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# Interactions

Donnons un sens à l'innovation

LES DOSSIERS

## *The socio-economic ambitions assigned to the PIA*

**and to UTC's research activities** *page 5*


## A new look at **Innovation and the Climate**

to Jean Jouzel, climatologist & Vice-President of the IPCC *Page 13*

FROM THE PRESIDENT'S DESK

## Thank you, Daniel

This issue is largely devoted to our Investments for the Future (IF) programme, for which UTC extensively mobilized staff and resources with other partners, notably in the Picardie Region and we are all aware of the success this venture met (Picardie leads the French Regions in terms of IF Programmes, relative to the Region's potential, whether we refer to the excellence laboratory MS2T, the technological research institute Railenium, the excellence platforms Robotex and Figures, the training project InnovENT-E … and, of course, I cannot leave out the Institute for Energy Transition (Pivert) for which Prof. Daniel Thomas was an untiring servant, indeed without whose personal commitment, this 250 Meuro programme would never have emerged, as well as the IAR cluster for which he was one of the pioneering instigators. Daniel was both a pioneer and a visionary who combined his scientific expertise with his sense of politics to build and maintain a venture that has been crowned by success in the area of agro-resources and biotechnologies. Daniel impressed us all by his kindness and open mind, open to other people's ideas and able to build up an approach encouraging pluridisciplinary approaches and a dialogue between specialist fields, notably with proponents of social sciences and humanities. Daniel struck us all as having a rare capacity to synthesize and get to the core of any complex problem. Both a professor and a knowledge transmitter, Daniel was a peerless adept at popularizing science and technology. We were totally subjugated by the extraordinary span of his scientific culture that enabled him to intellectually assemble together all sorts of concepts from different specialties, running from thermodynamics of irreversible processes to microbiological chemistry and not forgetting applied maths, process engineering immunology and nanotechnologies. These few words in an editorial column cannot pay homage to this great academic, an honest man in the noblest sense, who deeply marked his time through the sheer strength of his convictions, serving general interests, through the intelligence he brought to his action and the relevance and humanism that underscored his vision. With this, all I can add is Thank you, Daniel... for everything ■

**Alain Storck**
President and Vice-Chancellor

## The 'Aspic Engine' was awarded the Norbert Ségard Foundation Prize for a promising young development

Marc Muller and Quentin George, two UTC undergraduates were awarded the 'promising young development' prize from the Norbert Ségard Foundation, for their work to set up the startup Aspic Technologies. This project enables construction of realistic sound environment and was granted the quality label of the UTC Innovation Centre in December 2012. ■

## UTC ranked #1 in the Digital Barometer of the French Engineering schools

For the month of March, UTC was ranked #1 in the Digital Barometer of the French engineering schools, which assesses the digital strategies of the engineering schools from three main points of view: web activities, social networks and mobile phone "apps". UTC also came first in the March social ranking, thanks to prominent visibility on social networks, notably with an institutional page on LinkedIn and on Goggle +. ■

## Second edition of the Picard IT Days

Tuesday May 20, saw the second edition of the Picard IT Days at the Mégacité -Amiens. On the agenda, there were conferences and workshops to update awareness of the most recent progress in digital technologies. Several startups, created by UTC graduates, companies such as Reviatech, Virtual Sensitive and Novitactwere presented during the Picard IT Days. ■

## Visit to Brazil

A delegation from the Brazilian Federal University of Technology, province of Paraná, visited UTC and its new Innovation Centre, April 14, 15 and 16, 2014. The video is at ■

**http://webtv.utc.fr/watch_video.php?v=MAAH6W31MD1G**

## UTC in the IT industries and Technology palmares

UTC was given a plebiscite vote in the latest French (all) Engineering School palmares published by the magazine "IT industries and Technology", coming 2nd for creation of start-ups and 7th among the more active engineering schools. ■

**RESEARCH**

# Detecting nanoparticle toxicity

Although only a few nano-drugs are on the market today, numbers here should rise rapidly in coming years. But possible side-effects of the nano-particles on the living cell structures are as yet not well known. The Nanotoxiscreen project will help improve the situation and our understanding.

**Nanoparticles are coming under close scrutiny because the potential areas of application in pharmacology are very extensive.** For example, the nanostructure enables you to release an active ingredient only when stimulated – (which may be optical, thermal, related to the skin's pH value … viz., a nano-drug can be deposited on a patient's skin and only release the active agent when stimulated. UTC's Enzyme and Cell Engineering Lab. (UTC-GEC) has been studying for several years now, how to synthesize nanomaterials, to test their physico-chemical properties and interactions with living cells and tissues. It is in this framework of research that the Lab has developed a certain number of techniques pour synthesis and characterization of nanoparticles. However no method was available to systematically and rapidly detect possible toxicity on human cells and for this very reason, Nanotoxiscreen was conceived.

## First objective : nano-drugs for the skin

In the framework of this project UTC-GEC has initiated a collaboration with the University of Applied Sciences of Thüringen (Germany), developing microsystems to make and observe cell cultures under a fluorescent microscope. Nanotoxiscreen is co-financed by the Picardie Region, and accompanies the EC Programme NanoDrugs – preparation of function-oriented nano-materials designed to develop new skin drugs. "We are working more specifically on drugs that will help cure skin diseases, especially the category of inflammatory skin disorders", says Kartsten Haupt, research scientist working at UTC-GEC. "The nano-particles in the drug lotions will stay on the skin but will not penetrate below the skin given their dimension. In effect, the scale of nano-particles we are studying are between 30 and 70 nm. They are generally composed of a compound polymer and an active agent. But we can also add magnetic or fluorescent nano-particles, according to needs".

## Observation en direct de l'impact des nanoparticules

The cells studied are genetically modified keranocyste (skin cells); they have a gene that triggers production of a florescent protein if the cell is stressed. "Using the micro-systems developed at the University of Applied Sciences Thüringen, we can observe directly the impact of the nano-particles injected in the skin cells cultivated in the system", explains Karsten Haupt. It is a closed system that presents a certain advantage compared with standard approaches. "A close system is easier to handle under a microscope, given that we no longer need to place the cultured cells in a special atmosphere. We could easily extend the system to other microscopes". The data obtained after observation under microscope can then be used to modelise the release of the active agent on the patient's skin. This observatory platform could also be used in biomedical domain in general, or in cosmetology and also to study other types of cell. ■

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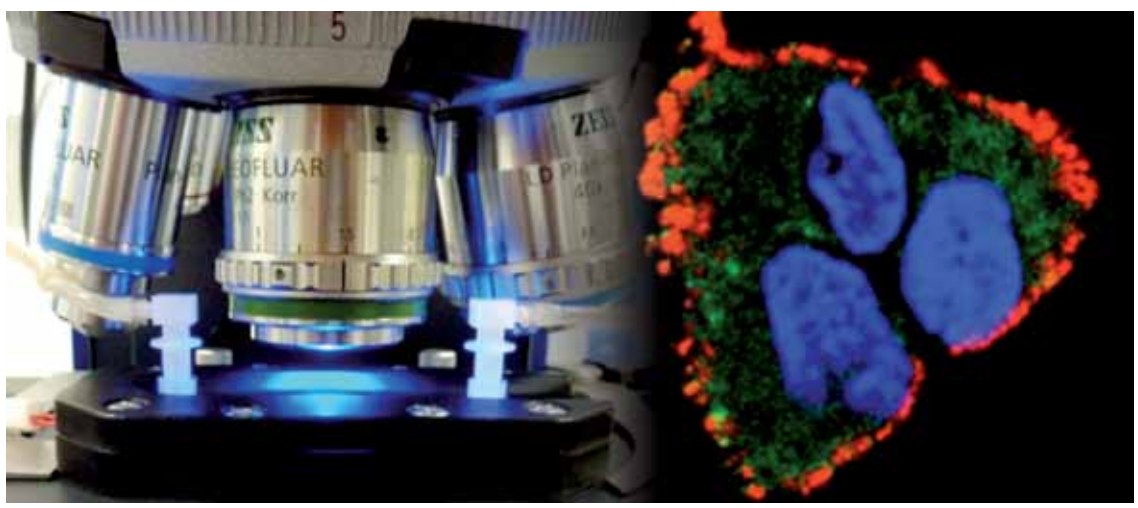

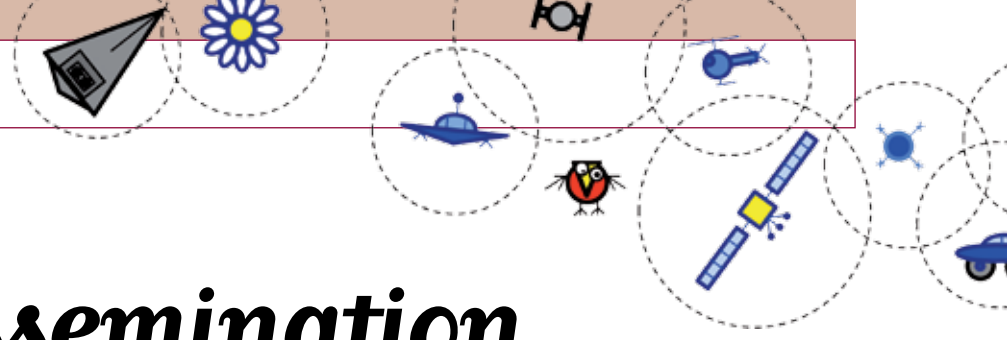

RESEARCH

# Optimisation of *data dissemination*

So-called systems of systems are becoming increasingly commonplace today, in a world where objects can all be inter-connected and many already are. Game consoles, satellites, cars ... must all be able to forward data as fast as possible. The snag is that communications between the systems are often intermittent. Whenever two elements of a system meet', they only exchange a part of the data available. Ronan Bocquillon, a PhD student at the UTC-Heudiasyc Lab is working on optimized data transfer protocols in systems of systems.

**The objective of his thesis is to obtain better dissemination of data among mobile systems in order to improve of the quality of the exchanges and enable the data to circulate as rapidly as possible between transmitters and receivers.** "We are looking at a general case, to situate our work outside certain practical situations and special cases", explains Ronan Bocquillon. "This really is basic research", confirms Antoine Jonglet, research scientist at the UTC-Heudiasyc Laboratory that supervises Ronan's thesis work. "The model on which we are working has a general scope in order to take the scale of the data into account and also the duration of the contracts". This research project on "Optimized data dissemination in a collaborative systems of systems", financially supported by the Picardie Region is also part of the UTC 'labex' projects "Control of technological systems".

## Subdividing data into packets

Data exchanged between systems (images, GPS coordinates, satellite photos ...) can be of varying formats, but this is not important given that the study concentrates on the theory of data exchange protocols. "In this case, we are looking a huge data, too much to be exchanged in a single transmission between two systems that enter into contact for a relatively short time. We must therefore transit via intermediate messengers who will forward the data in packet to the final addressee", says Antoine Jouglet. The data must be subdivided into sufficiently small packets to be exchanges in a brief contact between the transmitter and receiver systems. For example "data can be divided into 100 separate packets", says Ronan Bouquillon. "We defined a protocol where a packet could be forward every time the two systems make contact. In order for the information to be transmitted as rapidly as possible, without online losses, we have to decide which packet(s) should be given a priority when transmitted to another system". There must be relays, who handle and transfer information from the source to the addressee without using the data. It is this collaborative feature is fundamental in the research project, confirms Ronan Bocquillon.

