

Donnons un sens à l'innovation

Interactions

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UTC student engineers laureates of the Parrot Awards 2016!



Four UTC undergraduates won the final round of the Parrot Awards 2016, the theme of which this year was 'connected objects'. Maxime Robinet and Thomas Gaujacin the specialty IDI (Industrial Engineering Design), with the assistance of Lao Yang and Cédric Mascart, doing Computer Sciences and their Applications. Their reward was for a connected object project name LOOP which makes running more fun, more rewarding. The "runners" collect points by accomplishing challenges, either alone or in teams. Thanks to this first prize, these students will be able to present their product at the next CES2017, in Las Vegas next year. ■

A UTC-Graduate chosen to revamp the image of Hong Kong Hospitals



Adrien Terras, who gained his UTC engineering degree in Mechanical Engineering, Adrien has just been signed for a contract to revamp the image of the 44 public Hong Kong hospitals. Adrien set up

his digital advisory service Digitalin when he arrived in Hong Kong 3 years ago. ■

Anne-Virginie Salsac nominated to the rank of Chevalier in the National Order of Merit

Anne-Virginie Salsac, senior research scientist and lecturer at the UTC-BMBI Lab (Biomechanics and bi-engineering), has been nominated (May 13) Chevalier in the French National Order of Merit. This national award has made to mark her 5 years' service record since she completed her PhD in 2001. Currently Anne-Virginie Salsac is investigating endovascular technique and embolization of blood vessels using surgical glue; she is also studying encapsulation phenomena in blood vessels. The ceremony of induction to the Order will be performed by Prof. Patrick Le Tellec, Director of the Solid State Mechanics Lab at Ecole Polytechnique, November 14, 2016. ■

RESEARCH / INNOVATION

Plastic antibodies to fight BO

If antibodies, as is the case, can recognize pathogenic agents, should we not be inspired to draw on this and assemble synthetic equivalents, in the form of polymer molecular moulds to target the molecules incriminated? The so-called MIPs (acronym for molecularly imprinted polymers) have been made to trap the molecules in question, viz., those involved in producing "BO" polite [and politically correct] acronym for 'body odours'). Following an initial success in the area of cosmetics¹, it would appear that MIPs also have a promising future in biomedical practice where improved medicinal targeting has become necessary.

Let us imagine we no longer need to 'plaster' our armpits with deodorants which do not respect our skin and its ecosystem and that we choose instead to trap the molecules specifically responsible for development of unwelcome 'BO'. This has been made possible through the research work by Karsten Haupt, Professor in nanobiotechnologies and Head of the UTC-GEC (Enzyme and Cell Engineering) Lab. with Bernadette Tse Sum Bui, research engineer at the CNRS, in the framework of a MIP research partnership with L'Oréal. Drawing on the faculty of antibodies to recognize certain molecules, their research teams developed some synthetic materials capable of capturing the molecules in our body transpiration (sweat) involved in creating BO.²

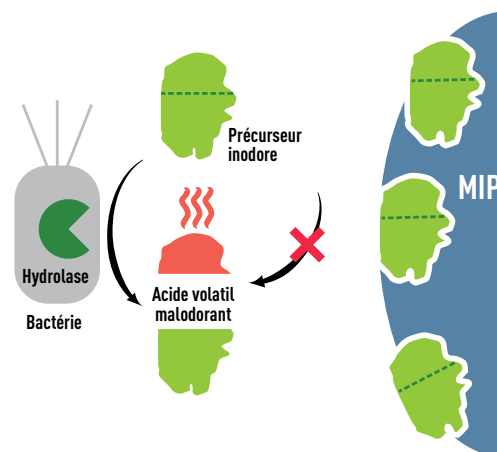


Diagram for an MIP (molecularly imprinted polymers) capturing a pre-odour, preventing the bacteria to transform into an unpleasant BO (body odour) molecule

The art of molecular imprinting

In essence, these MIPs are bio-inspired and bio-mimic materials that resemble minute plastic particles less than 1 micron in size. They contain small cavities the shape and chemical characteristics of which correspond exactly to those of the targeted molecules. They are obtained via a process called molecular imprinting, which consists of moulding the polymer round a single target molecule that serves as a molecular template. "UTC-GEC has the equipment to make the moulds and produce the MIPs", underlines Karsten Haupt who adds that "if the process itself is not new, this is the first application in the cosmetics field".

Trapping offensive smells

The research programme in the partnership with L'Oréal consists of designing and producing MIPs that are specialized to capture certain "precursor" molecules present in our body transpiration and responsible for the production of 'BO'. These non-odorous molecules are fed on by bacteria present in the skin – they consume the molecules and then degrade, producing volatile organic acids that do

smell. Capturing the molecules upstream is an especially elegant process since it does not destroy the bacteria as do currently commercialized deodorants. They therefore do not disturb the skin's ecosystem and do not favour development of micro-organism resistance factors. The MIPs only have a low impact on the bacteria, simply reducing and limiting their natural food supply. "The MIPs we have produced in this L'Oréal partnership work target one out of three groups of molecules responsible for unpleasant smelling skins", underscores Karsten Haupt, leaving the door open to design specific MIPs for each group. A patent³ claim has been registered by UTC-GEC for these MIPs, and it is now up to L'Oréal to integrate the products for the first consumer uses in cosmetics.

Separate, capture or deliver substances

MIPs have been used since the 1980s in the chemical industrial sector to 'recognize' and separate various forms of a given molecule, or various different molecules with similar structures. They are produced today by several companies for use in analytical work in the biomedical and

agro food sectors. Numerous applications existent in environment-intensive applications to detect and capture undesired molecules, or in the safety sector. UTC-GEC for example is engaged in a European project to design and assemble tools to detect artisan explosives and drugs. However the main area for applications is the biomedical sector with possible outlets in medical imaging, such as the use of fluorescent antibodies to detect cancerous tumours. In this case, the MIPs are designed on the model of those antibodies capable of targeting chemical structure that are specific to tumorous cells. In reverse, MIPs can be “loaded” with active substances that can be delivered to various organs, for example to the skin surface. Such processes are being envisaged for certain treatments that call for very precise, accurately targeting to avoid side effects.

Bioresources, Bioinspiration and Biomimetics

One of the reasons for the ‘popularity’ of MIPs lies in the ease with which they can be manipulated and stored (better and easier than antibodies). They are less sensitive to temperature and more stable, chemically speaking and thus better adapted for use in “extreme” environments. They also can be produced at lesser costs, and they do not require laboratory animals as is the case for production of antibodies. As Karsten Haupt sees it “there seems to be a high attached potential to our research and numerous application areas for the products”. UTC-GEC will now focus on their possible utilizations as active agents in the biomedical field, based on this innovative application of MIPs in cosmetics. The UTC-GEC Lab is committed to several national and European research propjets in “bioresources, bioinspiration and biomimetics”

and the Lab wishes to invest more to these aspects in the coming research programmes. The concept of using an MIP as an active agent offers scientists an opportunity to closely study Nature’s mechanisms and processes so as to be able to mimic them and design new materials and tools. ■

[1] <http://www.rsc.org/chemistryworld/2016/05/plastic-antibodies-molecularly-imprinted-polymer-deodorant-fight-body-odour> ; <http://www.cosmeticsdesign-europe.com/Formulation-Science/L-Oreal-backs-research-into-plastic-antibodies-in-deodorant>

[2] S. Nestora, F. Merlier, S. Beyazit, E. Prost, L. Duma, B. Baril, A. Greaves, K. Haupt, B. Tse Sum Bui, Plastic antibodies for cosmetics: Molecularly imprinted polymers scavenge precursors of malodors. In *Angewandte Chemie International Edition*, 2016, 55, 6252-6256.

[3] Patent claim by A. Greaves, F. Manfre, K. Haupt, B. Tse Sum Bui, registered under WO 2014/102077 A1, 2014.

Hypermedia visits of UTC’s research labs at
<http://hypervideo.utc.fr>

TRAINING / RESEARCH

Gang-style robots

To the extent that “gang-style robots” will become more and more present in our lives, UTC and the University of Genoa (Italy) have agreed to unite their engineering training capacities to set up EMECIS, a joint European Master’s degree in Engineering for Complex and Interacting Systems.

As much as it focuses on Europe and Theoretical and Development Research in Robotics, the new joint European Master’s degree in engineering combines UTC’s MSCI’ (Master’s degree in Interacting Complex systems) and the Master’s diploma in Computer Science Engineering awarded by the University of Genoa, Italy and it has lots of attractive features. EMICS – acronym for European Master in Engineering for Complex and Interacting Systems - is a course that addresses student engineers and lecturers who are interested in the ‘strange’ science of systems of systems and is a collaboration initiated in the framework of the French government incentive ‘Excellence Labex MS2T’- Control of Technological Systems of Systems at UTC where the work and research focus on “gang-style robots”! The objective of the course is to enable student engineers of both nationalities, French and Italian to enjoy crossover training at both establishments. The course also includes one or several placement abroad in order to have the joint degrees validated.

