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SORBONNE UNIVERSITES

MARCH 2017 ### N° **43**
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Donnons un sens à l'innovation

Interactions

LES DOSSIERS

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FROM THE PRESIDENT'S DESK

All hail! the UTC PhDs

Klaus Mosbach, emeritus professor at Lund University (Sweden) and Klaus-Jürgen Bathe, professor at MIT (USA). Two eminent professors who in recent years have been awarded the honoris causa PhD of UTC for their life-long career achievements in research and teaching. In this issue, #43, of Interactions, you will discover our younger research scientists who were awarded the Guy Deniélou 2017 Thesis Prize, jointly by the Greater Compiegne region – ARC and the national region Hauts-de-France, plus the French bank Société Générale and Airbus Safran Launchers … Our reporters complete the panorama with thesis descriptions of work done by several PhDs at UTC which amply demonstrate the richness and diversity of our interdisciplinary research and also the variety of job positions and enterprises who recruit our graduates and who are fully aware of the quality of the product, so to speak. These thesis topics clearly underscore the added value of our research contributions to developments fostered and enhanced by UTC among socio-economic players, reinforcing the dynamic and innovative values of our Region.
Thus UTC can be proud not only of its PhD graduates (but also of the companies who recruit them), for their capacity to manage complex technology-intensive issues. Motor manufacturer Renault has shown its trust in creating a joint laboratory, the SIVLab, with UTC and the CNRS, with the objective to improve perception systems. The Crystal Medal was awarded this year to one of our young female research scientists, Bernadette Tse Sum Bui, in recognition of her work and contribution to technological research at UTC. Witness also our clever undergraduate, Benoît Thomas, who invented a simple yet efficient bike padlock, which again illustrates that innovation can be implemented in most unusual areas. The issue sets out a number of reasons that will make for a rewarding reading, a positive vector to help understand better the nature and scope of interdisciplinarity. ■

Prof. Philippe Courtier,
President & Vice-Chancellor UTC

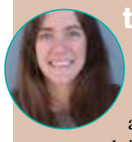
Hermann Matthies laureate of the Gay Lussac Humboldt Prize

Professor Hermann Matthies, Director of the Institut für Wissentschaftiliches Rechnen at the German University of Technology at Braunschweig, was awarded the 2016 Gay-Lussac Humboldt Prize in a ceremony chaired by Ms Najat Vallaud-Belkacem, French Minister for Education, Higher Education and Research and by Thierry Mandon, junior minister for Higher Education Research and. His candidacy was proposed by Prof Adnan Ibrahimbegovic of the UTC-Roberval (mechanical engineering) Lab, seconded by Prof. Pierre Ladevèze, ENS Cachan and Roger Ohayon, tenured professor at the CNAM. ■

Partnership with the European Innovation Academy

Monday, Jan. 30, 2017, UTC signed a partnership agreement with the European Innovation Academy. The objective of the agreement is to stimulate a spirit conducive to innovation and entrepreneurship for the students selected to follow the courses. Two weeks training are offered for the laureates of famous engineering schools round the world, such as UC Berkley and Stanford University. ■

A UTC-PhD student laureate of the Eiffel Bursary Programme



Tea Rukavina, a PhD student doing her thesis at the UTC-Roberval Lab has been declared laureate of the Eiffel Bursary Programme, financed by the French Foreign Office. This programme rewards non-French students (after selection by an international expert jury) nominated by the institution in which they are registered for higher education studies. ■

PhD Student Seminar in the Cervifer Project

The UTC-Roberval Laboratory will be organizing its third PhD student Seminar at the Daniel Thomas Innovation Centre (UTC) for PhD students under the Cervifer project (railroad virtual railroad certification), on March 29, 2017. The seminar this year will focus on the results obtained in doctoral theses presented and on progress in ongoing PhD work. Cervifer involves 13 partners: 5 research and training establishments (CETIM,

RESEARCH

A major manufacturing group who trusts UTC


©Schryve

Virginie Maillard, Exec. Director of R&D with the Renault Car-making group describe the full potential of the offer of the new joint lab. SIVALab (acronym in French for Lab for Driverless Car Integrated Systems), in a partnership signed with the UTC-CNRS-Heudiasyc Lab.