## Applications for drone and satellites

"We first have to know the order in which the systems 'make contact' and the time of the contact. That is what we call the contact sequence. Our data transfer protocol is therefore well adapted to satellite communications or for a squadron of drones, where the precise movements in space and time are well known to the operators." The results of the research could also be used for inter-vehicle communications, which is also a possibility under investigation at the UTC-Heudiasyc Laboratory. "The long term objective is to create a more 'rugged' system that is data error resilient and breakdown free", concludes Ronan Bocquillon. ■

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INTERDISCIPLINARY RESEARCH

# *The Ingetissos project*

Following severe facial trauma leading to an important loss of bone structure, it may prove necessary to envisage bone grafts. One of the techniques currently applied is to make an auto-graft (taking a bone from one spot of a patient's body for use at another place), but this is always heavy and painful surgery at best. To remedy the situation, the UTC-BMBI Lab (Bio-Mechanical and Bio-Engineering) has been working for several years to produce a bio-hybrid tissue (comprising a biomaterial (1) in which stem cells have been implanted and grown), with biological and mechanical characteristics that facilitate use by the surgeons operating and ensuring better later tolerance by the patient.

**Currently, the tissue developed by UTC-BMBI is produced in a bio-reactor with a carpet of hydroxyapatite granules, a material commonly used to fill in bone damaged zones.** The stem cells (extracted from a bone marrow of the patient) are spread on the carpet where they implant and cement the granules together to form a sheet. The stem cells then begin to differentiate into bone cells, where the biomaterial induces naturally the differentiation process. "This is more efficient than introducing differentiating factors, which as yet are not well identified and could not be authorized for clinical tests", underlines Cécille Legallais, research scientist at the UTC-BMBI Laboratory. "After 5 weeks, we carry out our own tests to make sure the cells have really become bone tissue".

## Obtaining a 'manipulatable' tissue sheet

"Since the tissue we aim to produce will in the long run be used for maxillofacial reparatory bone surgery (infilling), the clinician surgeons must be able to manipulate it and model it to exactly mold the shape required. "Often, in tissue engineering, we use a small plaque only a few millimeters thick. But for face surgery, this cannot be used, explains Cécille Legallais. "Our approach is to obtain a sheet that can be manipulated by the surgeons. They will be able to shape the implant, slice and incise it, fold it as a function of the exact shape of the cavity to be infilled. The idea is to make a tissue that will be just as strong as the bone was, but to make it far easier to use by the surgeons to do their infilling operations." At the beginning of the project, the tissue created was only characterized by its biological functions. "For example, for bone grafts, the question is to see if the tissue will effectively produce bones", adds Cécille Legallais. "As we saw it, it was useful and logic to characterize the tissue created from a mechanical point of view. This called for further, complementary skills in material sciences and engineering. We therefore identified specialists of polymer engineering in UTC itself." The UTC-BMBI team then met with Fahmi Bedoui, senior lecturer at the UTC-Roberval laboratory who had solid experience in the field. He was very interested in the project. A PhD student was recruited in October 2012, thanks to a

## Rock the Gallery

The Château de Compiègne welcomed students from the Ecole du Louvre and from UTC to present "Backstage Château" during the operation "Rock the Gallery". A large audience, with representatives of all generations discovered Napoleon III's apartments by torch-light and also the heating systems for Eugenie's bath, or menus! The ballroom was 'rocked' by music from the UTC Stravaganza orchestra. ■

joint financial support from the Region + CNRS. "Very rapidly, we focused on a research subject several other partners: the teaching hospital at Amiens who provide the stem cells and the Institut Fair Face" (cf. intra), details Cécille Legallais. "And that was how the Ingetissos Project came to be".

## Next step: reinforcing biohybrid tissues

The arrival of Fahmi Bedoui in the research team allowed them to characterize the breaking point of the tissue. "We realized, after some static traction tests, that out issue broke relatively rapidly and that we needed to reinforce the solid part of the implant", he adds. "We then carried out microscope tests to see how the sheet is damaged, and what role the granules play. The microscope tests allows us to see that there was a strong attachment between the tissue and the granules and that the weak features lay in the tissue itself." Then the research team focused on ways to strengthen the tissue sheet. "We decided to replace the granules by a polymer fibre containing coumarone resin (2). We project these fibrates onto a random flat surface to as to build up the 3D tissue. The cells envelop the granules and fill in the spaces", explains Fahmai Bedoui. "The cells colonize the granules and move on to a system of cells in a 3D material, which strengthens ad guarantees the mechanical properties. This tissue is currently in development. But in some 2 to 3 years, the first clinical tests on animals will be conducted and if all goes well, the first human tests will take place in 5 years or less. The potential for strengthened tissues goes beyond medical uses. As Fahmi Bedoui explains: "Development of such tissues should lead to job creation, inasmuch as these are non-delocalisable activities with high added value. They will be created near the patients, since we shall have to, be very reactive and comply strictly with stringent sanitary requirements. ■

(1) In the framework of this project, this refers to a bio-medical, bio-compatible and bio-resorbable material, of either natural or synthetic composition.
(2) A synthetic compound inspired by an existing natural compound.

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SEMINAR

# Internet blues

In the framework of the 'OuiShare* Festival', dedicated to the share economy and collaborative consumption held in Paris May 5-7, Bernard Stiegler offered his personal analysis on these nascent economic models. By way of an introduction, he quoted Bill Gates announcing recently the loss of most of today's jobs within 20 years' time.

**"We should be thinking about what "job" means – given that today it is defined as a salaried position that provides for buying power", invites Bernard Stiegler.** "Loss of many forms of job is a problem that is being ignored at every level in then land, in France and in the European Union". As he sees it, a contributive economy is not simply another model con the today's economic system, but rather as a real revolution leading on to "a complete overhaul of our macro-economic criteria".

## Breaking the grip of consumerism?

In the framework of Ars Industrialis, an international association that he created, philosopher Stiegler advocates an industrial policy to enhance mind technologies; he also developed the concept of "contributive pharmacology". He was pleased to note the enthusiasm of economic actors and industrialists faced with the idea of setting up "collaborative economy", even if it still remains riveted to consumerism. "On the contrary, inasmuch as a contributive economy would rely on peer-to-peer relationships, there would be a real break with the consumerist model, the latter being doomed to disappear. Such a model would represent a new stage in industrial development and we already can see the first actors, like Google" says Bernard Stiegler for whom a digital world is both positive and toxic, hence the use of the term 'pharmacology'.

## Internet 'blues'

He illustrates his case with Google, a company he both admires and criticizes: the American giant was born from contributive economics and today is capable of exploiting massively the data Internauts provide, for consumerist aims, i.e., for purchases the consumers in fact do not need. The consumer becomes irresponsible and even captive in the process. "Contributing is a way to 'deproletarise' citizens: use of freeware enables development of shared knowledge. The present trend used by the Californian companies (Google, Facebook, etc.) and the revelations by Edward Snowden on the US mass surveillance systems have led to a burst of Internet blues, a dark era for us, the activists", analyses Bernard Stiegler. The period is marked by a "basic" doubt as to the positive nature of the digital world, and makes us critical of what is happening in social networks. "If sharing data on a social network is a form of contribution, can it be nonetheless perceived as something positive. What are the consequences in our private lives and on individuals? We do not need to abandon social networks, but just propose a critical analysis and suggest new pathways for relational technologies that do not "denature" the spirit of the Internet web and use the data available in a critical and tailor-made manner. Today, data processing by Facebook is hidden and feeds into a business with a toxic logic for a contributive economy, aggravating the loss of personal responsibility and intimacy", underlines the philosopher.

> We do not need to abandon social networks, but just propose a critical analysis

## Creating novel capacity and skills

As far as the major change in the economy brought about by contributive logic, Bernard Stiegler quotes Chris Anderson (cf. Interaction #21) who announced in the American journal Wired that the theoretical knowledge base in the course of the 21st Century would become proletarian. For example, the translation services at Google are not based on work by linguists but on intensive computation withy big data. "This means that linguists will become obsolete, and likewise for medical practitioners when it comes to predicting epidemics. We must now begin to rebuild a society that integrates the changes induced by using a contributive economy. Not everything can be automated. We must create novel capacity and skills", adds Bernard Stiegler. The example he invokes is to compare the life expectancy of populations in Bangladesh which is in fact longer than that for the black neighbourhoods of Harlem, NY. "The resilience of populations depends on their capacity to maintain their knowledge base. Social networks can develop relational processes with a very high practical value. A contributive revenue could be imagined, on the model of show intermittent workers, since the value comes through channels other the market-place", suggests Bernard Stiegler, adding "the transition to a contribution base economy should be subject to serious, precise analyses, notably in terms of how we could build up a collective intelligence using big data. To recover from the current 'Internet blues', the EU could engage 'Digital Studies' and take the leadership for Web 3.0, based on contributive economies". ■

*Pun on We Share

# The socio-economic ambitions assigned to the PIA

## and to UTC's research activities

The French Government's Programme Investments for the Future (PIA) launched in 2010 finances research and innovation in 6 strategic directions that concern France's future. The key idea is to promote and enhance French excellence, running from basic research through to industrial innovation. The total budget allocation amounts to 47 billion euros, and UTC has benefited largely, with a high degree of involvement in 8 structures that comply with PIA labelling. The Picardie Regional echelon (thanks to UTC) has obtained the largest number of PIA awards (in a pro rata of the number of UTC lecturer research scientists).

**"We were able to make offers for every call for project proposals, in line with UTC's varied and wide range of skills", says Bruno Bachimont, Executive Director for Research at UTC.** And it was noted that UTC outperformed many other candidates, with a least one project selected in each major PIA category. Between 2010 and 2012, UTC was selected via PIVERT for an ITE (Institute for Energy Transition) award, an 'excellence' laboratory with Labex MS2T (acronym in French for Control of Technological Systems of Systems), an institute for Technological Research (IRT) with the Railenium, two "excellence" equipment units, with the equipex Robotex and Figures, an accelerator company SATT, with SATT Lutech, an 'excellence' initiative with Idex SUPER and Idefi InnovENT-E for specific training in international affairs and exports. "Now we have to mark up the successes in each, which is a great challenge" underscores Bruno Bachimont. The Interaction Dossier in the following pages presents each PIA structure and presents a status report of PIA at UTC after several months' existence.

> The French Government's PIA programme Investments for the Future do not constitute the scientific policy of UTC, but it must serve its objectives
> **Daniel Thomas**

### End results with an eye to the future

"Some of these programmes are in line with research topics that have been going from some time now at UTC", notes Bruno Bachimont. For example, the PIVERT (green chemistry) programmes are more the end results of a dynamic system of research set in motion by Prof Daniel Thomas in the 1970s. His aim at the aim was to set up a cutting edge research centre with a territorial socio-economic approach. "Thus, when the first call to proposals came for the area of Institutes of Energy Transition, ten PIVERT file and candidacy were ready and was selected almost immediately, one out of only two in the first series of selected projects. The same applies to Railenium and also to other projects that related to transportation (driverless cars, computer-aided driving, rail transport, etc.): these subjects were already being investigated by teams in the pole of competitivity i-Trans and the IRT. "These programmes represent the crowning touch on previously engaged research. Others like Labex MS2T are shaping our own future", adds Bruno Bachimont. This Labex for example is taking us deeper into a new area of "systems of systems". "It is an area with enormous prospects in terms of innovation and potential applications. The Labex has a strong structuring effect and enables us to prove that we have the capacity to push further our scientific investigations". Bruno Bachimont also recalls that "inter-lab synergies enabled us to prepare high-quality application files". UTC is also party to the SATT Lutech structure and the Idex SUPER, the assigned objective for which is to accelerate technology transfer roles and to enhance the international visibility for the SATT members. "These two entities represent important challenges in terms of international recognition and development of new partnerships", underlines the Director for Research. After 3 years operations, the first chosen PIAs will be carrying out their assessments and opening the way to the next phases. In the framework of PIA2, with some 12 billion euros, in addition to the amount allotted for PIA1, a call to project proposals will be launched for the area "Initiatives Science – Innovation – Territory and the Economy (ISITE in French). UTC will be making proposals with Picardie partners on the basis of its recognized know-how in the field.