What are ‘systems of systems’?

“The Internet, the fire-brigade emergency warning network, mobile phone services are all examples of systems of systems”, explains Philippe Bonnifait, Vice-Chairman of UTC’s Scientific Advisory Board, and Director of the Robotex Research Group (GDR) at the CNRS and head of the MSCI Master’s degree awarded by UTC. If by “system”, we refer to “a set of components of varying nature organized to attain a shared objective”, then a system of systems is similarly defined as “a set of systems organized to attain a shared objective”, notes the research scientist Bonnifait. It is the complex “machinery” of systems, with more or less autonomy for decision and interaction, sometimes with a wide range of component systems that interact, communicate and organize their tasks which in most instances are collaborative and distributed.



The World Grandes Ecoles Championships



30 athletes and 40 supporters took part in the World Grandes Ecoles Championships, Saturday June 4. A wide range of events were on the programme, plus exchanges with representatives the entrepreneurial world. The UTC athletes came through with flying colours: 3rd in the 4 x 400 mixed race, 2nd in women's long jump and 3rd in chair-handicap basketball. The UTC team finished 5th and their mascot came 3rd, a brilliant performance! ■

Harbin Institute Of Technology (HIT) visits UTC, Compiegne



The senior officials in the Chinese delegation from the Harbin Institute of Technology (HIT) were welcomed to UTC-Compiegne before going to Paris to pursue discussions in view of setting up a joint HIT-UPMC* training programme in the framework

of the Sorbonne Universities cluster. ■

* University Paris 6 Pierre & Marie Curie

Visit by an Indonesian Delegation from the University of Muhammadiyah Malang

In the framework of reinforced relationships between UTC and the Indonesian University of Muhammadiyah Malang, UTC was happy to receive a delegation to present the UTC Innovation Centre. Following a project conducted by Jean-Louis Batoz, UTC-Urban Engineering Systems, other cooperative projects between the two universities are envisaged. ■



Bringing men and robots closer

"Following suit to the digital revolution, the next phase will certainly be that of robotics", underscores Philippe Bonnifait, who foresees humans and robots coming closer together in the future. Whereas in post WWII industry, robots were seen as shapeless tools bolted to an assembly line, the 21st Century robots will be integrated to our human environments. Whether we are talking about cars, about vacuum cleaners, life companions (pets) or more or less humanoid workers, robots will be here to stay, autonomous, adaptable, interactive and communicative. The question of massive development of systems of systems and robotics that Philippe Bonnifait presented recently to the Académie française was closely followed and appreciated by all the "Immortels" present.

"Even if the French people seem particularly uneasy and even scared by the arrival of robots in their day-to-day lives and if the production lines for robotics are finding it difficult to take off, French research in robotics is still recognized as being one of the best in the world", explains the head of the new Master's degree. The decision to set up a Master's degree between a French and Italian establishment not only offers students a new form of mobility, but also opens paths for research scientists to have a more open vista to Europe. It is planned that the course will commence in September 2016, with three Genoan students coming to UTC-Compiegne and two French students travelling to Genoa. ■

Hypermedia visits of UTC's research labs at <http://hypervideo.utc.fr>

EUROPE

Interconnected driverless vehicles, safety first



UTC's Heudiasyc Lab was the only French representative registered at the GCDC 2016 Grand Cooperative Drivv Challenge and was able to present a project in the framework of its MS2T Labex on Control of Systems of Systems. GCDC 2016 is one of the key features of the European (EC) i-GAME project financially supported by the European Commission and four academic and industrial partners TNO (Netherlands Organisation for Applied Scientific Research), TU/e (Technische Universiteit Eindhoven), Viktoria and IDIADA (a Spanish vehicle certification agency). In 'Euro-lingo' the GCDC is a scale-one 'demonstrator' for a driverless system for interconnected vehicles progressing in line on a motorway. It is a research projects focused on inter vehicle communication which enables most risk situations to be forecast as well as ensuring maximum safety.

The vehicle chosen by IUTC was a Renault ZOE fitted with sensors, an on-board inertial guidance system and the radio link equipment and actuators was duly qualified (the test consisting of recovering full control of the vehicle in the case of a surprise mishap while moving. Heudiasyc obtained the best score in another test which consisted of correctly analysing and applying the priorities at a cross-roads. Then, on a motorway, the test vehicle received a demand to let an emergency vehicle overtake on one of the central carriageways. Road-works, cross-roads and junctions ... the French Zoe vehicle was thoroughly tested in this trial event. ■

d'infos <http://webtv.utc.fr> > Notre quotidien > Valorisation & stratégie d'innovation

How to grow up yet stay the same?

UTC-Compiègne, as a Founder Member of the Sorbonne Universities Cluster, has opened its local innovation ecosystem, its experimental territorial infrastructure, for its partners. We recall that UTC itself benefits from an experimental university status and is now spreading its academic model outside France as it has already done in France. The thrust covers two strong concepts, one of which consists of boosting technological research (with UTT-Troyes) on complex systems already under development in Shanghai. The other concept revolves round its cursus based on flexible pedagogy which enhances training and aims at closing the gap with the entrepreneurial world with long placements and workshop projects. This is now being exported to countries abroad, such as currently to Brazil.

IDEX

The Sorbonne Universities Cluster, *globalizing universities*

A somewhat 'shaky' scene

The 2007 law (known as 'loi Pécresse', the minister's name) aimed at implementing and encouraging the emergence of 10-15 major university clusters. In this area, the State ambitions have remained constant. Various ministers for HE in France have defended the idea of seeing communities of universities, as is the case in both large Anglo-Saxon tradition countries and also in emerging countries. The underlying principle is that they can thereby propose interdisciplinary courses and work. They have a status French law qualified as 'scientific, cultural and professional public establishments' (COMUE) The acronym COMUE designates institutions that group together HE and research establishments, such as UTC-Compiègne. From a local

historic perspective, the COMUEs replace the previous "poles" which, it turned out, had limited potential in terms of joint skills. The objective for COMUEs is thus to enhance "intimate" collaborative agreements. In essence, COMUEs offer the challenge of achieving advanced levels, of integration, in which Prof Alain Storck, President and VP UTC, underlines that each partner "retains its own independent autonomy".

The Sorbonne Universities (SU) Cluster

For the purpose of building up a pluridisciplinary university to face the challenges of the 21st Century, the recently

created SU Cluster groups together the following Founder institutions: University of Paris 4 (Sorbonne), the University of Paris (Pierre & Marie Curie), the Museum d'histoire naturelle, INSEAD (Fontainebleau), the CIEP, the PSPBB and the University of Technology, Compiègne and research intensive establishments such as the CNRS, INSERM, INRIA, IRD. The Sorbonne Universities cluster indubitably represents a prestigious 'trade-mark' and has a very ambitious set of policy targets (cf. www.sorbonne-universites.fr). It aims at mobilizing the cluster partners round a high level scientific, intellectual, social and cultural project designed to rehabilitate the university as an institution. At the same time, each partner's independence is assured, as needed to advance their knowledge base, for the dual benefit of



Society and the economy. Each must be in a position to offer innovative and high-quality courses to prepare their students for a complex world. The partners will also be invited to explore the challenges at their respective specialty boundaries. UTC-Compiègne is perfectly at ease with the SU cluster and its aims and has the intention to participate fully and comply with the process stages as they appear. The two Paris Universities (4 and 6) will have to go even further and combine their forces. “The Government” notes Prof. Alain Storck, “wants to see the creation of

combined poles, and indeed this criterion is a condition needed to justify the Investments for the Future programme, the IDEX (so-called ‘excellence’ initiatives, used to finance HE institutions and research establishments”. Joint training and research projects financed up to 30 M euros/year, for example to cover the needs of e-health projects, international mobility enhancement or collaborative training packages. As President Storck notes “the two main Parisian universities represent 90% of the SU student population so we must explore together the way we join the

cluster and the choices and options as to our mode of cooperative co-existence”. How for instance are we to preserve our added value (as seen and appreciated by our industrial partners, how do we build an association that is respectful for each partner’s identity, whatever its size. The COMUEs are justifiable. The initial philosophy was to favour interdisciplinary collaboration and to rehabilitate the university institution per se, correctly adapted to a complex world. No dogmatic stances, no a priori standardization, complying with each partner’s DNA. ■

UT GROUP

Do the French Universities of Technology (UTs) share common aims?



UTC-Compiègne has moved closer to UTT-Troyes and is currently preparing to consolidate HE

clusters as required by the public authorities following the 2007 Pécresse Law.