For how long has the Renault Group been involved in the concept of driverless cars?
For over two decades now, Renault has been interested in the development of automated devices designed to improve vehicle safety performance. For example, car braking systems that incorporate obstacle detection and vehicle speed regulators were first to benefit from these innovations. Our new models Espace and Scenic already integrate technological driver aids to trigger an emergency stop if a pedestrian inadvertently crosses the road ahead of the car, or if there is a sudden traffic slow-down ahead. The idea here is to free the driver's time (and mind) for other activities. Gradually, Renault models will incorporate an ever-wider range of solutions to delegate driving to the automats on certain, monotonous, routes (e.g., on long motorway stretches or in traffic jams). As of 2020, we hope to be able to put our first 100% driverless vehicle on the market, which will be quite a step forward.

What role can UTC play in this area of research?
We have been working on these topics with scientists at the UTC-Heudiasyc Lab, on a research contract basis, for over 10 years now. The creation of the SIVALab, inaugurated March 3, 2017, provides a solid 4 year base for our partnership. We chose UTC because of the excellent track-record and skills at the Heudiasyc Lab, particularly in terms of on-board data acquisition systems, which are quite unique. SIVALab is the only example in France of a Renault partnership with an academic laboratory centred on this thematic.

What new opportunities are offered by SIVALab?
SIVALab makes it possible to share human resources and equipment infrastructures. Qualified engineers and PhD students at Renault combine their efforts with the members of the UTC-Heudiasyc Lab. Some Renault ZOE (all electric) cars will be provided, inasmuch as electric vehicles lend themselves to driverless mode experiments. The electric propulsion unit is easier to remotely control. Moreover, this vehicle fits in well with the image Renault wants for its future cars: ecological, driverless and connected.

What special themes will be studied at SIVALab?
The fifteen SIVALab research scientists will study some inherently difficult problems that relate to improvement of perception systems to analyse the near-vehicle environment and its localization in reference to a land coordinate map. In order to attain this objective, we must make the data forwarded by the on-board cameras, radars and associate connections, more reliable. Current precision of GPS units is down to 1m but this is not enough to control a vehicle in a driverless mode (where a 1 cm accuracy is required). By considerably improving communication with the roadside infrastructures and with other road users in the same area, we shall be in a position to consolidate GPS data.

Safe driving

Philippe Bonnifait, a specialist in robotics at UTC-Heudiasyc Lab and lecturer in computer sciences and applications, has been appointed Director of SIVALab. He explains the

relevance and the scientific assignments of the new structure.

What role will UTC be playing in research on driverless vehicles?

Following the launch of several Cifre collaborative schemes, PAMU (2010-2015) was the name of a collaborative project which enabled us to build close contacts and exchanges with Renault's R&D teams. We were looking for a solution to foresee a vehicle park in driverless mode. The slow manoeuver speed and the fact that we are experimenting on an off-road site allowed us to design a 'first' fully automatic manoeuver, including an emergency stop function should a pedestrian get in the way. With acceptable priced sensors, we were able to design, assemble and produce a new technology accessible to the public at large. At the time, this innovation was deemed, however, to be a gadget. At the time too, we spoke of 'smart' cars rather than 'driverless' cars … Things have evolved a lot since and UTC-Heudiasyc is now in a pioneer position in this highly promising field. In 2011, UTC was awarded an "excellence" lab label under the Government incentive programme "Investments for the Future" and an 'Equipex' named 'Robotex" in which we already make use of two driverless Renault Zoe cars. The fact that our strong points and success in the field are fully recognized now led Renault logically to propose a long-range partnership with a university laboratory.

So, what specialties does your research programme cover?

Our research field choices lie in methods and systems for vehicle localization and its environment perception. With these two main themes, we focus on technological strategies that relate to data acquisition and consolidation (the data being provided by maps and GPS receivers) but this allows flexible policy decisions – our research topics can vary as we progress. Industrial priorities will be taken into account while we continue, nonetheless, to carry out the widest ranging research possible. There are numerous potential applications, not only for private cars but also for shuttle transport vehicles and robot taxis, already experimented in Singapore and soon in France. Differing from other concepts such as the Google Car, our line of philosophy, with the car manufacturer Renault Group, consists of providing the driver with an aid but not replacing him/her. The activities assigned to the SIVALab will be coherent with other research projects conducted at UTC-Heudiasyc on the same theme of driverless cars in the framework of the European Galileo geolocalization programme which became operational in December 2016.

How exactly will this joint laboratory be managed?