### Serving UTCs scientific objectives

Managing the PIAs calls for a special form of investment by UTC who finances the work alongside the State funding and with external partners contributing too. If the PIAs open up new prospects for the university they must not be seen as substitutions for the UTC research policy. "PIAs are excellent tools, but we must makes sure that because of their scale, they do not dictate the way we see scientific research beyond the ten year horizon. Apart from the case of the Labex, management control is shared with other actors. "We must preserve our strategic interests and integrate the socio-economic ambitions assigned to the PIA in line with our wider calling as a higher education and research establishment", details Bruno Bachimont. And he quotes Daniel Thomas: "The French Government's PIA programme Investments for the Future do not constitute the scientific policy of UTC, but it must serve its objectives". ■

### The 6 strategic axes for the PIA

**Higher education and training** : to assist emergence of excellent university poles capable of facing world competition.

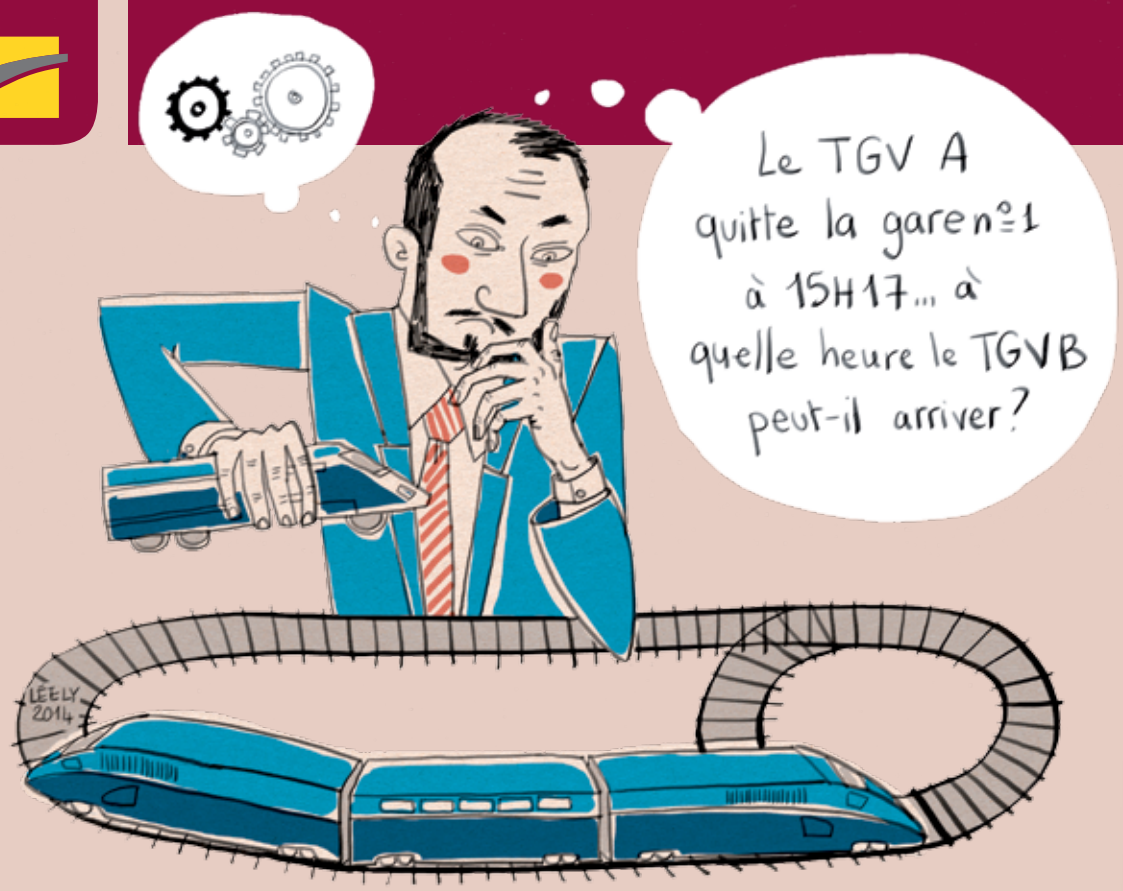
**Basic research and its valorisation** : providing our laboratories with the means needed to reach 'excellence' and to accelerate technology transfer.

**Industrial sector specialties**: to support development of innovative SMEs and VSMEs and to consolidate tomorrow's sectors of economic activity.

**Sustainable development**: to contribute strongly to energy transition and ecological policy decisions which lead to a new and more sustainable growth model.

**The digital economy**: to help deploy tomorrow's very high speed data processing networks throughout France and to develop new uses for the benefits of enterprise and households.

**Health and biotechnologies**: to make progress in our knowledge bases and to develop new solutions that help activate, improve, develop and validate new approaches in medical practice.




## What is an IRT ?

Among the priorities set by the Government's Investments for the Future programmes, there are the IRTs (acronym in French for Institutes of Technological Research. Each IRT serves to reinforce ecosystems formed by the clusters and presupposes that the units together have a critical mass of means and skills assembled on a single site (preferably). The IRT must cover all the stages of an innovative process, up to demonstration and industrial prototyping. It pilots research programmes carried out in connection with technological platforms and can carry out experimental R&D compliant with the highest international standards and lastly monitors the added value of its work.

The 8 IRTs selected in 2011, with an overall budget of 2 billion euros should allow France to reach levels of "excellence" in tomorrow's key sectors. The other 7 IRTs are: NanoElec in Grenobles, AESE in Toulouse, LyonBiotech in Lyons, with a branch unit Paris, M2P in Metz, Belfort-Montbeliard andTroyes, Jules-Verne in Nantes, SystemX, Saclay and B-Com à Rennes.

**IRT RAILENIUM**

# High speed rail inn

UTC is one of the founder members of the IRT-Railenium, with the Universities Lille 1 and Valenciennes, as well as the IFSTTAR. Objective: to preserve France's leadership in the railroad sector and also to accelerate innovation in this area.

**The IRT-Railenium received its Government recognition (label) in 2011 after approval by an international jury.** The IRT Railenium is the first cluster with a world-class calling, via the pole called i-Trans. The concept underpinning "Investments for the Future" is to accelerate innovation in France, by creating structures that are capable of ensuring the connection between the academic laboratories and the industrialists. This is the mission assigned to the IRTs (including Railenium) thanks to development of strategic public-private partnerships in research, training and innovation" says Jean-Marc Delion, Railenium's Delegate General. After a period of testing and trials – bearing in mind that IRTs represent new entities that rarely fit into administrative charts – Railenium, as of 2013, is now in battle order.

## Dividing the time-to-market by two

In terms of research work, the IRT has defined 8 working thematics: processes and materials, civil engineering and soil mechanics, energy management, intelligent intra-vehicular "smart" interactions, metrology and testing, data processing and man-machine systems, digital modelling and virtual prototypes and, final area, the economy and sustainable land planning. "The IRT came to be via an ambition that focused on railroad infrastructures and systems and we extended our field of investigation to rolling stock and operators", explains Jean-Marc Delion. "We are having discussions with Alstom, and we identified 34 technological blocking points to design tomorrow's high speed trains (ex. French future TGVs) and proposed our scientific aid to remove these blocks". How do you get in phase with innovations in telecommunications? How do you channel high speed internet connections to very fast trains? How do you increase the number of trains running at the same time? Today France's TGV tracks are "saturated" when more than 13 trains/hour are running and it would cost far too much to double up the tracks. But the inter-train distance (currently 20km) could be reduced inasmuch as the emergency braking distance is 3.5 km. We still have to see how we can reduce this inter-train distance. "We could also have between 18 to 30 suburban trains on the SNCF networks! More and more conurbations round the world need solutions such as we are

proposing" adds Jean-Marc Delion. The mission of Railenium is to reduce the time-to-market, that is the time between having the idea and the introduction of a solution in the market-place, currently estimated at 14 years! "If we could divide this time by a factor 2, we would have a key to successful railroad innovation" stresses Jean-Marc Delion. "Railenium can contribute to accelerating the upstream and downstream research work, offering services to both the industrial and academic partners: the offer covers better contact protocols, project specification, negotiations on intellectual property rights, location of resources, validation of results though physical and digital testing … today tests are carried out for many forms of equipment on operational networks and this alone created organizational stress and incurs extra costs!"

## A computational platform at UTC

This is a point where UTC is especially involved, i.e., in virtual computerized prototyping and digital modelling via the project CERVIFER, initiated by Prof. Mohamed Ali Hamdi, UTC-Roberval Laboratory and a member of the Railenium Board as UTC's representative. The objective of the project is to enhance the level of competitivity of France's railroad industry thanks

# ovation

to intense use of virtual computerized prototype software packages. "The railroad industries still use physical tests which are often very costly in order to qualify and certify rolling stock and railroad infrastructures. If we refer to virtual certification as practiced in the aeronautical and automobile sectors, the railroad sector has high potential margins to use computer aided virtual prototyping", stresses Prof. Mohamed Ali Hamdi. The CERVIFER project started October 17, 2013 with an initial budget allocation of 11.8 Meuros over 4 years (of which 4.85 Meuros in State subsidies in the framework of the Government Programme Investments for the Future ; in particular the Vehicle for the Future Programme, via ADEME (State environment agency) and 1.76 Meuros from the Regional Authorities (Nord-Pas-de-Calais and Picardie). Computer aided virtual prototyping in the automobile and aeronautics sectors has enabled physical testing to be cut by a factor 2 and, consequently, to reduce by the same factor the tile to design a new car/aircraft – which is in line with the CERVIFER project. The consortium has 14 partners, co-ordinated by ESI Group, the main European virtual prototyping software editor. There are 5 railroad industrialists (Alstom, RATP, RFF, SNCF and Vossloch-Cogifer) and the same number of research and training institutions (CETIM, IFSTTAR, Lille 1, UTC and UVHC). Hutchinson-Paulstra (a company specialist in anti-vibration material) and Vibratec (acoustics and vibration services), alongside Railenium are also among the partners. The objective is to deliver an experimental prototype of a software platform integrating specific modules to meet the needs of railroad industrialists to pre-certify rolling stock and infrastructure components. This collaborative platform allows for service and expertise offers to be made and certain modules could go on the market-place. details Prof Ali Hamdi. "The platform will be located in UTC's Computer Centre and accessible to all CERVIFER partners",

The ambition of Railenium is to be the go-between for the EU and the French actors in the Shift2Rail programme between 2014 and 2020

## An idea nursery open to European programmes

The other programme that mobilises UTC is the creation of a railroad test facility at Compiegne. "We are currently working on the test bench project to validate our calculations – for example for wear and fatigue of wheel-rail contact situations", underlines Professor Mohamed Ali Hamdi, who is participating in the specification of the test-bench with IFSTARR and the industrialists who would like to run tests on this future facility. "The objective, after a long bench-making phase, is to finalise the detailed specification for the test-bench project before end-2014". Railenium will ensure the project management and monitoring. Today, one half of the 15 IRT projects subsidised by ANR have started. "We have 34 new ideas in the incubator stages", adds Jean-Marc Delion. "The aim is to encourage the seeding of new ideas". Other UTC laboratories are beginning to show interest in Railenium, notably UTC-LEC and on April 16, 2013, Jean-Marc Delion and three collaborators presented the IRT projects to the UTC research scientists. "If Railenium effectively started in the Nord-Pas-de-Calais and in Picardie Regions, we would like to build partnerships outside the circle of the founders, in France and also in Europe", stresses Railenium's Delegate General. Railenium is looking to Europe, via the ShiftRail2 Programme, Europe having decided to devote one billion euros to research and innovation in the railroad sectors. "The ambition of Railenium is to be the go-between for the EU and the French actors in the Shift2Rail programme between 2014 and 2020. Railenium is therefore a very strategic IRT for UTC's international visibility and there is an advantage for the university to be more and more involved in railroad research and development", concludes Mohamed Ali Hamdi. ■

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plus d'infos ▶ **www.railenium.eu**
**www.shift2rail.org**

### The 15 Railenium projects

15 projects were selected in the launch phase of Railenium.
They covers all "rail" and infrastructure components, interfaces with rolling stock and associate activities:

- Types of track and track components;
- Control and modelling of rail-wheel contact;
- Designing smarts sensors to monitors tracks and critical infrastructure points;
- Using materials with renewable origins;
- 'Levers' to increase track capacity (trains/hour);
- Optimised maintenance and in situ work zones;
- Track and platform sustainability;
- Development of very high data rate connections using laser technologies;
- Railroad signaling and inter-operability of comm. systems.