French Universities are indeed engaged in a vast consolidation thrust. The size of each campus is considered to be a powerful lever for productivity and progress as long as they respect the individual identities and their specific features. In every other sector, we can observe how enterprises have regrouped over the past decade. Globalization forces us to achieve critical sizes. France does not escape this self-evident requirement. UTC-Compiègne asserts that its particular DNA profile and its other specific features

constitute a real added-value. As UTC sees it, technology is not a by-product of science - it is a science in its own right. This identity of the French UTs (and in particular for UTC) is an undisputed advantage, a form of differentiation that makes the pioneering UTS original and yet different.

A question of methodology

There are 3 universities of technology today in France: ours (UTC-Compiègne, created in 1972), UTBM-Belfort Montbéliard and our “big neighbours” UTT-Troyes. For the past year now, Compiègne and Troyes have been working together and getting closer. “With UTT-Troyes, our objective is to become the first engineering school in France in terms of their combined size”, adds President Storck. If they achieve this, they will be in an excellent position to defend the colours of engineering sciences and technology in an even larger combination, including a big Parisian techno-cluster. UTC and UTT have lots of points in common: “Together we have begun building a partnership with various enterprises via our engineering subsidiary Uteam,” comments Prof Storck, “and our specialty

curricula are complementary and can be seen as a geographic extension of the Paris capital area and its engineering schools”. Pierre Koch, President and VP of UTT-Troyes confirms the potential synergies and makes a plea to adopt organization modes that preserve the interests of the parties. “In France, our engineering schools are too small, individually, but one previously heard solution, to combine them all together would not have been an appropriate move”. President Koch also recalls that the recent French Regional reform has led to less, but larger geographic entities. “We are now key players in our respective territories, UTT-Troyes in the ‘Grand Est’ and UTC-Compiègne in ‘Hauts de France’ (the new official ‘denominations’) and we must preserve our capacity to act locally”. Nonetheless, both Compiègne and Troyes are supporting the same training project; they have agreed to jointly take major, new, changes into their pedagogical vision, but President Koch feels that “we must identify an arrangement that complies with the consolidation-related challenges and preserves the independence of all regional actors. But the conditions of participation of University Paris 4 and Paris 6 will help us clarify these points”. ■



INTERNATIONAL PLATFORM

International development of the UTC model, *all the way to Mexico*

"More than ever before, education and academic mobility have become the object of intense competition among nations. France is one of the key players of this global competition and the image of our university system is excellent in Mexico, both for arts and social sciences and also for hard sciences and technology. This advantage and associated privileges is of course due to the excellence of the training courses we offer in HE markets and with an increasing number of players in the game, it is now necessary that our universities in France organize themselves and propose to the potential foreign students increasingly innovative training specialties, open to be able to host international exchange agreements. The objective, of course, must be to offer a clearly international dimension to the curricula, first of all to benefit their French students but also to offer open training possibilities to students of the major foreign countries, such as UTC is doing today in Shanghai ... and soon too, in Mexico", HE Maryse Bossière, French Ambassador to Mexico.

UTC, an atypical institution and a model highly appreciated outside France

Training students who have the capacity to innovate is one of the prime missions of UTC where the experience and 'excellence' know-how in technological training benefit fully to the undergraduates with interdisciplinary teaching, for example in biotechnologies, systems of systems, in social sciences, organization, uses ... But engineers tomorrow must also be able to take account of societal concerns that extend beyond purely technical and scientific aspects and knowledge. Every innovative project they undertake must integrate human and societal issues and parameters. Engineers in the 21st century will manage work in a project-oriented manner. A purely scientific and/or technological approach are not sufficient in a fast-growing all-digital era. We now find new technologies everywhere and concentrated in daily uses, whether it be in transport, in mobility, in urban engineering systems, in computer sciences and their applications, in ecology, etc. And UTC has understood this well: its pluridisciplinary approach has given it a unique and enviable reputation, notably in France but also abroad where numerous nationals participate in building and offering scientific and technical knowledge and knowhow to developing countries as they progress in a context of globalization, spreading

a French touch in other countries to create international digital platforms. This is a stance that associates Mankind and Technology, which position UTC has steadfastly 'cultivated' in China (University of Shanghai) where cooperative agreement has been in place for over a decade now, but also in Chile and in Mexico and at the same time the potential areas of cooperation are being reinforced with similar universities of technology in Morocco and Brazil.

Opening a new 'platform' in Mexico

Based on its excellent track-record so far, UTC is actively pursuing its international development policies by creating a new platform in Mexico. As of the coming academic year, the UTC core programme will be offered in the Franco-Mexican Lycée in Mexico. Some 40 students either French or Mexican nationals from French lycées in Mexico and other Central America will be able to apply to follow this core post-baccalaureate programme; in a manner similar and following the examples of the UTC set-ups in Shanghai and Chile, this Mexican platform will focus on three objectives - training, research and

building up partnerships with the socio-economic milieus.

Mexico is "soon to become one of the world's main workshops"

Enabling students to benefit from international training opportunities allows them to "gain the capacity to adapt to heterogeneous and multicultural environments that are in line with the corporate expectations and needs of French enterprises abroad", underscores Olivier Schoefs, Executive Director for International Affairs at UTC. So why choose the country Mexico? Several clear reasons here – Mexico is "soon to become one of the world's main workshops in the fields of automobile assembly and in aeronautics", explains Dr Schoefs. Mexico currently ranks #1 in automobile production for Latin American countries and enjoys a strong GDP growth rate (+2.5% for 2015). It also has strong commercial ties with the US via the North American Free Trade Agreement (NAFTA), this opening up a gateway to the North American continent. There is also a significantly strong French presence in cutting edge technologies such as in the

The aim, as seen by HE Maryse Bossière, Ambassador of France to Mexico, is to train future French and Mexican managerial personnel.



energy and agro-food sectors. As Alfred Rodriguez – President of the Franco-Mexican Chamber of Commerce - sees it, the coming inauguration of this platform is a “splendid strategic opportunity for Mexico where the need for ‘generalist engineering graduates (such as trained at UTC) is enormous, for those industries that require professional with the same level of skills as their counterpart French engineers, but also beneficial for UTC itself which institutionally will thereby strengthen its presence in one of the most dynamic Latin American market-places”. In order to respond to the high demand for engineering professionals, UTC goes even further. Its notable strong-point, over and above the excellence of its training programmes, lies in its capacity to meet the needs of French companies who have set up business abroad, training “agile” engineers capable of adapting to complex, heterogeneous environments. “Development of UTC’s overall policy thrust focuses on intercultural relationships, given that beyond the scientific and technological skills acquired, an engineer tomorrow must also foster and gain in cultural adaptability, not only in terms of know-how and knowledge bases, but also and especially in choices that impact his or her future professional lifestyles”, recalls Olivier Shoefs. In Mexico, various local ecosystem actors are attracted by this newly proposed form of cooperation. Several multinational groups,

such as Saint-Gobain, Safran, Thales and Alstom Thales are keen to see bicultural profiled candidates and they also appreciate finding professional working elsewhere in the world with strong « soft skills », engineers with real team and project management skills.

Faced with this challenge, new partnerships and cooperative agreements are definitely on the increase

Aware as it is of the potential for mutual interests for both entrepreneurs and the students, the French Embassy in Mexico would like to see a large French technology-intensive pole in this country. As President Storck sees it, the arrival on the scene of UTC-Compiegne constitutes “a first stone for this key French technology pole” and “is committed to a strategy that goes far beyond student exchange programmes”. UTC will be accompanied in this venture by several solid partnerships. Olivier Shoefs recalls “the close links of UTC with NAUM (National Autonomous University of Mexico) and the research centre of the National Polytechnic Institute of Mexico” the largest school of engineers in the country “with whom we have been collaborating for more than 10 years now

on the topic of driverless cars”, adding that “several scientists-lecturers from UTC are already in Mexico working on projects with colleagues at the National Autonomous University of Mexico and the National Polytechnic Institute of Mexico, a strategic partner for the SU cluster”. Moreover, UTC and the research centre of the National Polytechnic Institute of Mexico are studying the possibility of developing a joint master’s degree focused on electric propulsion vehicle. This particular project has enabled the partners to strengthen other research projects with SU partners.

And... there is more to come!

Soon, the students may face an almost over-rich set of opportunities! UTC-Compiegne is exploring options with other regions such as the Middle East, South-East Asia, the USA/Canada and Sub-Saharan Africa. With methodology and determination, UTC-Compiegne is pursuing its growth policy thrust in the “21st Century territories”. ■

You have the floor, Excellency - Ms Maryse Bossière, Interactions #41

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LIVING LAB

When territories provide ideal ‘scale-one’ lab. experiments

In order to provide a new impulse to the establishment’s innovation policy, UTC is placing some of its stakes in the concept of the “Living lab.”. The underlying idea is to innovate more and more efficiently, by using the surrounding territory as a laboratory to carry out various new technological system experiments and utilizations on a scale-one basis. It is a project that calls for reinforce partnerships with all the actors of the local eco-system.