Before SIVALab was established, we used to sign annual research contracts which did not really allow us to envision or plan our work over a mid or long range period. Thanks to this 4 year renewable agreement, we now have a flexible and ambitious road-map with key deadlines. The next three months will be devoted to recruiting research staff. We recall that SIVALab is a three party structure: UTC / CNRS / Renault Group. A steering committee has been appointed to manage operational questions, oversee and monitor research activities. It is essential that these factors be shared. Financial arrangements and intellectual property rights for innovations made and developed in the lab will also be shared between the lab and Renault. This partnership with a major car manufacturing group enables our research activities to change scale. We shall be able to access technological means that were beyond our reach beforehand, such as smart cameras, laser sensors, latest generation GPS receivers and test-tracks for the vehicles. ■

plus d'infos ▶ View the SAVLab inauguration at UTC/ SIVALab : http://webtv.utc.fr

Nos séries > Les laboratoires de recherche

RESEARCH

Networking vehicles

For more than 15 years now, Bertrand Ducourthial from the UTC-Heudiasyc Lab has been applying his dynamic network research to connected vehicles; inter vehicle communication, analysis and use made of data from the onboard sensors are at the heart of his research programme to improve road safety and driver comfort.

Collaborative applications already enable drivers to signal observed traffic problems to other road users. The "connected vehicle" made in UTC, goes further and delegates to its vehicles the possibility to communicate with each other and, under certain circumstances, to act accordingly, independently of the driver. Innovations here are aimed notably at keeping the driver informed about road conditions ahead (traffic jams, adverse weather, back ice on roads …) and data about these conditions are collected on the Internet via road-side antennae and are redirected to the vehicles in the relevant sectors via other antennae. "The expression 'connected' is often used to designate vehicles that have a current Internet connection", details our lecturer, specialist in computer sciences and their applications. Sharing the information provided by the increasing number of sensors we find today in the test cars (outside temperature, rain …) but also using roadside WIFI antennae, the network will generate a real-time road condition "map" without need to question other road users. The objective here is to combine data from the various sources to make the overall situation picture more reliable without intruding into our private spheres. "If one driver switches on his windscreen wipers, or if an on-board sensor picks up an abnormal temperature, this information may be "false" or spurious but when several such signals concord, a rain or black-ice alert can be broadcast to all road users in the area", explains the professor.

Smart and reliable solutions

Beyond the simple inter-vehicle exchange of information, the other aim is to make the network "smart", using distributed algorithms to collect, broadcast, combine and transmit … the information in a reliable, robust, manner. Ongoing research work enables modelling of dynamic networks and allows scientists to demonstrate the efficiency of their algorithms. Various robust design techniques enable efficient connection/ disconnection protocols for the test vehicles. These algorithms also include the possibility to envisage automatic execution of tasks as a function of incoming data. When rain is signalled, the windscreen wipers and the headlights can be switched on automatically. This technology can be implemented via a simple on-board computer that connects in to the CAN (controller area network) bus of the vehicle. Bertrand Ducourthial and his research colleagues have developed an on-board 'comm' system which has been proven satisfactory. Several on-road experiments have been conducted to supplement the laboratory studies. Last December, a fleet of 10 vehicles were used in a demonstration, all fitted with WIFI antennae and GPS receivers on the roofs and with two 'road-side' antennae on a test track installed on UTC premises. Our UTC-Heudiasyc scientist is carrying out studies to improve efficiency and safety of vehicle networks. The quest to define and implement rapid, reliable solutions for constantly moving users represents a major scientific challenge. "What we did was to develop an ad hoc address-free network in which the vehicles on the road cooperate to find and connect to relevant Internet links via the road-side antennae". The risk of fraud activities – e.g., creation of virtual traffic jams to secure road monopoly situations – and remote hacking are all part of the improvements that the team are studying carefully. The scientific lead that UTC has acquired in the field of connected vehicles is an advantage and the Heudiasyc team is a recognized pioneer in driverless, smart vehicles. ■

IFSTTAR, the Universities Lille1, Valenciennes and UTC-Compiegne), 4 industrialists in the railroad sector (ALSTOM, RATP, SNCF, Vossloh-Cogifer), IRT-Railenium and 3 other industrialists: Hutchinson, Vibratec and the ESI Group responsible for overall project management and monitoring. ■