## What exactly is an ITE ?

Formerly called an IEED (Institute of excellence in carbon-free energies), the institutes for energy transition (ITEs) are interdisciplinary platforms that bring together the skills of industrial and public research establishments in a co-investment logic (public-private) and calling for close collaboration among all the actors. There are 9 ITEs today in France which will reinforce the competitivity clusters and their eco-systems.

An ITE is an excellence tool the finality of which is an industrial development and/or service developments. They suppose a critical mass in terms of means and skills preferably on a single site. They cover all innovation processes, up ti and including the demonstrator and industrial prototyping ITEs relate to future energy sectors that will have a positive impact on climate, e.g., through better insulated buildings, more efficient transport rolling stock, energy control, facilities and equipment, geothermal engineering, renewable marine energies, smart energy grids and networks.

**ITE PIVERT**

# An Investment for the Future *ahead of its time*

"It is a sufficiently rare event, eminently worth mentioning: PIVERT has held its promises", says UTC Professor Daniel Thomas*, by way of an introduction. He was the initiator of this ITE (acronym for Institute for Energy Transition). Here is the status report on this Investment for the Programme, with its 247 Meuros budget (over 10 years).

**PIVERT is an acronym for Picardie Innovations Végétales, Enseignements et Recherches Technologiques (Plant Innovation, teaching and technological research in Picardie) is one of the ITEs.** Selected in 2011 in the framework of the French government programme Investments for the Future, PIVERT is far ahead of the other ITEs in respect to its budget. "In fact PIVERT is as important as all the other ITEs taken together and the budget envelopes are respected, both public and industrial funds" underlines Daniel Thomas. PIVERT is the centre for research, innovation, experimentation and training in plant chemistry based on oil-bearing biomass (colza, sunflowers, etc.). PIVERT is developing the bases for a future bio-refinery. There are three pillars: a precompetitive research programme called Genesys, the Biogis Centre (hall for development and demonstration) and competitive, demonstration projects conducted by the industrial partners.

Competitive demonstrators conducted by industrial partners **budget targeted-over 70 Meuros over 10 years**

## Genesys : 3 calls to tender, 36 projects, 5 patents

The Genesys programme, based on calls to tender, marked the beginning of PIVERT's activities", explains Gilles Ravot, CEO of PIVERT SAS. The first two calls, in 2012 and 2013, led to a selection of 36 projects to which an overall budget of 30 Meuros has been allotted. The 35 projects selected in the 3rd call are currently under analysis by experts from the Agro-Resources and Industries cluster (IAR) and they will publish their results in Autumn 2014. The research themes are sub-divided into 7 sub-programmes, viz., new crops, field to industrial units, biomass fractioning; catalysis and bio-catalysis for oil-bearing plant chemistry; lipid auto-assembly; formulation and nano-structures; nutrition and health; bio-refineries – industrial metabolism. "The only area where PIVERT is slightly behind others is in thermal and thermochemical processes used to fraction the biomass" notes Daniel Thomas. "We are experiencing some difficulties to mobilize operational projects via calls to tender and we shall be coming up soon with some proposals to improve the situation." Prof. Thomas then analyzed each programme in turn: new crop systems have progressed well, catalysis and bio-catalysis offer encouraging prospects, "notably thanks to the active participation of the catalysis laboratory in Lille" and very novel projects, in lipid metabolism. In this sub-programme, the UTC team under Isabelle Pezron, has carried out "excellent work" in formulation, for example, reversible nano-object construction using biodegradable lipids. "We can envision replacing liquid

## Optimism at Solvay

**Solvay, is a shareholder (and founder) of the company PIVERT SAS represented by Thierry Vidal among the club of industrialists in the PIVERT venture. "The objective is to bring academic research closer to market realities and to define interests in common"**

In the framework of Genesys, Solvay has interests in 3 research sub-programmes (catalysis, biochemistry and formulation) – which coincide with Solvay's core business. "We also have interests in all the other programmes, apart from nutrition", says Thierry Vidal. "As industrialists, we shall specify the research topics that interest us most, with the objective that they may be included in the calls to tender". The projects selected by Genesys involve only academic structures. But this is not a reason for the industrialists to just 'wait and see'. For example, Solvay is conducting a joint competitive project with UTC on the subject of lipid auto-assembly processes. Solvay has set up an in- house research unit specifically oriented to bio-sourced chemistry, which is a market segment where Solvay aims at gaining points. "PIVERT is an excellent vector to encourage contacts between the academic and industrial spheres", underscores Thierry Vidal, paying homage to the "very reactive and attentive team at Solvay SAS, a company that has invested considerable financial means and human resources to the PIVERT programme. It is difficult to put figures on these commitments, as the precise accounting has not yet been carried out. "PIVERT is still a young structure, and we are all in the learning phase", explains Thierry Vidal. "We shall continue our level of commitment, both in Genesys and the Biogis Centre, because it is important that PIVERT leads to positive results and that the investments made by Solvay prove worthwhile. Personally, I am optimistic: the programme of activities for PIVERT are perfectly oriented in the right direction".

crystals in screen assemblies by these nano-objects", forecasts Daniel Thomas. The nutrition/health sector is interesting for industrialists to control precisely the composition of edible oils so as to improve their sanitary properties and the sub-programme devoted to the bio-refineries involves UTT (Troyes) "where we have the best French teams in industrial ecology" underscores Daniel Thomas. Gilles Ravot adds "The 36 projects under analysis have already generated scientific papers and the PIVERT group has registered 5 patent claims. Three new claims are being prepared currently. The programmes selected are becoming increasingly transverse and span several of the sub-programmes. Thanks to the results obtained, we are now running ahead of schedule. Subsequently, we must valorize the research at the Biogis Centre."

**28 academic and industrial partners**

PIVERT was selected after a first government call to tender in 2011, as was INDEED (national institute for the development of ecotechnologies and carbon-free energy procurement), Lyon; after the second call to tender, 7 other ITEs were selected: France Energies Marines, Brest (Brittany), Greenstars in the Thau basin (Languedoc-Roussillon), l'Institut français des matériaux agro-sourcés (IFMAS), Villeneuve d'Ascq (Nord-Pas-de-Calais), l'Institut photovoltaïque d'Ile-de-France (IPVF), Saclay (Ile-de-France), Supergrid, Villeurbanne (Rhône-Alpes), Geodenergies, Orléans (Centre) and l'Institut véhicule décarboné et communicant et de sa mobilité (Védécom), Satory (Ile-de-France).

## The Biogis Centre, innovation go-between

The Biogis Centre, a technological hall designed to act as a go-between between research and industry is under construction. It will be commissioned in Spring of 2015 "It is a technology transfer facility, where research programmes end and industrial prototyping begins", says Gilles Ravot. "It will also be an important training centre, reinforcing the position of the Picardie Region in the field of agro-resources. It will attract and stabilize demonstrators and maturation projects and consequently will create jobs locally. As Daniel Thomas sees it, this technical platform will obviously induce new industrial activities in the neighborhood. "PIVERT will prove to be an efficient tool, bringing UTC and the local industrial sectors closer together. Today the UTC research teams TIMR (Integrated transformation of renewable matter) and GEC (enzyme and cell engineering), the Roberval and COSTECH Laboratories, ESCOM, etc., are all involved in PIVERT projects that unite almost all the chemical sector actors in France, including Solvay (cf. insert). Tomorrow, when the competitive phase projects begin, the industrialists will naturally approach UTC to assist them to finalize the work".

## With approval from Brussels

The management team of SAS PIVERT is composed of 10 persons: "an excellent team that set its marks fairly quickly", feels Daniel Thomas. Gilles Ravot underscores: "We take care to listen to the stakeholders and we really try to come up to their expectations, avoiding seeing the soufflé go flat, so to speak. We have set many things in motion to help build and strengthen links with and among the PIVERT actors; the club of industrialists welcomes these efforts that reinforce the credibility of the structure as a whole". The other factor conducive to success is the work in the direction of Brussels. "We are almost the only project in the framework of the French government programme Investments for the Future to have notified our activities to the European Union officials who approved the State aids we were receiving, also our road-map and the collaborative structure of our research programme. The procedure lasted for a whole year, but the approval by Brussels allows us to work safe in the idea that the public subsidies are guaranteed and will run the risk of a demand for reimbursement. This facilitated and accelerate no end the way PIVERT worked. The industrialists showed a very high degree of enthusiasm at the way things were turning out. Indeed they estimate that PIVERT will generate an extra 1 billion euros of annual turnover. Sofiproteol and Teros have increased their involvement in the R&D programmes over the past few years" adds Daniel Thomas.


**GENESYS budget of 120 Meuros**

## 247 Meuros to 'invent' tomorrow's bio-refineries

Thus, 70 Meuros (out of the provisional 247 Meuros budget), come from French State authorities, the rest provided by the industrial stakeholders. The role of the Picardie region must be underscored, notably in offering the site in the Techno-park "Rives de l'Oise" at Compiegne. "Without UTC, the setting up of the agro-resource cluster IAR- PIVERT would have been far more difficult" adds Professor Thomas. "The flame lit by the academics has been revived beyond all our expectations by the economic and other institutional regional partners". After 10 years of operations, the aim of PIVERT is to become profit-making, thanks to the Biogis Centre and the referral to competitive projects. But bot only this; "we must now invent a bio-refinery for tomorrow, capable of replacing fossil fuels by oil-bearing plants, making use of processes that are neutral in terms of GHG emissions. All of this must now be written in an industrial metabolism where the waste material of a region become the raw material for a bio-refinery". And as Daniel Thomas concludes: "There's every chance that we shall succeed in this venture". ■

**150 research scientists** recruited each year over 10 years

**5 000 industrial jobs created** direct or indirect positions

* cf page 14

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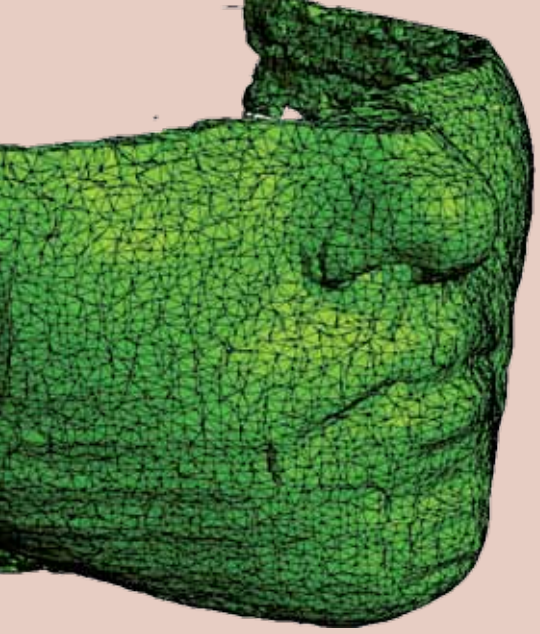


ÉQUIPEX FIGURES

# Remodeling faces

(EQUIPEX) «FIGURES»(a French Government labelled excellence platform) stand for "Facing Faces Institute GUiding RESearch", co-managed by the Amiens teaching hospital and surgeon Prof Bernard Devauchelle, is a platform specialised in facial reparatory surgery.

**The 'Figures' Government label covers the period 2011-2019, and involves several partners: UTC, CEA (France's Atomic Energy Agency), UPJV (University Jules Verne Amiens) and two companies PLUGMED and MSC Scanning.** Scientific monitoring on behalf of UTC is assured by Prof. Marie-Christine Ba Tho (Director of UTC-BMBI (Bio-mechanics and Bio-engineering Laboratory).