Sustaining economic growth, creating new jobs, meeting and answering the challenges of energy transition issues, rarefaction of natural resources, ageing of our populations... the processes of innovation,

faced with today’s societal challenges, appear increasingly necessary and are now integrated among the main missions of the Universities. In its dual role as both an engineering school (grande école française) and a technology-intensive

university, UTC has stressed the values of innovation ever since it was created. President Prof. Alain Storck emphasizes that “to innovate you need three vital ingredients - firstly your establishment needs to be multidisciplinary and the



UTC model has always embodied this feature in its curricula; secondly, the university team must be committed to a pluricultural outlook: they must deal with a wide variety of profiles, as many as there are different ways to think in the professional world ‘engineers, philosophers, medical practitioner, artist ...’ which together become a self-evident factor for better creativity. Thirdly, a thing we call ‘partenarial culture’. When it comes to transforming new knowledge, new ideas into products, processes or services, identifying market outlets requires a pluri-actor network, mobilizing academics, entrepreneurs, territorial institutions ... it is these pluricultural and partenarial dimensions that underpin our university model”.

A major innovation actor in the “territory”

From its early years, UTC has always collaborated with the industrial sectors. Likewise, it established close links with the regional and territorial authorities in regard to various innovation-intensive projects. As René Anger – former executive director of the Regional President’s privy council- recalls “In essence, UTC was even initiator of the Region’s innovation policies? For the past few years, has also been engaged in the development of a local ecosystem for creativity and innovation. The University’s Innovation Centre is one of the key-stones of this successful venture. The Daniel Thomas Innovation Centre is a facility that focuses on maturation of projects, designed as it was to encourage and enhance exchanges among

the various actors in the innovation field. But the Centre was only a first stage. The University is now seeking to provide an extra impetus to the local eco-system by setting up and implementing the Living Lab concept that is a direct spin-off of the open vista policies of UTC. So, what is the underlying idea? It consists of involving all the potential partners for an innovation as of the design phase, beginning with the end-users, considered as key actors. To this end, the project must be tested in vivo, for example, medical monitoring equipment in a retirement medicated unit (Ehpad), or testing driverless cars in an urban environment. The aim is to find a best-fit for the final product to the real utilization conditions once the prototypes have left the labs.

Exploring new utilisations

Involving all the potential partners for an innovation as of the design phase, beginning with the end-users, considered as key actors. To this end, the project must be tested in vivo.

Within the « Living lab », thematic platforms (health technologies, transportation and digital applications) can experimentally model the urban and the territorial milieus. “But at UTC we are currently envisaging to make the approach systemic, turning the local “territory”, so to speak, into a mega-living-lab.: a scale-one test-station for new technologies, but more than that, a place to explore new utilisations of the technologies. Innovation does not stop at technological breakthroughs.” “Development of driverless cars, for example, will perhaps offer an opportunity to encourage mobility in the territory and also to rethink the connections between driving a car alone and taking public transportation,” explains President Storck, personally committed with the Compiègne townhall officers to explore this

“Open Labs represent the future”

Question and Answer (Q/A) session with Prof. Saadi Lahlou, Dept of Social Psychology, London School of Economics (LSE) and member of the UTC Scientific Advisory Committee.

How do you assess UTC’s innovation-intensive policies? What strikes me most are the transdisciplinary features I see in all UTC projects. With a growing specializations in scientific skills, it now is becoming increasingly difficult to integrate all the elements when designing a new technical device and often the ‘proof’ of product/process validity of the design only comes later, in the market-place. This is probably why a great many projects fall apart, collapse or require costly adaptations in order to comply with market expectations. UTC has taken this problem into its stride. While continuing to progress and advance the science bases of their specialties, the UTC scientists do not hesitate to confront their findings with other specialists and with the real world conditions. They are not afraid to mix technical and philosophical questions. And they are quite right in doing so: in biotechnologies and energy engineering for example, ethical issues have now become a predominant theme.

Where does the interest for ‘living labs’ lie?

The concept provides a real way to progress towards a better level of interdisciplinary exchange and work by integrating real use constraints upstream – uses, ethics, costs ... Taking such constraints into account raises problems when you try to model the system, because the number of parameters becomes rapidly unmanageable. Often, rather than attempting to model all possible situations and outcomes, it will prove more efficient to test a trial product with users in conditions that are close to reality and then proceed by trial and error, gradually improving the product/process. What you are doing here is introduce reality factors ... and this way you at UTC have come to the “living lab” concept. University labs then can integrate reality and bring end users into the circuit. The future now lies in ‘open labs’ where the scientists come out of their ‘ivory’ labs to test their innovations in the real world and this in turn proves even more efficient as approach. This is, as I see it, the new orientation of UTC when UTC talks about the future of its “living lab”.





Building criteria to pilot innovative projects

How do you assess the performance level of a university in terms of its innovation policy and outreach? Today we can do little more than count the number of patents claims registered and the number of start-ups created. To go beyond this highly restricted vision and help the institutions to pilot their strategies more accurately, President Alain Storck and Professor Hubert Gatignon, INSEAD Fontainebleau, are studying a analytical grid assessment process with four blocks of indicators.

The first block covers the immediate economic results of the institution's innovation policy: number of start-ups created, number of innovative products/process, etc. patented or not but not yet on the market-places, whether they embody new technologies, or new business models ...

The second block looks at the medium term impacts expected, thanks to student training course specifics: number and typology of courses or specialty modules that focus on innovation and/or entrepreneurship ... "This is a very important characteristic", underlines Hubert Gatignon. Universities contribute to innovation through their research activities and results, but they also have among their missions to educate and train undergraduates to encourage them to adopt a pro-innovative stance. Especially so in France, where our institutions are efficient when it comes to technologies and patent claims, but where we also experience much more difficulty in terms of developing the national economy and create jobs on the bases of these innovations".

The third block assesses research that focuses on innovation and entrepreneurship: numbers of specific units, laboratories, research programmes, numbers of peer-review papers and books printed.

The fourth and final block analyses the tools implemented to improve the indicators above: innovation centres, 'Fab'Labs, living labs, innovation chairs, student associations for innovative collaborations and entrepreneurship, possibilities for financing projects and aiding incubation ...

Lastly, the grid also includes an indicator reflecting the status of the various university and international partnerships in the field of innovation collaborations.

innovation possibility. "On the less busy routes, we could imagine a "door-to-door" service using driverless vehicles to replace public transport buses. The aim would also be to see this at least cost. And the most efficient way to validate the hypothesis is to test it scale-one with users, in a partnership with the territorial authorities in charge of transportation questions". Another example: to limit as much as possible the use of chemical fertilizers in agriculture, one of the ways considered is to increase the crop rotation rate and to adapt the farming processes to be adjusted closely to the soil conditions. The latter can vary quite a bit in a given field. The idea then is to subdivide the surface into micro-surface units and doing the treatment using drones to relay the information to a control system. To develop and test such a system, you need a "territory", agricultural partners and, more than this, you need a team of research scientists who will commit themselves to this area of project.

A continuous 'to and fro' movement from real to virtual and back

"In fact, the territory is both a scale-one lab and a research topic in its own right", asserts of the industrialists and member of

our organization. "There is an added value, including in areas we ignore. By carrying out various experiments, the innovation designers will be in a better position to identify and analyses phenomena that they had not necessarily anticipated and the modelling of the system will become a continuous to-and-fro movement between real and virtual worlds. This should enable us to innovate better and more. UTC has two precious advantages to develop this approach. The first is its capacity to integrate engineering sciences and humanities, which fit in well with the philosophy of the living lab. – i.e., not

to remain content with just technology for technology's sake, viz., a technical device, but also as something in interaction with a material, human and societal environment. The second asset is the proximity of UTC with the territorial and regional authorities and the trustworthy relationships the university has built with these partners", notes René Auger. "There is an obvious mutual benefit to be drawn both for the university and for the territorial actors if they commit themselves to an experimental approach that has benefitted all the participants". ■

A Dual Partnership to boost R&D in Complex Systems

Two of the French universities of technology, viz., UTC-Compiègne and UTT-Troyes have agreed to unite their forces to develop co-operation with their industrial partners to work on a challenging thematic – complex technological systems. They have as their objective to propose a joint scientific and engineering expertise to the industrialists, underscoring the control of risk and human factors. Interactions zooms in on this strategic project.

Sensor networks coupled to data processing equipment to ensure medical monitoring of senior citizens in their homes; a fleet of drones in formation exchanging information whilst on surveillance missions over forest-land under the threat of a fire outbreak; driverless vehicles, exchanging information with their immediate environment to ensure safe journeys on the road...