A UTC student receives prize at the Imagin'maïs competition

Marilou Simonnetto, a UTC undergraduate majoring in Bio-engineering with the elective specialty Bio-engineering, innovation, agro-resources, was awarded the "Feasibility" Prize at the Imagin'maïs competition, organized by the Maïz'Europe Federation, for her innovative foodstuff project developed in a partnership with the company Roquette: a light caramel ice-cream (-53% sugar content and - 93% fatty content). The lioght product being developed thanks to specific food ingredients technologically extracted from maize! ■

The professional Master's degree in QA (quality assessment) and performance measurement in organizations, came 3rd in the Eduniversal rating for 2017

The professional Master's degree in QA (quality assessment) and performance measurement in organizations, came 3rd in the Eduniversal 2017 ranking of the best Master's degrees, Master of Science and MBAs, in the specialty of QA. Three criteria were used to make the ranking process: notoriety of the teaching programme, salaries and professional openings obtained by graduates, plus satisfaction marks given by the students themselves! ■

INDUSTRIAL REVOLUTION

Moving towards a third industrial revolution

Inasmuch as the Region Hauts-de-France wishes to enhance the emergence of a new economy based on energy transition, it has initiated since 2013 the 'Rev3' programme to support the players in this industrial revolution. UTC - in its pioneer position in numerous sustainable development fields - is totally committed to this innovative approach. Philippe Vasseur, Special Commissioner for the Reindustrialization of Hauts-de-France spoke with Interactions' reporter about the participation of our universities and engineering schools in this ambitious project.

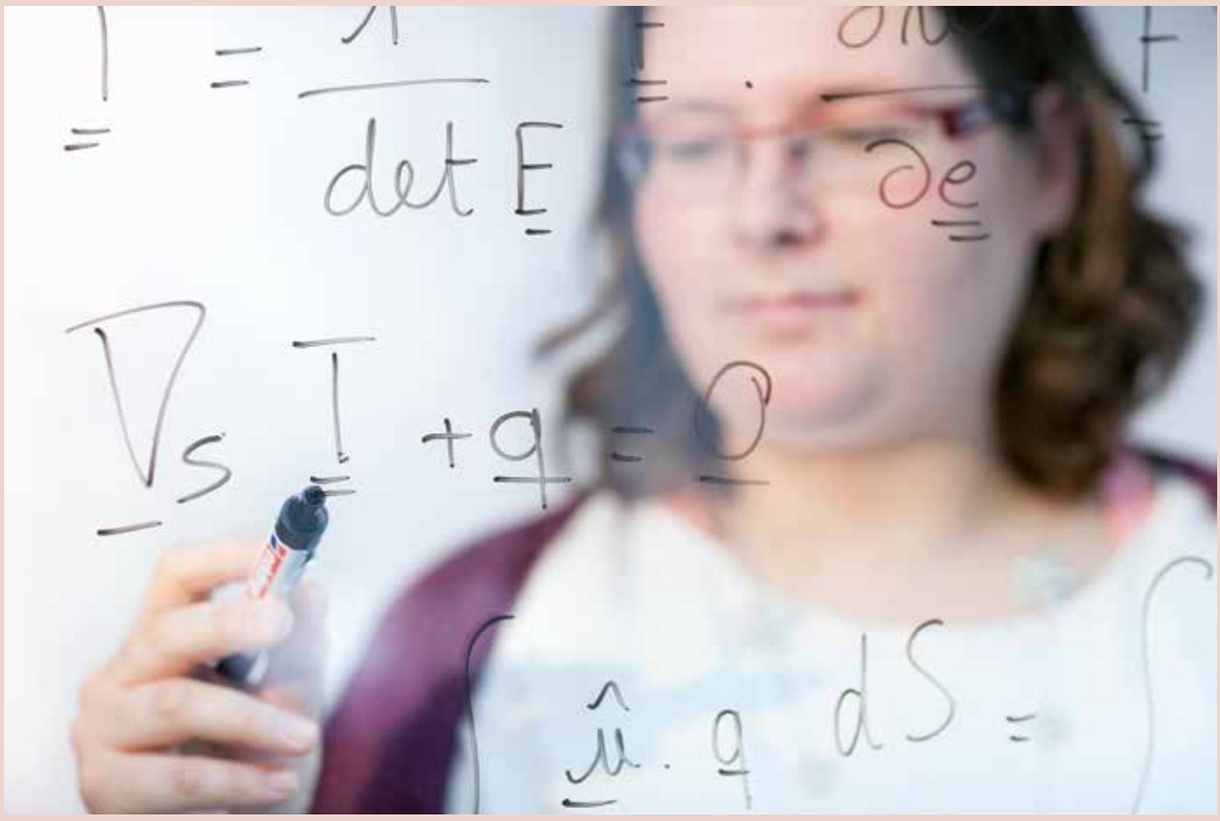
What role will Research and Higher Education play in the 3rd Industrial Revolution (so-called 'Rev3')?
Their role is primordial and the French Universities fully recognize this. So what exactly is the 'third industrial revolution ('Rev3'), when it is not an attempt to rename the far-reaching economic and societal transformations we witness today? We are living in a connected society and this ongoing revolution together with a desire to economize on resources and preserve the planet is changing the way we consume, exchange, house our families, move, produce goods and services … Scientists, research workers and students have known this for a long time, inasmuch as they are constantly at the cutting edge of innovation. It is for this reason that they figure among the first actors to move resolutely into the third industrial revolution as it impacts the French Region Hauts de France. And, if we are to judge by the increasing number of projects in our universities, research centres, laboratories, corporate clusters, they indeed enjoy a head-start in the search for innovative solutions and the implementation of new models. Let me cite the example of the Catholic University of Lille with its Live Tree project which aims at transforming the Vauban precinct of Lille (where the University is today) into a permanent campus, including several 'demonstrator' buildings; or, yet another example, the Sunrise project of the University of Lille which prefigures what a fully smart city might look like in the future.