## UTC-Roberval and UTC-Costech laboratories are also involved.

The research programmes conducted by UTC relate to the consequences of disfigurement and graft maxilla-facial surgery. This covers a wide area of research specialties: biomechanical modeling to simulate face movements, with a view to planning operations and function re-education, development of grafts and implants, tissue engineering for bone reconstruction, perception, expression and self-teaching of the patient's face.

## Three new pieces of equipment for UTC

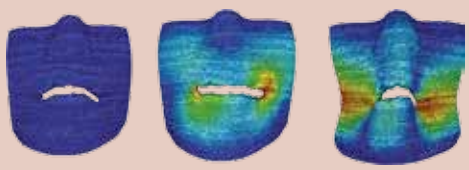
The overall financial packet amounted to 105 000 k€. UTC received 603 k€, plus 125k€ from the FEDER (EU regional development fund). This budget, associated with the research programme has enabled the acquisition of a movement detection, a system specialized in facial sensing (installed at the UTC Innovation Centre), a bi-axial mechanical characterization system for bio-materials and a bioreactor for bone tissue engineering. The dynamic calculation software and structural analyses for face modelling were financed and installed at the UTC Inter-Lab. Computation Platform and Multidisciplinary Modelling (Pilcam2).

## First scientific results

The first scientific results relate to personalized 'tailor-made' modelling of the face muscles that are responsible for facula mimics (such as smiles) from medical imaging. In parallel, the protocols used to analyse facial mimics and facial measurements were readied. As were the experimental protocols used to carry out biaxial characterization of soft tissues (skin, muscles) as well as preliminary research into hybrid substitutes rebuilt as bio-reactors. These results were communicated at the first Open Day for the Institut Faire Face (cf. Interactions #24), but were both national and international publicity. They were obtained in the framework of structuring regional projects SIMOVI (Face Movement Simulation) between the teaching hospital (CHU) at Amiens, UTC (the BMBI and Roberval Laboratories) and Ingestissos (tissue engineering for bones, cf. page 3). Other projects are being readied: ERM_VISAGE designed to explore 'elastographics' via magnetic resonance techniques and to analyse the facial mimics with EMG, FLOWFACE aims at modelling face fluids and SILLKGUIDE is investigation the possibilities of innovative surgical nerve prosthetics and patient's recovery of movement functions. ■

### What is an Équipex ?

With a budget envelope of one billion euros, the first call to tender for "excellence equipment" is designed to enable French laboratories to acquire cutting edge scientific intermediate range research equipment (costing between 1 and 20 Meuros) to carry out world-class research, "for the purpose of furthering the advancement of knowledge and innovation". Out of 336 projects deposited at the French ministry of Higher Education & Research, only 52 were selected as viable. 340 Meuros were allocated to the laureates. UTC is involved in two projects selected - Robotex and Figures. These two projects are among the 12 that were allocated more than 10 Meuros each.



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ÉQUIPEX FIGURES

# The 3D scanner unit used by Figures

MSC Scanning has been a partner of Figures (equipex) since 2009 and an exchange with Professor Devauchelle – the company is specialized in contactless metrology. "We are contributing to this research in three areas: imaging, tissue engineering and bone reconstruction", explains Damien Flacelière, founder and CEO of MSC Scanning.

**"Our equipment allows us to obtain complete 3D imaging files in less than 5 minutes and to carry out digital mock-ups to monitor the cases", adds Damien Flacelière.** Example – MSC Scanning scanned a young patient suffering from muscular hypertrophy in her mastication muscles throughout her treatment. "We measured her face at every injection, and this allowed the practitioners to guide their work. Thanks to analyses on the external features (surface, volume, etc.), the scanner is an equipment that is complementary to MRI", stresses Damien Flacelière.

## 1/ 100th mm accuracy

For tissue engineering, the 3D images acquired by MSC Scanning prove useful to reconstruct skin segments that are similar to the original (missing) tissues; the new segments will be used in graft operations. "We scan the face of the donor and the patient receiving the graft, so as to delineate digitally the best suited segment of the donor to achieve a 'perfect' graft. We are able to plan the scalpel trajectory and create the graft template", adds Damien Flacelière. For bone reconstruction, the same principle applies: the MSC Scanning tools can 'sculpt' a bone segment to be taken from a hip-bone to replace with a 1/100th mm accuracy the damaged bone. This technique makes for a precious time gain and guaranteed precision, with gains in terms of the patient's mobility, appearance, etc. "There are 500 facial muscles! With Frédéric Marin, at UTC-BMBI Laboratory, we are busy analyzing face movements down to the sharpest details", explains Damien Flacelière.


## The Photomaton and 3D Printers

MSC Scanning is based at Montreuil (93), with a subsidiary at Amiens in Picardie and employs 5 persons. The partnership with the Figures 'equipex' team represents 15% of the company's activities and this provides for excellent visibility and new commercial prospects such as an installation at the Palais des Congrès at Amiens of a photomaton coupled to a 3D printer that will produce miniature 3D figurines of persons who get their 'photomaton' photo taken. "In the future, the cost of prosthetics will drop considerably thanks to these tools. The only problem is that research in the field is hampered administratively in France, as we saw recently in the serious delays to receive the funds allocated through the 'equipex' programme", notes Damien Flacelière. However setbacks like this do not dampen Damien's motivation, which is also spurred by the interest he vests in his research and development in the 'equipex' framework.

## Restoring life

"I admire surgeons and the ability to work calmly. We began scanning a dozen atypical head-skulls for an exhibition organized by the Intitut Faire Face in June. The idea was to copy the skulls to produce pedagogical aids for the Medical Faculty", explains the Director, who began his career making plaster molded copies at the Louvre Museum, including pieces such as the famous Victory of Samothrace. "It was I who installed the scanner at the Louvre, and then I joined a company in the field before setting up MSC Scanning 6 years ago", recalls the CEO. Equipex represents a splendid challenge and opportunity given the positive results that could be achieved for disfigured patients. "The mission of the 'equipex' is to restore faces and hence give a new life for these patients? The next objective will be to print 3D organs using stem cells. That would be an extraordinary feat!" ■

IDEFI INNOVENT-E

# Training PMEs in *innovation and export skills*

Innovation and presence in export markets go hand in hand: the more an SME is innovative, then more it can export, the reverse also being true. Bearing this in mind, 4 university partners (including the UT Group) decided to join forces to propose training modules for SMEs to encourage and enhance development in these two areas. The Innov-ENT project was selected by the National Research Agency (ANR) – the Government's research project assessment operator in the framework of the Investments for the Future and the call to tender for "Excellence initiatives in innovative training programmes" (IDEFI).

**With a 6 year budget (2012-2018) of 13 Meuros (of which 5.5 Meuros from public funding), InnovENT-E aims at developing the capacities of SMEs to innovate and export via adapted training programmes.** "InnovENT-E was given a very positive assessment by the IDEFI Jury, for whom the only surprise was that academic institutions should be concerned about SMEs", recalls Jean-Louis Billoët, Director of INSA Rouen who gave the initial impetus to the project. The training modules were developed by the academic partners of IDEFI, viz., the UT Group, the INSA Group, the CESI and the University of Lorraine, with close collaboration with the INPI (France's Intellectual Property Bureau).

## The Four 'Mousquetaires'

This partnership provides for a nation-wide coverage in France and also to mutualize the efforts in design and mediation of the training modules. "Our operational mode is like the four mousquetaires: if one actor is absent, the group suffers and we have equitably shared the budget allocation and the IDEFI pilot activities to as to build up a collective dynamics" says Jean-Louis Billoët. The aim is to propose courses that can be accessed on line (distant learning) in both initial and continuing education, for SMEs and other students. "For example, by combining modules from INSA Rouen, CESI Paris and UTC, we now offer a training course for the timber industry and for a pharmaceutical sector", adds Pascal Albert, who is InnovENT-E coordinator for the UT Group. .


## How exactly can one train for innovation?

InnnovENT-E has not yet reached this stage. Its first year of business activities was given over to producing a skills benchmark which called for a wide-reaching enquiry that addressed the SMEs and experts. "We wanted to be sure we would be in a position to propose a full and adapted training. The enquiry allowed us to identify our shortfalls and to remedy the gaps," explains Pascal Alberti. To illustrate: we needed to add a more practical add-on for training in inter-cultural contexts, the original being deemed too theoretical. One of the difficulties in this particular IDEFI is to share training modules, with all the associate issues of intellectual property rights and share of revenues (once the modules have been placed on the market-place), not forgetting dissemination of the training courses. Following a distant-learning programme about theory of creativity seems fairly simple but just how does one go about mediating a course about implementing innovative practice? "We are currently thinking about these issues that the IDEFI investments must solve. We are co-financing a 'hands-on' innovation support centre that will be located at the INSA Lyons and we are already contributing financially to the development of a professional software package (UTC) to help teachers prepare and create on-line course material", says Jean-Louis Billoët. "The IDEFI is an excellent mirror for UTC and its Management of Innovative Projects major", adds Pascal Alberti. "IDEFI forces us to discuss the way we do things and helps detect various questions that must be explored. It provides for a vision that is more export intensive and international than the MIP Major".

## A new university diploma for the UT Group

There are 70 000 students in the 4 universities of technology (forming the UT Group) who can benefit, if they wish, from the new diploma. The INSA Group will be offering a training course via apprenticeship (with a dozen or so modules) and the UT Group a course derived from InnovENT-E activities leading to award of an inter-UT diploma. "Late on, we intend to transform the offer into a Master's degree", forecasts Pascal Alberti. InnovENT-E has begun to formalise a catalogue of training modules in order to propose them as soon as possible to potential SME clients. "The minute-writer for the national HE and research assessment agency (ANR) who sits in on our bi-annual meeting has assured us that we are one of the most advanced IDEFIs and indeed are in phase with respect to the objectives", underscores Jean-Louis Billoët.

## Key figures for InnoVENT-E

**Budget allotted – 13 Meuros** over 6 years (2012-2018), 48% from public funding

## Guaranteed development?

The following stages will be to rely on partner networks (competitivity poles, clusters, sectors, employer organizations, public institutions and specialist reviews) to enhance the visibility. To give an example, InnovENT-E has already signed an agreement with the competitivity pole Mov'eo, specialist in mobility. "The major groups and contractors could also be interested: when they gain international contracts, they often need to raise the level of skills in their SME suppliers to associate them more efficiently", adds Pascal Alberti. InnovENT-E will then be pursuing a national and international development scheme. "UTC already benefits from partnerships in Brazil in innovative areas. We know that InnovENT-E will be of interest to the partners. We provide a capacity for SMEs to adapt their innovations to the constraints of foreign market-places and the possibility to secure the positions", says Pascal Alberti. The same logic and approach will be applied in China, Morocco and Chile and with the international partners of other universities. One of the main objectives for 2014 will be to create a foundation to pursue the work when the 6 year IDEFI phase comes to a close. "INPI (intellectual property rights), Oseo and 6 French Regions has assured us that they will support our activities and we are making proposals to others to integrate our seeding fund", concludes Pascal Alberti. ■

## What is an IDEFI ?

The acronym IDEFI, in French for Excellence Initiatives in Innovative Training, the management of which has been entrusted to the ANR (the Government's research assessment agency) was initiated in Autumn of 2011 to complete the 'research' of the Government's Investments for the Future incentive campaign with a specific action to encourage and enhance innovation in training. Thirty-seven projects were selected by the Jury after a preselection phase among the application files (58 out of 93) and a final selection where the project directors were auditioned.

PIA folder to follow in the next Interactions

# A new look at Innovation and the Climate

Jean Jouzel, a climatologist by profession, is Vice-President of the IPCC (Inter-Government Panel on Climate Change) has recently published 3 sections of its 5th Report on climate change and global warming and their consequences. He will preside over the ceremony of the PhD awards of Sorbonne Universities, June 14, 2014.

