace its vehicle by taking account of its resale price. On the contrary, in households with higher incomes the resale price is less important, and even if they tend to replace their cars more often, they will use their cars as long as possible. In the end, one comes to the realization that the annual costs of maintenance and operation really do not affect their choices. In addition, a rise in the price of petrol seems to increase the vehicle’s duration of use, something that we had already noted before.
Steer the conception of an electric car

In Bron, experts from the Unit of Experimental Testing (UNEX) are supervising a young company from Lyon to help them develop its first electric car. Crash tests, recommendations... the series of tests should make it possible to ensure the vehicle’s approval and its passengers’ safety.

“This is the first time that we are conducting an expert assessment on an electric vehicle geared to tourism. Apart from the typical accidents, we must take into account electrical risks related to the batteries, possible gas leaks, or fire hazards due to short-circuits...,” explains Alain Maupas, Deputy Director at UNEX. “The company Courb contacted us in March 2012, to help them develop their electric vehicle: the C-Zen. A comprehensive test program began in December 2012.” The first tests dealt with the front suspension cradle, the part of the vehicle which must absorb the energy so that the passenger compartment is not deformed too much during impact. A final series of tests was completed in April on the entire vehicle.

Experts in fast dynamics, crash tests and metrology
A crash sled, an instrumented crash test dummy, 128 sensors (on the dummy, the front suspension cradle and the wall), ultra high-speed digital videos... UNEX put a good part of its technical capabilities to their disposal, as well as four engineers and technicians, out of the seven people in the laboratory. “We are analysing the results with Courb,” explains Alain Maupas. “Their goal is to receive vehicle approval from UTAC (Technical Union for the Automobile, Motorcycle and Cycle Industries).” This is the third time that UNEX has tested this kind of vehicle after two tests on electric and hybrid vehicles, for Renault Trucks. Apart from transport, their expert assessment also covers the behaviour of materials, structures and devices in impact situations.

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Why did you call upon UNEX? I’ve been aware of IFSTTAR for ten years, because of my previous job. The experts at UNEX are qualified and they have considerable resources. Our start-up, comprising 16 people, was created in 2007. Our objective is to produce and market electric vehicles. This expert assessment costs us 40,000 euros, but we receive a 60% tax credit, since IFSTTAR is a government laboratory. The fact that UNEX is located only five kilometres from us was also a plus.

Are you satisfied with their expertise? Since the team is small, exchanges as well as decisions are fast, which is appreciated. Our research department took into account their advice about some changes in design to the front suspension cradle, and we hope to pass UTAC approval in three months. We will be able to ask UNEX again for follow-up approvals, like pedestrian or lateral impacts.

Alexandre Desneux, Technical and Industrial Director at Courb.
Concrete and engineering structures:
for a better sustainability

Jean-Michel Torrenti is Deputy Director of Materials and Structures Department at IFSTTAR. He has just taken part in the writing of a guide on the sustainability and the life cycle of reinforced concrete structures.

WHAT NEW INFORMATION DO YOU PROVIDE ABOUT THE SUSTAINABILITY OF STRUCTURES?

The contractors would like to maximize their overall construction costs. In order to do that, they need to have greater control over the risks, which implies a good knowledge of the physico-chemical and mechanical phenomena involved. We are contributing to a better knowledge about these phenomena, while at the same time showing the importance of a probabilistic approach for the dimensioning of new concrete works, the follow-up, and the repair of existing works. To that end, we created a database of tests undertaken based on operating procedures that we had developed or that we had modified. We thus built a database containing the properties of concrete sustainability... porosity, for example.

HOW WAS THIS COLLECTIVE PUBLICATION DEVELOPED?

In fact, this book is the result of a research project dubbed APPLET, launched in March 2007. It focused on modeling structures degraded by corrosion and on suggesting solutions. Financed by the National Agency for Research, this project gathered together 19 partners, for the most part, academic laboratories, such as the Universities of La Rochelle, Lille I and Toulouse III, and manufacturers, such as Oxand and Vinci Construction France. A working group was responsible for making sure that the requirements of the contractors were correctly taken into account before presenting the final recommendations.

WHO SHOULD USE THIS BOOK?

First off: researchers. But also the contractors: with the evolution of the standards and practices, they will find ideas to better manage and to better foresee the sustainability of their structures.

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Meeting with LAB

Created over 40 years ago, the Laboratory of Accidentology and Biomechanics (LAB) is a private research structure financed by PSA Peugeot-Citroën and Renault. It gathers together about 15 researchers. Among those is Anne Guillaume, its Director since 2008, who presents here some of the collaborations entered into with IFSTTAR.

What is LAB currently working on?

We have three areas of expertise: accidentology, biomechanics and the study of driver behaviour. In accidentology, we are looking to better understand the causes of accidents, as well as the injuries incurred, by analyzing the elements from the scene of the accident and the damage to the vehicles involved. Each year, we thus study 300 serious accidents, and of those, 50 in an extremely thorough manner. This enables us, in particular, to see how the cars’ security systems functioned and, if necessary, to suggest improvements. As for the biomechanics of the impacts, our objective is to better understand and to better simulate the injury mechanisms of the human body. Lastly, we are studying driver behaviour in order to better comprehend the factors of distraction and inattention, and to better understand drivers’ needs in terms of Driving Assistance.

What are your collaborations with IFSTTAR?

Our first project together was back in 1977. Since then, we have had numerous collaborations. The most recent is within the framework of the European project U-DRIVE, which has just been approved. It aims at better determining driver behaviour. From now until the end of the year, basically everywhere in Europe, 250 cars will be equipped with internal and external cameras, and instruments for recording engine data, such as speed or sudden stops. This will allow us to study the “almost accidents”, all of those minor frights which could have led to an accident. We are also collaborating within the framework of European projects, such as THORAX, for better defining the biomechanical aspects of the thorax, and CASPER (concluded in June 2012), which was concerned with child safety. As a result of this project, we were able to prove that 70% of children under 12 years old were not properly seated, and that they were, in fact, not sufficiently protected. I would also cite the project VOIESUR, supported by the National Research Agency, which is focused on improving knowledge about road accidents in France.

What do you take away from this joint research?

It enables us to improve our work methods and to make progress on questions that we would not have the means to study by ourselves. Moreover, we are very complementary: LAB uses an applied approach, whereas IFSTTAR works upstream. For example, on the U-DRIVE project, LAB deals with vehicle instrumentation and analysing results, while IFSTTAR works more on the development of new analytical methods for the large amount of data collected, as well as on using the results in order to provide advice on road safety. This synergy also allowed us to co-lead several theses, defended in 2010.