These few examples serve to illustrate the fact that the complexity inherent in today's technologies stems from the heterogeneous nature of the component systems. The latter comprise numerous building-blocks obeying different logics and with different behaviours, all of which are increasing interconnected, and used to process a host of varying operations. It is this overarching situation that makes it difficult even to describe what is happening, not to mention designing and managing them correctly. Mastering this complexity is one of the major challenges in engineering sciences. And it is for this reason that UTT-Troyes and UTC-Compiègne have chosen to associate their skills on this particular theme and to develop partnerships with the industrialists. "Here we have two engineering schools that focus strongly on technological research, that is looking closely at engineering as a science", explains Professor Bruno Bachimont, Executive Director in charge

The complexity inherent in today's technologies stems from the heterogeneous nature of the component systems. The latter comprise numerous building-blocks obeying different logics and with different behaviours, all of which are increasing interconnected, and used to process a host of varying operations.

of Research at UTC. "As we see it, complex systems are scientific in essence. But it also represents a priority axis for co-operation with industrialist partners. Enterprises are the first to be confronted with the issues raised by system complexity. And the best way we have currently to solve these questions is to share our skills and efforts to define and propose solutions on a joint basis".

An intelligence-intensive approach to complex systems

The objective shared by the two universities does not include answering industrialists' questions immediately they arise, on a customer/supplier line, but rather to build long-standing partnerships that will enable them to finance research and reinforce their expertise on complex systems, while favouring technology transfer operations and policies, innovation and hence help improve industrial competitiveness. So, how does their project stand? The short answer will consist of proposing a service offer to industrialists on the core theme of system intelligence, stressing in particular risk and human factor management. In order to deploy and implement this strategy, both UTT-Troyes and UTC-Compiègne have a similar trump card – their pluridisciplinary

approaches. "We are in a position to come up with global answers which essentially are transverse to all the issues we find in complex systems", underlines Jérôme Plain, Director of Entrepreneurial Relationships at UTT-Troyes. "And this is all the more true that our skills here are complementary. By combining our strengths, we can tender to wider-ranging calls for projects".

Risk management – a double-edged challenge

Mechanical engineering, acoustics, nanotechnologies, computer sciences and applications, biology and bio-engineering if we consider "hard" sciences, then these two universities of technology (UTs) have the capacity to integrate their research findings from a variety of specialties in a single complex system. Thanks to this multidisciplinary approach, they have also developed a strongly based expertise in the field of risk management, which represents both one of the main applications of complex systems (medical monitoring at home, surveillance operations on sensitive sites) and a problem area that calls for attention if we wish to master the systems. And because of their inherent complexity, it proves more difficult to forecast system behaviour and/or to identify all the endogenous and exogenous risk factors involved, and to ensure safer operational modes. ... "For engineering scientists, we are faced here with a change in paradigm", note Bruno Bachimont. "Earlier on, we used to start by building a model and then we expected the system to concur with the model. Today, our model long techniques are confronted with the sheer complexity of the real world which lies beyond our reach. Hence the need to develop new approaches to



identify correctly and master the system's uncertainties".

At UTC-Compiègne, these questions lie at the heart of the research concerns of several teams and especially those with the French government incentive Labex (MS2T) Master's degree 'Control of Technological Systems of Systems'. At UTT-Troyes, science and technologies for risk control are one of the nine research themes explored at the Charles Delaunay Institute, a mixed research unit (UMR) that brings together all the research activities of the university. It is a transverse theme, involving all the research teams, on programmes that range from surveillance and safety in large-scale systems, to e-health programmes, and cybersecurity measures, eco-design or systems and network resilience and crisis management protocols.

Systems that integrate human factors

Moreover, both UTs have numerous social research scientists, over and above the hard-science specialists. "We therefore have the capacity to study complex themes, integrating both the technological and social aspects of the issues and that is a clearly advantageous asset for us", underlines Jérôme Plain. Indeed, this specific feature enables the scientists to anticipate societal impacts of technological systems: what, for example, will be the consequences in terms of employment opportunities, protection of our private spheres, and with what degree of social acceptance? Questions like these are all the more important that a form of technophobia is gaining ground as rapidly as technophilia.

It also enables "human-inclusive" approaches (as opposed to "human-exclusive"). "Interactions with end-users is often regarded as the weak link in systems, as problems to be overcome and which generate risks and extra difficulties", explains Bruno Bachimont. "Our approach consists of regarding humans not only as end-users but as an integral component of the milieu in which the system is called to operate and as an ingredient contributing to its resilience".

An engineering pole to serve industry

To develop the co-operation agreements with the industrial world, the two universities rely on Uteam, the partnership research management subsidiary of UTC-Compiègne, in which TTT-Troyes will take a participative stake. As it had already done for UTC, Uteam has the remit to valorise the expertise of the laboratories for the associate enterprises, to negotiate and manage their research contracts. But Uteam will also set up a pole of skills in engineering sciences, to propose services complementary to those from the laboratories: expertise, test protocols and experiments, design, accompaniment for technological development ... For these engineering activities, Uteam will address the scientific and technological platforms of both UTC-Compiègne and UTT-Troyes and will engage PhD level or post doc) engineers. "Our platforms have the engineers, who have often been trained in our own laboratories and, given their proximity with the research scientists, are consequently continuously updated in their scientific knowledge-bases",

explains Bruno Bachimont. "This personnel possess all the expertise need to make high level offers to the industrialists. But our universities do not have the financial means to keep them employed beyond, say two to three years. Hence the idea of recruiting them into the Uteam staff to keep their skills 'on hand' and to build up a self-renewing group of experts, who could also envisage reinforcing the R&D teams of the same industrialists. This vision is inspired from what happens with the Fraunhofer-Gesellschaft Institutes in Germany." With both universities sharing the multidisciplinary approach and the new Uteam organization, they intend to boost cooperative activities with the industrialists. Their objective is to double the number of research scientists engaged in contract research over the coming three years and to increase by some 10% per year the level of partnership research projects and joint registration of associate patent claims, with the industrial partners. ■

Key facts and figures UTC-Compiègne and UTT-Troyes

10 research laboratories

400 lecturer research scientists

500 PhD students

75 % of the collaborative research already conducted with the socio-economic world



Regard sur

la marraine d'une promo

The new God-Mother for UTCs 2016 graduate ceremony, Anouchah Sanei is currently Global VP Science and Technology for Campbell Soup at the company's Home Office in Camden, New Jersey, USA. She has a track record that is passionate, full of challenges and pragmatism and it proves that over and above her excellent engineering and technical skills, our PhD alumna also has both the capacity to adapt to a pervasive and global 'present' and also to innovate in a changing world.

Anouchah has been selected to be God-Mother of the 2016 graduates [ceremony scheduled Nov.19] and will be an opportunity for her to say "thank you" to UTC, her university and to instil to the awardees keen open mind, her rigorous thinking and adaptability, not forgetting a tremendous sense of pragmatism which has enabled her to cover three continents and work with three agro-food world leaders. Now as VP

for Global Science & Technology with Campbell Soup base at Camden, New Jersey, Anouchah Sanei is not only an internationally flavoured Godmother, but also a professionally accomplished woman. "None of this was written on the wall when I launched on my early career-path", she explains, insisting on the importance of learning "to develop a personal strategy to live for and, why not, inventing a new path. Nothing today will be easy for this up and coming generation, concerned as it is with ethical issues and long term commitments but at the same time fascinated by the immediacy of 'now'", she offers. "It is important to motivate them in their own fields and offer them a strategic, global and modern vision from the first day they are hired, and at the same time to realize the must cultivate their capacity to seize on opportunities as and when they occur". Anouchah Sanei is highly critical of what she perceives today as a trend to recede into a national, ever-anxious, survival mode.

Since she is not exactly sure what being a UTC Godmother implies, Anouchah Sanei suggested that she could help share her eXperience by moderating debating groups, or even on-line chat sessions to fully play her role as mentor to the new graduates. "UTC, from the very beginning, tried to welcome 'the best' candidates, in terms of their school track-records, but also recruited some original

profiles where their sense of developing and fostering relationships and their innate entrepreneurial spirit enriched each and every class", she underlines insisting on this highly important and specific feature which is the trade mark of the university. "When you enter a world level recruiting arena, you must be able to recognize that competition is not only important per se but it is also quality-intensive and companies tend to be careful in the way they look at criteria, between those of a European university and any other HE establishment on another continent; certainly a well-educated brain is necessary, but above all, you need a well-connected, adaptable brain that will be the only cutting edge advantage you can offer to ensure due recognition in the world for our scholastic predispositions in France", she underlines, to conclude. ■

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world

LE SAVIEZ-VOUS ?

Christophe Lecante, Julien Bahain, Pierre Gattaz and Louis Schweitzer... had all accepted to be Godfathers of earlier classes.

The talks delivered by the Godfathers to the year's graduates are on : <http://webtv.utc.fr/> under the heading 'Notre quotidien/ Parrains ...'