**What are the key conclusions of the latest IPCC Report?**

Global warming is now definitive and without precedent. This is the main conclusion of the most recent reports of the working parties* that comprise the IPCC. Compared with previous editions, the figures contained in these versions show that the greenhouse gas emissions have continued to grow despite the economic crisis, that they have never been as high as they are today and that the global warming is due to increased GHG effects. Since the 1960s, the Erath's mean temperature has risen by 2/3 degree and we shall reach a CO2 level of 400 ppm next year (cf. insert below Did you know this). The increased greenhouse effect is due (for 80%) to combustion of fossil fuels. IPCC proposes several scenarios: if the emission are maximum in the near future, the mean global temperature will rise between 4 to 5° by year 2100, with sizeable impacts on biodiversity, health, agricultural crops, etc., and the oceans' surfaces will rise by 1m. This scenario should be avoided at all costs because it will be very difficult to adapt to the situation. We must try to contain the global warming to +2°C by 2100 and this requires that we divide by a factor 3 our GHG emissions by 2050, so as to retain a degree of autonomy in terms of our adaptation. It is technically possible, provided that we move rapidly to using carbon-free energies.

**DID YOU KNOW THIS?**

**In May 2013 - for the first time since Man appeared on Earth - the threshold value of 400 ppm (parts per million) of CO2 in the atmosphere was exceeded, compared with the value at the end of the 19th Century when it did not exceed 300 ppm. It is this concentration that increases the greenhouse effect and leads to global warming.**

**What innovations would be needed to combat global warming?**

What we need are solutions in terms of energy efficiency: dividing by a factor 4 the French emissions of CO2, as written in law, implies that we divide by a factor 2 our national energy consumption, without sacrificing the national economy. To make renewable energy sources more efficient and competitive, we must innovate in energy storage techniques and capacity. Renewables could assure 50% of our energy requirements by year 2050. The nuclear sector –b with its well-documents limits – is also mentioned by the IPCC, as are capture and storage of carbon (CCS). Current research in this area must move rapidly from laboratory to industrial phases, and this is not among the policy options we see today. As a Member of the Governing Board of the European Institute of Technology (EIT) for climate questions 'Climate KIOK), I am especially interested by the innovation aspects. The EU devotes 70 Meuros to innovative projects in the form of call to project proposals for Climate KIK 2014. The objective of this European initiative is to favour innovation and creation of associate enterprises. Projects relate to cities, agriculture and emission of GHGs. For example, one of the difficulties in our field is to measure precisely emission levels in urban areas or for a given Region. Climate KIK supports research projects that addresses such a challenge.

> To make renewable energy sources more efficient and competitive, we must innovate in energy storage techniques and capacity. Renewables could assure 50% of our energy requirements by year 2050

**What role can science play?**

I am among those who defend basic science – which is falling apart in France. Today if you wish to ask for a grant for a climate related innovation, it will be far simpler than asking for a budget to obtain polar ice glacier borehole sample. It is becoming difficult to financially launch a basic research project – but I see this as a policy mistake. It is this basic work that underpins the innovation in a decade from now. We must find a balance even if I clearly understand the accusations that in France we are very slow to move research from the lab to enterprise.

**You were Godfather to the PhD awards ceremony at Sorbonne Universités (Cluster) – how did you feel?**

In France, for as long as the Ph is not really recognized in enterprises and to a lesser extent even in public service, then Universities will remain less attractive than the graduates from France's engineering schools. This ceremony contributes to PhD notoriety. One of the work ahead for the Universities, if they wish to be successful is to make the PhD attractive, as is the case today in Germany and elsewhere. I am a French docteur ès sciences myself, obtaining my PhD at the age of 21 on the topic of how hail stones are formed and at the time, getting job offers was no problem; today it is a much more difficult afire for our young PhDs. ■

* IPCC Group 1 looks at scientific data in regard to climate change; Group 2 analyzes "the consequences, areas of vulnerability and adaptation"; Group 3 prospects for mitigation measures.

**HOMAGES**

Titular Professor as of 1979, Daniel Thomas joined UTC May 1st, 1974. His career is intimately linked with the success of UTC to which he contributed in an outstanding manner. Today, UTC has lost one of its most significant figureheads whose international reputation in the field of biotechnologies – at his personal initiative – and his human qualities will forever be engraved in our minds and hearts. The University mourns his departure. Below are the first few of the many homages received, some from long-standing friends of the University. We shall publish more homages in later issues, in remembrance of the great man, Daniel Thomas.

# Daniel Thomas UTC Pioneer

**Last week, Professor Daniel Thomas, a truly marvellous scientist and for me a great friend, left us bereaved.** . I also measure the loss for UTC, for France and for Europe inasmuch as he was one of the world leaders in biotechnologies, in particular in enzyme engineering.

Daniel was a great scientist, who possessed an acute sense for creativity. As a professor, he made some early capital discoveries that enhanced UTC's world-class position in his fields – he was the University's Vice-President when he deceased.

He and I enjoyed a very creative relationship, both on the personal and professional levels. Today, for example, one of my most talented PhD students, Dr Karsten Hapt, today Professor at UTC, came from this school. Today he is a brilliant pioneer in biotechnologies especially in molecular printing processes.

Well-known by scientists and entrepreneurs round the world, Professor Daniel Thomas had that fantastic capacity to set up new contacts between companies and research establishments. Daniel Thomas also worked hard to organise scientific meetings and I personally recall one such international conference held in Compiegne, which ended on a magnificent reception at Versailles. I should also mention that I was awarded an Honoris Causa doctoral degree at the hands of President Prof. Alain Storck and by Bernard Beigner, Rector of the Academy of Amiens. This was a great honour for me, 10 years after the famous Professor Marc Van Montagu, co-laureate of the 1998 Japan Prize (1998).

**Klaus Mosbach,**
Emeritus professor
Lund University, Sweden

Professor Daniel Thomas was a wonderful, outstanding person, open-minded, positive-thinking and who possessed, moreover, a fantastic memory. I recall as if it was yesterday an incident that took place when we at the University of Lund in Sweden had invited Daniel Thomas to join a thesis jury. I must underline that defending a thesis is a highly respected process in Sweden and I try to invite the very best opponents to the event, as if it was a Nobel Prize deliberation. When it was Daniel Thomas' turn to speak – the jury sitting behind a table, facing the PhD candidate, with some hundred persons also present in the room, I noted he did not have the thesis open (running between 100 and 200 pages) and he began "On page 38, you miswrote a scientific formula …" The jury and guests were staggered by his memory of the facts and figures.

I could write a book about you, Daniel, but I hope these few lines will convey how much my feeling for you were strong. Science has lost a great man, far too early. ■

**Klaus Mosbach**

# A *builder* at heart

**In all my career, I think I have rarely met anyone as dynamic and forward-thinking.** I met Daniel Thomas in 1972, when I was finishing my own PhD thesis, and Daniel was a young research scientists engaged by the Charles Nicolle Hospital in Rouen. Even in those days his enthusiasm was communicative and his research work held the rich promise of things to come.

**Albert Goldbeter,** Chair of Theoretical Chronobiology Faculty of Science Free University, Brussels

The year before, my colleague René Lefever had met with Daniel Thomas during a science school in Aussois and he had immediately identified the high interest in Daniel's work when he began to immobilize enzymes. Consequently, he invited Daniel to come to the Free University of Brussels (ULB) at a conference where he met Professor Ilya Prigogine (Nobel Prize for Chemistry, 1977). Daniel's research at the time related to the bi-stability of membranes with embedded enzymes and to Prigogine's work on auto-organization and dissipative structures. Daniel's work led to a publication in Nature in 1974, with the title "Memory in enzyme membranes". In the early 1980s, Ilya Prigogine organized a meeting between Daniel Thomas and Jacques Solvay, Chairman of the Solvay Company with whom Daniel collaborated on this question of immobilized enzymes. Following this, Daniel came frequently to ULB where he was appointed Professor to the Solvay Chair of Chemistry (1982-1983). He was able to give a 2 hour lecture without a single note and that really impressed us a lot! At UTC, he built up a team of keen, dynamic, young research scientists and he lent his strong impetus to their work.

Following my first meeting with Daniel Thomas, in the framework of my own PhD work, I had begun an annex thesis on a subject that he was studying is his own laboratory at that time. I went to see him several times in Rouen and then at UTC where he was appointed when it began – with him, I recall was his mathematician friend Jean-Pierre Kernevez, who died unfortunately and far too soon. Both men were close to each other: Daniel had understood long before others ion the scientific community the potential of modelling life function in biology and the complementarity between experimental and theoretical work. I saw Daniel Thomas many times over the following years. When I did a post-doc at the Weizmann Institute, in Israel, in 1973-1975, we were working (all three of us) with René Lefever, on an article that was never in fact published. Daniel had somehow forgotten our manuscript in a desk drawer and the final editing touches were never made! The reason was simple enough: already Daniel had many dossiers moving forward in parallel and he never stopped. A true visionary, a creative, a builder at heart!

But then our ways parted, with different research interests – myself concentrating on modelling life biological rhythms and Daniel on more biotechnological affairs. I held him in highest esteem. He indeed contacted me several year ago to join a meeting of UTC's Science Advisory Committee and I was so sorry to have to turn down the invitation, for sheer lack of time and the meeting would have given me the opportunity (and the pleasure) to see him once more. I shall always recall his penetrating, laughing almost bawdy eyes, bordering on the malicious. Thus I was not unduly surprised at learning the scope of his research activities and the applications in the biotechnological sectors. Here was a man of exception, whose memory will remain engraved in my heart and mind. ■

**Albert Goldbeter**

# The link between *academic and industrial spheres*

**Daniel Thomas and I met in 1981 at a conference in Tokyo.** As a pioneer in GMOs, I explained all that I thought possible to create from plant sources and he immediately realized the prime contribution that life sciences could offer for the future of our societies, whereas he was a PhD in Physics.

Often scientists like to present themselves as leaders in their basic research field of specialties, with no concern as to possible applications of their work. But Daniel Thomas, with his functions at UTC and also at the National Academy for Technologies of France (NATF) felt that it was his duty to inform of progress made in the laboratories those where he saw a promising outlet. He was the anchor-man between the academics and the industrialists in biotechnologies, even if basically he was a lecturer and a research scientist above all else. He was endowed with a marvellous intelligence and charmed everyone. He was at ease when communicating with any specialists, no matter the subject, and this alone enabled him to move scientific boundaries forward and with them the applications in many areas. He was an honest man, able to build a vast network of faithful friends and others who listened to him, to advance themselves.

**Marc Van Montagu,** Professor University of Ghent, Belgium Japan Prize 1998

At the end of the 1990s the ecology groups decided to condemn GMOs via ideological slogans with no scientific base; this was a difficult period for Daniel Thomas. No politician at the time – especially in France – had the courage to defend a scientifically sound point of view, and this led to a halt of research in the GM fields. But Daniel Thomas was made of sterner stuff and that was his great merit. He reoriented his work to fermentation and use of organic wastes as possible energy sources. This bio-sourced energy has a promising future ahead in France, if the country wishes to exit nuclear power production and does not wish to exploit shale gas sites. Green carbon (in plants and organic wastes) can replace fossil carbon and thanks to Daniel's foresight, UTC is in an excellent position here. He also worked on the development of catalysing proteins capable of producing future raw materials with abundant bio-sourced components for the plastic industry sector, to replace petroleum by-products. Unfortunately the world of research does not have sufficient means to move ahead as fast as the demographic challenges and climate change. Life itself is too short: Daniel Thomas left us at the age of 68 while I am here at 81 and I still see myself as a young debutant. ■

**Marc Van Montagu**

In tribute to Daniel Thomas, you can leave your messages of sympathy on **http://interactions.utc.fr**

AGENDA
interactions.utc.fr

**President A. Storck took part in the 2nd Innovation Day at the University Mohammed V, Morocco**
may 27
Alain Storck will be one of the speakers at the Conference on the theme "Innovation in Technology Transfer" organized by the Ecole Normale Supérieure de l'Enseignement Technique de Rabat, Morocco.