The Interactions Hall of Fame portrait of Anouchah Sanei is on p.20



Digital technologies to help visually impaired persons to take the measure of space

The TEDxUTCompiegne programme is a sequence of local events that aim to “boost creativity, enable change and encourage innovation to make Compiegne prosper”. The latest invitation to the event organized at the Technology Transfer Centre was Anke Brock, a research scientist with Inria-Bordeaux, on the theme ‘Horizon 2050 – Innovation and Society’ and a member of the Bordeaux Laboratory for Computer Science and Applications, a specialist in Man-Machine Relationships. Her interests for the moment are focused on “geolocalization tools” to help partially blind persons.

To what extent are information and communication technologies (ICTs) to be seen as challenges for partially blind persons (and handicapped persons in general)?

By the age of 75, one person out of five in France develops a visual impairment, which represents some 200 000 handicapped persons. It is therefore important to learn more about relevant ICT research that potentially could help disabled, impaired persons. What I personally want to show is that computer science research is not an exclusive, reserved area for technology ‘geeks’ but also means that we must have a degree of compassion and sensitivity to better understand users with special needs. Today, persons with visual impairments use digital technologies to access information they could not get otherwise. All current smartphones and i-Pads propose an audio read-out of text displayed on the screen. Overall, the digital world appliances offer tremendous possibilities to improve the standard of life-style for handicapped persons.

How does a visually impaired person cope with a spatial reference?

This question of how a visually impaired person perceives a spatial environment was first raised in the 1930s by experimental psychology scientists. At the time, the answer proposed was to assert that a partially blind person was incapable of ‘building up’ a mental representation of space, other than simple or familiar shapes and forms, such as the lay-out of a home, apartment and its furniture. Today, our research has shown that visually impaired persons can create efficient spatial representations. Nevertheless, different zones of the brain are involved in memorizing and representing spatial information. We have found that certain zones of the visually impaired persons are underdeveloped. Beyond the question of brain development, cognition sciences have also revealed that the capacity to cope with spatial data still differs a lot depending on whether the impairments goes back to birth or not. Globally speaking, the development of cognition capacity

to cope with spatial data is slower for visually impaired persons. There are three levels of spatial knowledge. The first level relates to identified points of interest and the second to the ‘trajectories’ between these points. The third level, known as “configurational knowledge”, implies the spatial representation of the data taking the form of a plot map which integrates orientation, distances and all the information needed to move around confidentially in, the surrounding environment. It is this last-mentioned level that enables a flexible approach to the environment by adapting decisions in terms of spatial representations. Studies in cognition science show that those with visual impairments find it more difficult to reach and use the third level. Our research nonetheless also shows that these persons can acquire this level of knowledge notably by using accessible interactive maps.

What technologies are currently available or under study that could help visually impaired persons to cope with their environment?

Well, various technologies do exist or are being explored. Ocular prosthetics are now being envisioned, but only for special forms of impairment. Geo-location tools are also under development, transmitting information by audio or tactile channels. Originally these tools were intended for pedestrians or cyclists but they could also prove very useful for partly blind persons. Having a map is often necessary for a geo-location process. Braille maps have been available for a long time now, which of course implies that you have to be able to ‘read’ braille, which is not the case for all visually impaired persons, especially those who develop and suffer from their impairment in later life. Consequently, scientists have been working on interactive maps for the past 3 decades. The screens are fitted with pistons (or screen bumps) that dynamically represent braille

words or signs and landscape features. There are systems such as Tactus that propose keyboards with screen keys that liquid channels make emerge. There is also research on screens that generate local vibrations or electrical pulses that induce a sensation of texture. There are indeed numerous development areas but all of them are more or less easy to, implement and costly. My work focuses on classic screens over which 3D maps can be superimposed. The map can therefore be followed by finger, with the tactile screen picking up the position and translating into sound data, things like street names, distances, opening hours for shops ... Not only do the experiments show that interactive maps are every bit as efficient as classic 3D maps enabling impaired persons to represent spatial information, but also provide for a swifter access to the geographic information. 3D maps offer a more global representation of the environment because the user can rapidly explore the entire environment to gain a general view; this is not the case for tools that propose a tactile (vibration or texture simulation) return that offer better local data. To proceed this way (based on local knowledge only) calls for effort in memorization and spatial reconstruction, whether you are impaired or not! Further development and popularization of 3D printers should change the deal overall and thereby enable anyone to make his/her own 3D maps as needed. ■

Today,
persons with
visual impairments
use digital technologies
to access information
they could not get
otherwise.

plus ► Abécédaire de l'innovation :

<http://abc-innovation.utc.fr/> > Charles Lenay, Supléance cognitive

Innovation Workshops for Metropolitan Areas

June 15, 2016 UTC-Compiegne hosted the presentation of the results of the first Innovation Workshop for Metropolitan Areas (acronym in French AIM) on the theme “multimodal mobility scenarios” on the Rio da Janeiro campus, by students in the UTC-GSU (Urban Engineering Systems) Department.

A novel pedagogical approach...

With the support and the financial backing of the “Degree College” programme (Sorbonne), these AIMs are designed principally to assure the development of international project workshops (APIs) with the framework of a larger network of public and private partnerships. The idea is – over one semester – to have several teams, from at least two different countries, collaborate (Degree level 3 and Master’s Degree) on a joint programme such as the prospective and futuristic evolution of a site, for example. Each team, with its supervisors, collaborates with the other teams engaged via digital links, to attain the objectives set by the project sponsor. They organize the project management as they would in a design office, with phased stages – initial state, diagnosis, first draft proposals and a final phase to present the work and the positive nature they see in their results.

To open the way, a pilot project has been set up on the campus of the FURJ campus (Federal University of Rio de Janeiro), following a show of interest by the local Mayor, Paulo Mario Ripper, who would like to improve mass transportation and the development of alternative modes such as bicycles, car-sharing or even a magnetic levitation train concept (MAGLEV). The decision was taken to work on the internal campus mobility, in a partnership with FURJ, the University of Paris 4 - Sorbonne and the RATP Paris mass transport consortium.

last in time and be consolidated, notably through the creation of a urban managers training specialty courts and a network of universities round the world to support these projects. ■

Plus This file and results can be viewed on the UTC WebTV

An excellent experience, combining project work and meeting people that allowed us to enjoy several points of view, not necessarily the same as ours

student in Urban Engineering, for a Master’s degree

This is the first time I have felt I was really able to contribute positively and that I was indeed useful – I would like to see more projects like this in Brazil!

Rafael Lopes Witiuk, Brazilian student

... focused on the challenges facing major metropolitan areas

Among the societal questions of the 21st Century, international metropolitan areas provide an attractive and relevant site for technological innovation and multicultural inputs, inasmuch as there are numerous specialties that converge to build the cities of the future on the basis of challenges that revolves round mobility, environmental and energy politics within the overarching aim of sustainable development.

A pilot project in Rio da Janeiro to validate the concept

Having students face up to reality in the field

Three teams (one each from the establishments mentioned) propose several scenarios, combining different transport modes that could meet the short, medium and long term expectation of the commuters. They therefore carried out a professional, pluridisciplinary analysis, both from a system point of view (connections between transport, planning and the environmental constraints) and the technical; point of view (modelling the mobility flow patterns) and the socio-economic aspects (polling users and identifying needs and shortfalls). This metropolitan site provides an excellent study area for students, enabling them to experiment their theoretical skills, to acquire new knowledge through the eXperience gained here, and to develop creativity and innovation, faced with these issues that impact directly on ‘civvy street’, industry and local authorities.

Long-term prospects

This first experience prove successful and so now the students and partners are joining their thoughts to determine how to make the system



Ilha do fundão, the FURJ site and a nightmare for commuters / ©mrivero

AGENDA

interactions.utc.fr • www.utc.fr

Summer school - "Culinary science for tastier, healthier food" • July 18-29

This summer school will enable the attendees, whether they be experts or novices, to update themselves as to the latest trends in culinary sciences, gastronomy and food-health relationships. After a first week devoted to learning what the texture of foodstuffs means, to acquiring the knowledge needed to improve the nutritional profile of foodstuffs. Through better control of food texture, innovative technologies will be proposed and even used to prepare healthier versions of certain French specialties recognized and admired throughout the world.

Second international workshop: "Static-Tribo-Electricity of Powder" • August 4-6

Khashayar Saleh, research scientist and lecturer at the UTC-TIMR Lab is the conference organizer for this second edition of the "Static-Tribo-Electricity of Powder" STEP Workshop. STEP is a conference with a voluntarily limited number of participants, this choice helping to enhance the exchanges among the engineers and research scientists. The debates will focus on how electrostatic charges are generated, how charged particles are controlled, how the electrostatic charge are correctly measured and other topics that relate to tribo-electricity.

Special Day "Cosmetics and Perfumes: Natural ? Natural origins?" • October 6

UTC is a partner for the conference organized by the learned society 'Chemical Experts' and the Ecole Supérieure de Chimie Organique et Minérale [Organic and Mineral Chemistry] on the theme "Cosmetics and Perfumes: Natural ? Natural origins?" » The aim of the Day is to give the industrial actors in these specialty fields a clear and realistic update on the means at their disposal to guarantee and assess the "natural" parameter of their products. The conference will focus especially on the analytical tools needed to detect and trace the "natural" elements present.

www.weeevent.com/naturalite-cp

1st International Conference on Urban Physics • FICUP, Quito - Galápagos, Sept. 25 – Oct. 2

The 1st international conference on Urban Physics hopes to become a founder event to present work on digital modelling of cities and megapoles, these urban areas facing critical problems throughout the world. The programme of the conference aims at giving scientists in differing fields (infographics, environment physics, digital models, renewable energies, urban planning ...) a forum where they can discuss and confront their ideas and methods to detect and analyse the physical parameters so that local authorities can manage the development of cities all the better and satisfy the economic and environmental constraints.

www.ficup2016.com

UTC Diploma award Ceremony • Nov. 19

Cette année, pour la première fois, nous accueillerons en tant que marraine de la promotion, Anouchah Sanei, Global Vice President of Science & Technology at Campbell Soup Company. **Follow the ceremony on our Instagram®** : www.instagram.com/univ_de_technologie_compiegne

TECHNOLOGY – AN OUTSIDE VIEW-POINT

Ecology , 'Heaven Mandate' of the Chinese Government

You all know economist-ecologist Professor Yann Moulrier-Boutang through the analyses he offers on subjects like cognition capitalism or the pollination economy. But were you aware that he is also an expert on China? I met him during his trip to Shanghai where he was broadening his views of the ecological challenges that face China today. If, obviously, the strategy of the Chinese Government is to find solutions for its environmental crisis over the coming two decades, it remains uncertain that they will or can succeed.

China is faced with the same challenges as Western countries, but the scale of the problems is much greater, both in terms of solutions and typology of the problems.

Although Western media regularly publish shocking images of Chinese air pollution, this specific problem is not the most crucial and comes in 5th place on the list of the seven ecological plagues identified by economist Moulrier-Boutang. Beginning with the observation that unemployment appears as the main braking factor, impeding as it does ecological transition, he goes on to develop the idea of a universal income that he sees as a solution that ought to be envisaged seriously in the overall Chinese economy.

How does China stand in relation to ecological issues, notably the air pollution question?

Although the media focus endlessly about air-pollution, this particular problem is not the most ominous, even though it is indeed serious. It is due to home, office and industrial heating where the energy source is coal-burning stations. The capital Beijing suffers considerably from this plague and we hear (and see) a lot about peak conditions – however, the situation has been improving ever since the city authorities launched a major 'deindustrialization' policy. It was announced in April that 1.8 M jobs in coal-mining, foundry and steel-making were to be made redundant. In fact, air pollution, geography are changing. The city of Shanghai, jammed between Wuhan, Nanjing and Hangzhou, all three of which industry-intensive and highly polluting cities, has a somewhat inglorious future ahead inasmuch as its level of air pollution might even exceed that found over Beijing. Manchuria is also severely impacted. There, as with China's coastal cities, modern industrial specifications have led to the installation of extra coal-burning stations to remove the risk of a power outage. Consequently, current coal production in China is 1.4 billion tonnes/yr. not including the 200-400 M tonnes imported from Australia. Another source of pollution is indigenous to urban areas: combustion engine driven transportation. Over a two-year period, the index rate for such engines has risen from 19 to 21% and should rise to some 50% in 2025/2030.

The equation is straightforward: even if, technically speaking, progress has been made in terms of reduced engine pollution emissions, the increase of the number vehicles on the roads will be such that overall pollution will inevitably increase.

What other ecology-related problems must China solve?

China has been exploiting its land and soil resources for 7 000 years and some of today's problems, such as scarcity of water, go back at last a century. We must also bear in mind that the surface of the country represents 3 times all Europe, if we include Tibet and Manchuria which were conquered under the Han dynasty [206 BC - 220 AD]. Ecology in China is a far-reaching question. As I see it, there are four other ecological challenges that are more worrying than air pollution, beginning with diminishing farming land. China now only has 4% of its surface in farm-land, compared with 43% in France. The reason clearly lies in the policy that has seen 27 000 km² a year changed from arable to other uses, i.e., the equivalent to the entire surface of the United Kingdom replaced every decade. That, indeed, is why China is now buying up land and property in Argentina, Ethiopia and in South Africa. The second issue is deforestation. The rate of change here has led to Inner Mongolia becoming a desert area. The futurologists' visions of Beijing being buried under sand, consequently, are not, totally extravagant.

In third position amongst the problems, I would single out drinking water rarefaction. For thousands of years now, China has been faced with this issue, particularly in its Northern provinces. Between the 1st millennium BC and the 1st millennium AD, a canal over 2 000 km long was excavated, to bring water to the Northern capital cities. And this is still the case today. The Chinese leaders have gone as far as diverting some of the water of the Yang Tse Kiang River. The shortage of water is such that for the city of Beijing, a drastic choice had to be made between watering the 17 million trees planted especially for the Olympic Games [3008] and using this water for the Games themselves. As a result of taking the latter option being taken, all the trees died. The fourth problem I see is that of heavy metal pollution



Prime Minister
Li Kejiang is striving to
avoid an excessive salary hike
to slow down the delocalization
of industries, including Chinese
companies. The country aims to attain
a positive balance of payment. The
Government praised hard, honest
work to improve the quality
of production and limit
corruption...

in the main rivers. This has a notable impact on fish-farming which is a source of the majority of the food demand by the Chinese. Tap water is not safe in any of China's cities. But following on to air pollution, there is top-soil pollution and a degraded level of biodiversity. Pesticides, insecticides and GMOs are being used with "no limits". And certain Chinese provinces have gone so far that all the bees have simply disappeared and humans were required to pollinate the trees, flower after flower. Bees have now been reintroduced. The same sort of problem was encountered when, under Mao Zedong, practically all the sparrows (seen as pests) were wiped out in compliance with the Chairman's call that "If a sparrow steals 3 seeds from you, hit it 3 times with a cudgel" [1].

In concrete terms, what is the Chinese Government doing to solve these problems?

The Government had correctly understood that if Chairman Mao had benefitted from a "Heaven Mandate" [2], it was a reward for him restoring Chinese independence; the same holds for several past governments who accompanied the industrialization of the country, raising the standards of living of the Chinese fourfold in just several decades. Today the 'rewards' should come via ecological issues. I would give the Government 25 years to solve some of the major ecological questions. Failing this the current "dynasty" will be called to question. For this reason, since the Universal Exhibition of 2010 [Shanghai]; the Government launched the pharaonic projects such as the diversion of the Yang Tse mentioned earlier. To deal with impending desertification round the capital Beijing, millions of trees have been planted on a green belt 500 m wide and 2 km long. Stringent standards in terms of water and energy saving now apply to the building trade. The Government is launching a massive nuclear power programme, with an investment covering several reactors. It is also developing hydroelectric sites and photovoltaic stations. The solutions proposed relate to infrastructures and technologies. The Government favours a technocratic and 'developmentalist' vision of ecological questions. It taps into technologies developed elsewhere, then seeks to produce them and distribute in compliance with its "Made in China 2025" programme. China, for example, moved front-stage in terms of photovoltaic panel arrays. This technology has witnessed a technical progress, viz., 18-23% better energy conversion by using silicon, a rare element. In France, EDF acquired the company capable of increasing this PV cell efficiency. Well, all to the good, I say, except that China has done even better, using recycled silicon recovered from decommissioned panels (unfortunately with children as labour) which enables the Chinese to produce new PV panels with the same level of efficiency but at a lower unit cost and Government has made them obligatory for new housing areas. However, if China is now investing strongly in production and installation of PV arrays and wind farm generators, there remains the acute

problem of connecting them to the grid which is a very costly affair; to the extent that in North East China, the authorities do not know what to do with all the excess renewable electricity produced.

What difficulties does the Government meet to engage in ecological transition policies?