**24h innovation at UTC**
27-28 May
As every year, the "24 h innovation" event will take place at UTC and elsewhere in the world, May 27-28. The teams of 5-8 undergraduates, PhD students and teaching staff will be invited to propose innovative solutions to several problems proposed. After the 24h, a Jury comprising members of UTC and partner industrialists will designate the laureate team to represent UTC in the international competition, organized in parallel via video-conference.

**Special Day - Apprenticeship Engineers**
June 2
As each year, UTC will be organizing a Special Day for exchanges with industrial partners on the training to become an engineer via apprenticeships schemes, with the 3 main ingredients, viz., the host companies, the teaching staff and the apprentices. This event allows for privileged debate and exchange between UTC and these partners on training questions via apprenticeship schemes.

**Second Edition of the Digital Spring**
June 5
Thursday 5 June, UTC will be convening the Second Edition of the Digital Spring with organized by the Oise (60) department territorial authorities the objective to promote new day-to-day digital process uses and innovations of obvious interest both to private and public spheres. The programme will see meetings and lectures on digital topics, with workshops for local authorities and guided visits to the UTC Innovation Centre …
**www.printempsnumerique.com/**

**Conference on Algorithmic Writing 2.0**
June 16
Bénédicte Jacobs, research scientist and artist will be moderating the conference on Algorithmic Writing 2.0 at the frontiers of narration modes for digital traces on relational platforms – Monday June 16 – 2:30 - 4:30 pm at the Centre Pierre Guillaumat 2, Compiegne. The conference is organized by the Project Group 'TTH' (Technologies and Human Traces) financed by the Picardie Regional Authorities and by the UTC COSTECH Laboratory.

ENTREPRENEURSHIP

# Codequa : *Optimising purchases by the SMEs*

Emmanuel Monleau, who registered at UTC in 2002, is an entrepreneur. He created Codequa, an advisory agency with the aim to assist SMEs (and Very Small Enterprises), in March 2013.

**A graduate in Mechanical Engineering, and the specialty of Management of Innovative Projects, Emmanuel Monleau took care during his higher education days, not to specialise.** "I wanted to have a good overview, to stay as a generalist engineer and retain my legitimacy to discuss with various technical partners". Emmanuel Monleau carried out his final year internship/placement at the Purchasing Department of Valeo (automobile equipment) and was hired by Valeo and moved up through the ranks to become Head of 'battery purchasing' for the Middle East, Europe and Africa zone. He then moved to Emerson, where he worked till 2012. "Then I decided to set up my own company after my 'tiring' experience with the majors. And I saw in the field that the SMEs often possess incredible know-how at their disposal that they have difficulties to valorize, because they do not know how to optimise their procurements".

CODEQUA
VOTRE PARTENAIRE ACHATS

## One half of his activities abroad

Procurement advisory agencies rarely focus on SMEs and so there is a market niche here. Emmanuel Monleau therefore set up Codequa with Guillaume Caniver, a colleague with whom he shared an office at Emerson's who also wanted to create an enterprise. The associates have complementary profiles: experience in procurement for Guillaume Canivet, and a sales 'bent' for Emmanuel Monleau. Their first missions consisted of helping their clients to optimize their procurements, followed by setting up training modules for the SMEs. SMEs do not have specific purchasing departments (Chief Buyers). "In companies of this size, there is rarely a full-time job specifically set aside for purchasing operations. Often it is one person who does the job one day a week. In industrial sectors, purchasing can represent to 60% of the turn-over. Reducing the associate activities by 3% would have an effect on profitability equivalent to increasing sales by 30%", adds Emmanuel Monleau. Rapidly, Codequa found themselves approached by French companies established abroad or by foreign companies, to provide assistance for their procurement policies and activities. "We had not in fact envisioned extending our business abroad, but today it represents more than 50% of our business! Occasionally it proves more economical to hire an intermediary rather than make the purchases directly and locally. Codequa assumes the dual role of purchasing and delivery of goods", concludes Codequa's co-CEO, Emmanuel Monleau.

## Recruitment in view for 2014

After one year's existence, Codequa with its home office at Vaux-en-Vélin has an annual turnover of 200 000€ and several dozen clients, in France and abroad (Algeria, Mali, Senegal, French Territories, Australia, etc.). Over and above the two asscoiates, the company has recruited two interns after graduation. "The results are coming in and the prospects are encouraging. But we cannot afford to sleep on our laurels, and we must continue to prospect clients and call around non-stop … and it works", says Emmanuel with a smile – he hasn't yet signed himself a paycheck.

For year 2014, he hopes to double up the turnover and recruit another colleague to develop new markets and extend the range of services offered by Codequa. The company, located in a collaborative open space called the 'comptoir éthique', pays special attention to social and environmental impact. "We take total costs into account: buying in Asia implies that we include customs and excise fees. To illustrate, we managed to divide by two the cost of a procurement problem by identifying a supplier 40 km from our (user) client! Sometimes we have to ask the right questions!"

## Comfort and salary *versus* happiness and freedom

Emmanuel says that he appreciated the mental approach that UTC distils, providing a range of courses and the possibility to choose one's own a la carte cursus. "Today I can buy plastics and/or metals without feeling technically out of my depth". Emmanuel also became member of the UTC Business Club. "After I had followed Joseph Orlinski's course at UTC, it seemed natural for me to participate in the entrepreneurial dynamics of UTC. I work with the alumni association Tremplin UTC (Rhône-Alpes), a region where there are many graduates. It is a dynamic network" underscores Emmanuel Monleau. "I take the same pleasure now as when I was President of the Students' union (BDE): with a budget and limited time to indulge in hiuge ambitions and projects. You can lose in comfort and salary but gain a lot in happiness and freedom!" ■

ENTREPRENEURSHIP

# tbmaestro : *a 100% UTC enterprise!*

In the Paris offices of tbmaestro, a handful of UTC graduates are busy modelling physical items - buildings and urban infrastructures – with the objective to propose optimal management for public and private authorities in charge, for local authorities and for the State. The company was set up by Jean-Pascal Foucault, a research scientist and lecturer in urban system engineering, and who pursues a fairly straightforward HR policy – UTC graduates will be recruited as a priority!

**And the results are convincing too: over 6.7 million m², spread over 1 690 building premises are managed with tbmaestro which, for its second fiscal year has doubled its revenues and its profits.** It has signed a contract with Aéroports de Paris to manage the Roissy Charles-de-Gaulle (CDG) hub, plus Orly and Le Bourget airports up to year 2020. "This is a solid enough base for us to recruit 5 new permanent staff", indicates proudly Jean-Pascal Foucault.

## Each building must be seen as a unique entity

Jean-Pascal Foucault, who hails from Canada, is a graduate from École Polytechnique Montreal, and it was his intention to move into building operations and maintenance when he finished his studies. In the early 1990s, Canada was hit by a serious economic crisis, "there were no jobs going in design of new buildings but some in operating existing premises", recalls Jean-Pascal Foucault who had a 2 M$ Can to rehabilitate a school. In order to reconcile economic, legal, environmental and social constraints as best he could, Jean-Pascal Foucault started looking for methods available in France, in the USA, in Switzerland, etc. This did not produce anything tangible and none of the solutions he saw seems satisfactory inasmuch as they did not consider each building as a unique entity. That was when and why he set out and developed the bases for his future service offer and the software package tbmaestro, a buzz word (in French) for Dashboard, Modelling, Analysis, Strategic and Operational Assessment.

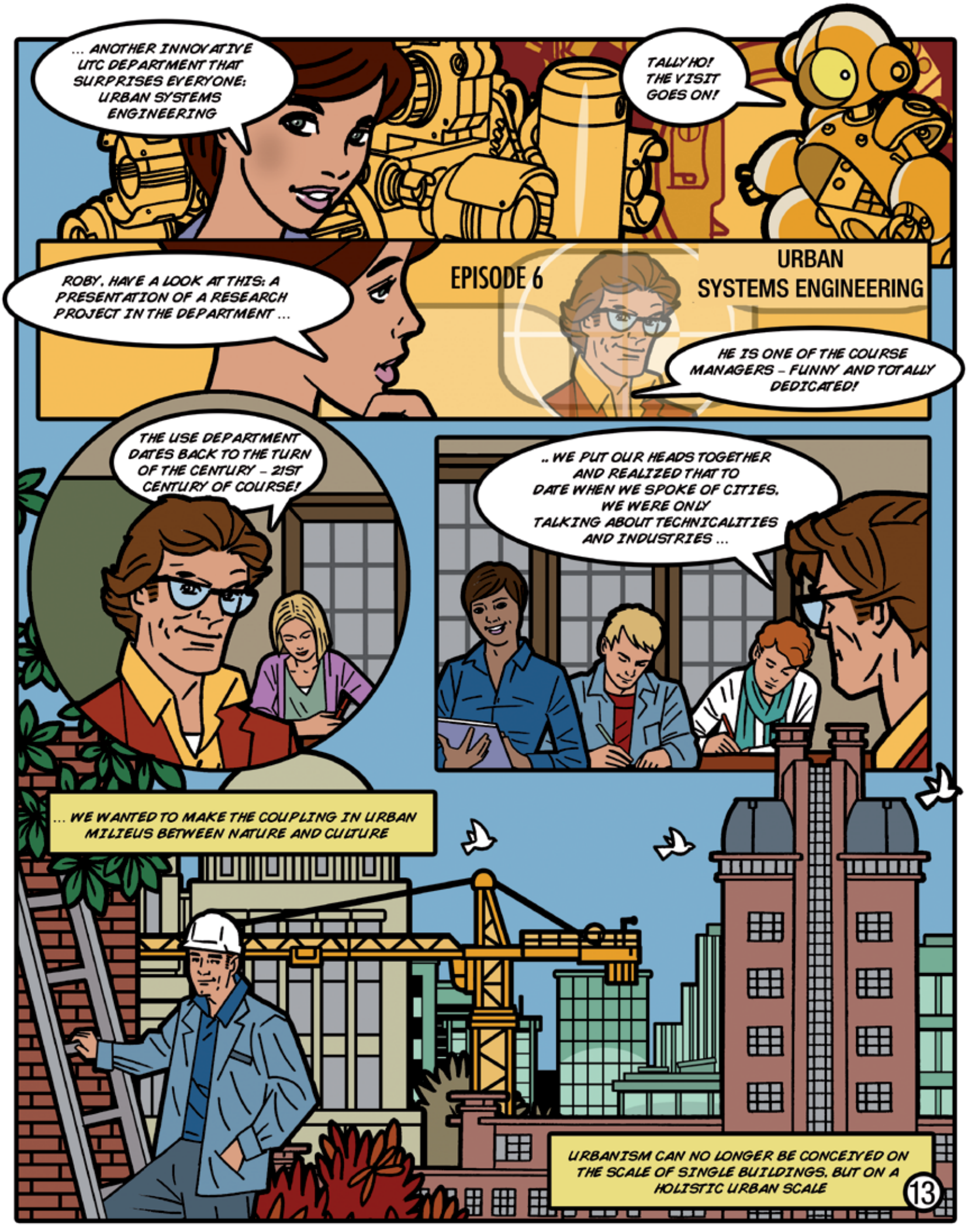
## 'Like the game Tetris!'

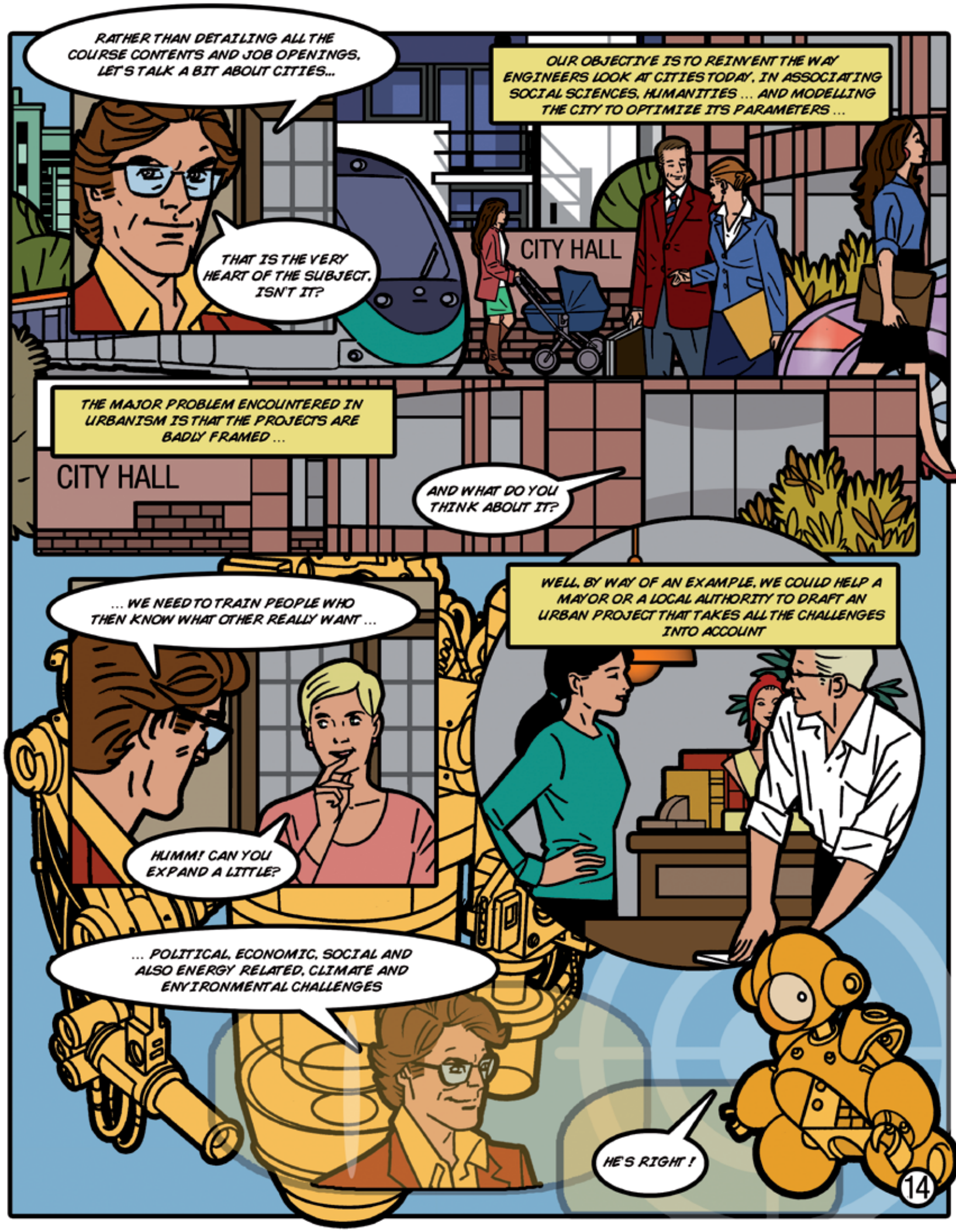
The tbmaestro tool proposes a multi-scale and inter-time scale representation of the metabolism and life cycles for physical entities. "After an audit is carried out, we must be able, just like in the game Tetris, to provide aids to decisions with a limited amount of information", says Jean-Pascal Foucault. The final objective is to be able to answer the following simple question; "With 1 000 euros, what are the most urgent maintenance jobs to be done? What should my priorities be? And by applying successive audits to the buildings analyzed, tbmaestro can build up a film of their evolution so as to preserve the heritage value in the quality requirement window defined by the client, as a function of the expected uses. ""Tbmaestro reintroduces the physics of materials and renews the engineering options in economic acfrive building management models. It enables the client to bring operational and strategic considerations into line. It gives a short term, mid-term and long range visibility to evolution in terms of risk assessment", summarizes Jean-Pascal Foucault. His approach then took a book form in 2003, published by the Presses Internationales de Polytechnique. Following a lecture he gave at the AFIM meeting (French association for maintenance managers and engineers), Jean-Pascal Foucault was approached by Manuela Sechilariu, from the UTC Urban System Engineering Department (GSU), as well as by the Aéroports de Paris (ADP) consortium. Jean-Pascal Foucault accepted to lecture at UTC. "President François Peccoud assigned me the mission to set up a company using tbmaestro given the interest manifested by the Paris area airport authorities ADP. I accepted even though I did not especially have an entrepreneurial fibre!" smiles Jean-Pascal Foucault in retrospect, he who became Director of UTC-GSU for 6 years!

## Hiring UTC graduates

The tbmaestro package was installed on the 300 000 m² platform of CDG Airport. The first results were positive and the solution was extended to the other Paris area airports (Orly and Le Bourget). With respect to new certifications needed in "sustainable" HQE, BREAM and LEED buildings, tbmaestro provides an improved dimension for risk assessment and control. "Very often, the risk managers are disappointed with their certified building assets after 3 to 5 years existence: expected performance is just not there. Good maintenance is the key to success. It is the definition of sustainable development in the real acceptation of the term", reminds Jean-Pascal Foucault. In 2008, he decided to move out from the UTC incubator UTEAM, and he pays homage to this unit: "Without their help, none of this would have been possible." When one his former students Claire Duclos called him to see if he had ideas for job openings, he invited her to join in. She officially created the company and today is the CEO. Ever since the incubator days and to date, tbmaestro has generated over 30 internships and some 25 first jobs for UTC graduates, between Montreal and Paris. The client catalogue now includes the town of Niort with the aim to modelise all its public buildings to fight ageing phenomena and to ensure quality of life style for the local citizens. It received an award Territoria d'Or for the city's overall plan – signed tbmaestro! "It is really spectacular for the young graduates who create their company. I continue to accompany and encourage them, but I have one big double wish: autonomy and pleasure", concludes Jean-Pascal Foucault for whom the entrepreneurial action is "devastating but so gratifying!" ■

On its 40th anniversary, UTC rewrites its history, in comic strip style : **In the heart of the Future**




RATHER THAN DETAILING ALL THE COURSE CONTENTS AND JOB OPENINGS, LET'S TALK A BIT ABOUT CITIES...
OUR OBJECTIVE IS TO REINVENT THE WAY ENGINEERS LOOK AT CITIES TODAY, IN ASSOCIATING SOCIAL SCIENCES, HUMANITIES ... AND MODELLING THE CITY TO OPTIMIZE ITS PARAMETERS ...
THAT IS THE VERY HEART OF THE SUBJECT, ISN'T IT?
CITY HALL
THE MAJOR PROBLEM ENCOUNTERED IN URBANISM IS THAT THE PROJECTS ARE BADLY FRAMED ...
CITY HALL
AND WHAT DO YOU THINK ABOUT IT?
... WE NEED TO TRAIN PEOPLE WHO THEN KNOW WHAT OTHER REALLY WANT ...
WELL, BY WAY OF AN EXAMPLE, WE COULD HELP A MAYOR OR A LOCAL AUTHORITY TO DRAFT AN URBAN PROJECT THAT TAKES ALL THE CHALLENGES INTO ACCOUNT
HUMM! CAN YOU EXPAND A LITTLE?
... POLITICAL, ECONOMIC, SOCIAL AND ALSO ENERGY RELATED, CLIMATE AND ENVIRONMENTAL CHALLENGES
HE'S RIGHT !
14

# The keys to success are self-relianceand active networking

Eric Roussel has resided in South Korea now for 3 years, where he has been busy supervising the development of one of Renault's international projects. He is a totally dedicated car enthusiast and has carried out almost his entire career with Renault.

**Eric Roussel enrolled at UTC following the advice of one of his lycée teachers, who spoke about this new engineering school with its special statutes, inspired as it was by similar American models.** "We didn't have the Internet back in the 1970s! We did not have much of a clue as to the specialties and the engineering schools in general, compared to young people today," he stresses. Of his UTC days, he recalls the original teaching methods and contents and also how to pull through any situation, almost, when looking for solutions. "If I think of all the UTC graduates I have met, more than 75% have chosen to move away from beaten tracks", he feels.

## "A kid's dream!"

With his UTC diploma in mechanical engineering, Eric Roussel first worked for 4 years in developing new materials for the weapons industry (ground based). Then he moved to Renault, joining a business unit specialized in small commercial vans, where he stayed for 10 years. "I was an automobile architect, an orchestra conductor designing and launching the Kangoo van and Trafic 2. When you like cars the way I do, it becomes a passion: we used to draw the pre-project drafts scale 1 on a drawing table as big as a ping-pong table. A kid's dream!". This small business unit – dynamic and reactive – corresponded well to Eric Roussel, whose credo was to avoid being bored at any time and at all costs. Following this rich experience, Eric was invited by Carlos Tavares – who today is at the head of PSA - to become project manager for the Megane 2 model. So from drawing board to mass production, Eric followed Megane cabriolet, the Megane break and the Megane Sedan. "Having had the privilege of working alongside people like Carlos Tavares, who at the time was the Director for the Megane 2 model, was a very rich and rewarding experience. They are marvellous managers who possess exceptional levels of intelligence and capacity to analyse situations".

## Round the world

Eric Roussel then felt the urge to travel. In 2004, when his 3 cars were on the production lines, the pressure dropped a bit and this called for 'new horizons'. So off to Mexico for 3 years as Quality Assessment Director for North Latin America. He was responsible for the manufacturing processes of the Renault factory units in Mexico (a Nissan unit) and for Marketing, Sales and Service Quality in Columbia. "This was a new organization structure at Renault, with the creation of a Quality Director for each major region in the world. I went to the city of Medellin one week every month: the Columbians are dynamic, happy smiling people and efficient. It was a true joy to work with them, just like the Turks with whom I had worked on the Megane project, plus a 'Latino' touch! adds Eric Roussel. After that Eric was appointed Deputy Chief Engineer for the Logan model (for the African and Asian regions) and he stayed in that position for 5 years. His job consisted of assuring "second industrialization" changes, viz., the small but necessary adjustments needed to adapt to the countries where the models are marketed, and to find local suppliers for parts and finally to manage the project development up to and including mass production launch. "I went to Russia, Iran, Morocco, South Africa … I had to travel a lot and frequently; over those years, I was rarely in my office and almost always "on the road"! Eric is the sort of person who hates seeing each day like the one before. In the course of his travels, Eric met with numerous, very interesting people. "Their levels of skills is something we ignore in France".

## Economic constraints

For the past 6 months he has been living in Korea and Eric feels he has become totally illiterate. "Signs in English are few and far between! I managed to buy some orange juice, but only because there was a picture on the pack. This is quite a disturbing experience", adds Deric with a smile. In Korea, he is now Deputy Director for the preparation of a new vehicle that will be assembled in 2 Asian factory units. In South Korea, he found a total 'foreign' atmosphere but every but as friendly as in Mexico and infinitely safer. "The lockers where the workers leave their laptops when they go for lunch are not locked. This conducive to having pleasant working conditions. In the capital Seoul, everything is so clean and carefully maintained. The city spreads out for miles between mountain ranges. You only need to travel a few miles and you find a path heading up into the hills". The advice Eric now hands down to his children is to learn how to build and maintain a network - which he himself thinks he cannot do now. For students who want to get into the automobile business sectors, Eric Roussel underscores that there are now strong economic constraints with top priority. "The economic pressure is such that we are led to reasoning to the nearest 10 cents when we design a car. Technically speaking, it is a marvellous, challenging world of its own! " ■

## BIO EXPRESS

**1977** : Admission UTC

**1983** : Graduate Mechanical Engineering, MIT (Cambridge, USA) / Cooperation in Algeria – Oran

**1985** : Head of the materials laboratory at AMX-APX GIAT

**1989** : Automobile Designer IDVU Groupe Renault

**1999** : Project Manager for the Mégane II line (cabriolet/break/sedan)

**2005** : Director Quality Assurance North Latin America, based in Mexico City

**2008** : Deputy Chief Engineer 'line entry' for various industrialization projects in Asia and Africa

**2013 to date** : Deputy Programme Director, based in Korea

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