In my opinion, the difficulties are both economic and social. The figure for annual growth in China stands at 6.6% today and the Government asserts it will remain at this level till 2020. In more recent times, Prime Minister Li Keqiang presented a new growth calculation formula and a new figure of 3.5-4% per year. French economist Patrick Artus has redone the calculations and comes to the figure 2.2%. This scenario does not include the experts' forecast that China is losing some 6% of its GDP every year for ecology-related reasons. Nonetheless, the advantage of the huge land mass that is China and having an authoritarian regime at its head means that the Chinese Government in fact has considerable means at its disposal. The programme launched in 2010-2011 called 'Smart Cities' amounted to 100 billion euros, 10% of which was allotted to Shanghai and its conurbation. But the country is also having to face sabotage strategy thrusts. Experience tells us that bargaining and corruption are rife among politicians and industrialists. We also note and know that the foreign companies are subject to very stringent standard compliancy decisions. And, over and above the question of corruption which the Chinese are fighting at the moment, another unknown quantity is the state of employment in the country. China is preparing itself for a strong social disruption and a face-off. The issues involved in solving ecology-related questions are seen as luxury expenditure and runs counter to the vital needs to ensure employment prospects. There is a non-negligible risk that the Government will choose ecology rather than alleviating the employment problems. This risk is all the more patent that faced with millions of workers being laid off, open demonstrations in the street have already occurred. The reality here is that China presents outside the country its intensive pro-ecology programme while it deals with the domestic employment scene on home front. I personally am rather pessimistic about these questions all the more that machines are now beginning to replace service jobs and seeing that 1.8 M workers have been laid off in the steel-making sites close to Beijing which, by a domino effect, may lead to a loss of 6 M jobs. And the problem will not stop there. The so-called Chinese exception no longer exists and the country is having to face the same problems as other Western countries. Prime Minister Li Keqiang is striving to avoid an excessive salary hike to slow down the delocalization of industries,

including Chinese companies. The country aims to attain a positive balance of payment. The Government praised hard, honest work to improve the quality of production and limit corruption. Salaries are limited, to the extent that overtime bonuses were statutorily halved, from 100 to 50% in just 24 hours. The offer for Chinese workers is a controlled salary compensated by cleaner air and safe domestic water. I consider that this political strategy is intelligent even if there is a lot of resistance and opposition. We should not underestimate the capacity and willpower of this government to succeed.

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In your opinion, what solution(s) could be implemented by the Government to solve this tense stand-off between the logics underpinning ecological, economic and social issues?

My intimate conviction is that a universal basic income could provide a solution for China. I'm trying to spread this idea and I have talked about it in several conferences organized in various Chinese cities. I believe it could prove to be an especially well adapted model for developing countries in order to eradicate poverty. Given that the economist Jean Pisani-Ferry showed that the average transfer value per inhabitant is 800 euros, so it is useless to propose an income below that value, as the liberal thinkers do, for example, have proposed with the attached risk of seeing the State's special budget decrease, but above all seeing the standard of living of the citizens drop. I advocate a universal basic income for all, and for all moments in life – from 1 200 € for adults and 600 € for children (the 50% difference is set to reflect the scale of consumption). The entire population is reassured, with each person acting as a pollinizer or contributor to societal wellbeing. But this subsistence income can be coupled with a parallel paid activity (whether it be a salaried post or not) and should be associated with a new labour rights protection system because of the changes in the work positions (part-time, intermittent and a lower level of pay when the pay is calculated over a year without evaluating the induced loss of rights. If we consider the French 'intermittent' system with a guaranteed part-time pay offset by flexibility. Concretely, what we envision is a system where 1 hour's work is duly paid the relevant 1 hour rate. Another advantage – with this subsistence wage those jobs that socially are not attractive should turn out to be better paid than the current (France) SMIC (guaranteed inter-professional wage). But, if the employers are to be encouraged to hire staff under this system, the lowest rated jobs (25% are paid at the French SMIC rate), they must see the social protection fraction integrally covering the social contributions. Under this sort of system, the entrepreneurs must also find points that they see sufficiently attractive so that they can decide to invest here. This enables an improvement not only of work conditions but of the activity contents proposed. The latter generates rights for extra retirement income (the base-line being the subsistence income). ■

[1] - Tiānmìng : in Chinese is a concept that goes back to the Zhou dynasty (1st Century BC), according to which the Emperors were legitimized. In the case of inappropriate behaviour, the mandate could be removed. It is close to the idea of 'by Divine Right' of monarchs in France.

[2] – [Ed.] English readers will surely enjoy: <http://radleyice.com/chairman-mao-and-the-sparrows/> when Chinese children banged endlessly on cooking pans to prevent sparrows from nesting and laying eggs.





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How to adapt and progress

Did one of her paths go through UTC? Well, the one that led from the Franco-Iranian Lycée in Tehran up the position of VP for world-class groups such as PepsiCo or Campbell's Soup did do a stopover in Compiègne. "UTC taught me how to navigate and to identify the best options to progress. UTC also taught me how to build and enrich internal and external networks in a corporate environment, thus enabling me to progress in my professional career", recalls Anouchah Sanei. One expression she repeatedly uses when remembering her arrival in France and her studies at UTC was "the D-System!" [Resourcefulness] Firstly in her two years doing a scientific stream DEUG diploma at Orsay University - Paris 10 to boost her scores in maths and physics after her Baccalaureate in Tehran, followed by a "prep" year in chemistry, before gaining her admission to UTC directly to the second year of the standard engineering course. "As I recall it, there were 4 or 5 women students in my class and we learned to work together and came up with some occasionally unique and creative solutions in order to succeed and pull through", explains Franco-Iranian Sanei. The base-line here was 'biology' followed by 'chemistry' as a self-evident strategy to leave Iran before the Islamic 1979 revolution descended on that country, the coming to UTC and understanding that scientific studies go far beyond lab work and lecture-rooms to take in all aspects of Society. UTC's credo, imparted by founder President Deniérou, was partly responsible for Anouchah realizing the value of adopting an open vision to the world of industry.

Nestlé products, ranging from café, to juices and to chocolate-based drinks. Anouchah was then recruited by PepsiCo just when Nestlé were considering moving her back to the Suisse home Office, a new change which enables her to adopt a change in rhythm – USA style – taking on the responsibility for the Snack Division in Dallas, Texas where just about everything goes faster! That move marked the end of her engineering functions, replaced immediately by managerial responsibilities as VP for R&D, in charge of the research teams and project management. "The ethos of adaptability in my job - which I cultivated partly during my years at UTC - was doubled up by a more strategic and global vision of Business and Marketing", underlines Anouchah Sanei, now fully aware and sensitive to the commercial dimensions of any product. Imagining the design, production, financial support, sales and team management have all now become integral components in an engineer's job and responsibilities.

So what about Europe?

The next stage of her career sees her back in Geneva at the PepsiCo Europe Home Office, as VP for R&D for Western, Europe and South Africa. In Geneva the pace is more relaxed, closer to the needs of a mature regional market configuration. But nonetheless, some difficulties remain inasmuch as you have to innovate constantly in an already saturated European market-place, with a constant in-fight among distributors to gain the favours of new customers, who are quite happy to pull the plug on product prices! "We really must try to understand the emotional aspects of consumers if we seek to innovate in a saturated market", adds Anouchah.

Heading a pilot station

For Anouchah Sanei, "the transition from UTC to the world of industry was a natural move thanks to the university's open view to the entrepreneurial world outside". Following various placements and project-work, she started a PhD at UTC, in a partnership with the biscuit manufacturer BN (short for Biscuiteries Nantaises at their Compiègne site, analysing the ways to extrude 'cracottes' (a form of biscuit). What Anouchah discovered then was that science activities are initiated in laboratories but have their raison d'être in factories or assembly plants. No sooner was her thesis written than she was recruited by Nestlé on the same topic and that opened the opportunity for her to engage in agro-food sectors. After a few years as Head of Innovation at the Nestlé R&D Centre in Amiens and then accepting a position to manage of the pilot station - a miniature factory designed to model large-scale fabrication of these products, a privileged setting to observe and analyse a factory - without the gruelling hardships of a real 3 x 8-hour shift schedule! - innovating through thinking about the products and the fabrication process. At the age of 28, she had to manage a team of about 40 technicians, workers and young engineers (many from UTC) and responsible for a production tool. "It was necessary to be humble and to trust the employees, the young and the seniors alike", explains Anouchah Sanei who recalls that period as a rich, human adventure and a management learning experience.

The ethos of adaptability in my job - which I cultivated partly during my years at UTC - was doubled up by a more strategic and global vision of Business and Marketing

Breakthrough innovation infrastructures

Through observing a lack of dynamics in the Old World and the desire to find and face another professional challenge on a continent that was here making, Anouchah Sanei was head-hunted by the world leader in industrial soup-making, Campbell Soup – and she accepted to go back once more to the USA as their VP for the Global Science & Technology Department as of Feb.2016. Campbell's Soups has been a pioneer in canned soups for the past 150 years and is making inroads now to fresh foodstuffs, to snacks, cookies and juices. The company is currently investing in developing a new range of so-called 'health foods' – with a new vision of what we are putting in our plates. It is her responsibility to design and set up the relevant innovation platforms and to develop the product policies for the future. Anouchah sees this job as "visionary, global and strategic for the future of the company and its standing resilience in the growing health foods market sector". Anouchah displays a passion for agro-foods and nutritional questions and also is a yoga and personal well-being adept, on the move all the time and yet sensitive to people, accepting challenges with modesty and always seeking the balance needed to attain her objectives. She has organized and managed her career-path like some perpetual movement adventure for an "exec. woman", but she has her feet firmly on the ground too. ■



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