What opportunities does our Region offer in terms of engineering and research training schemes in the fields of energy transition, digital sciences and their applications?
This Region, now called Hauts-de-France, is in fact leading the field, making a wide range of innovative offers. Obviously, UTC holds a key and privileged position with its research lab Heudiasyc; LRCS with its energy hub working on storage issues and solutions; L2EP and the laboratory for civil engineering and geo-environmental questions at Polytech Lille who are working on the theme of 'Smart Grids'. The group of engineering schools called Yncréa has just inaugurated its Master's degree in Smart Cities, this being in addition to the Cloud Computing Master's degree at INSET and the IRVE Managerial Project at the Ecole des Arts et Métiers (Lille), not forgetting "energy and environmental efficiency" at the CESI, Arras or UTC's "Chemistry- Transformation and Valorisation of Natural Resources". The Region's executive President, Xavier Bertrand, entertains the ambition to multiply the 'Rev3' projects at every level and in every location possible.

What paths are you exploring to bring academic lab work closer in line with industrial needs?
One of the paths is to see the development of the technology-intensive platforms such as the techno-centres which will provide conducive meeting points for research scientists, business executives and engineers who are working on applied research projects. A call for projects has just been launched for the installation of a methanisation techno-centre, a specialty field where UTC and UniLaSalle, Beauvais have already proven they possess the necessary expertise and skills.

How do you see UTC's participation in 'Rev3'?
I'm very proud and sincerely happy to see UTC participate with its world-renowned academic excellence. Our ambition will be to enhance and amplify the dynamics already displayed by private companies, local authorities and territories, engineering schools, universities and citizens whose desire it is to make Hauts-de-France one of the most advanced regions in the world in terms of its sustainable, connected economy and to benefit in terms of added value, competitivity and job openings. In concrete terms, this wide cooperation is already coming to be since UTC and its President were present and took part in the 'Rev3 Business Days' conference in February 2017.

What specific advantages are there at UTC to allow the university to become an important player in the 3rd industrial revolution in Hauts-de-France?
Among UTC's 9 research laboratories, 5 have direct connections with 'Rev3' via their research themes and investigations: multi-scale urban modelling (UTC-Avenues) which examines "cities and associate sustainable territories": Integrated Transformation of Renewable Matter (UTC-TIMR) and Enzyme and Cell Engineering (UTC-GEC) with their "resourced materials and production cycles"; Heuristics and diagnosis of complex systems (UTC-Heudiasyc) or UTC-LEC who analyse "smart, non-polluting transportation systems" . I should also include 2 technology-intensive platforms that have a bearing on 'Rev3': Stella used to study a dedicated micro-grid for recharge POS stations for all-electric cars, building electric supply and PLER to study electric micro-grids as well as the 'Excellency' Chairs of Green Chemistry and Processes and Smart Mobility and Dynamic territories.. ■



PhDs as key playors in innovation

In the world today, where innovation (technology-intensive innovation especially) occupies an ever-growing position, the skills and know-how of PhDs specialists in engineering sciences, notably the double degree PhD-Engineers can be seen as increasingly important strategic players. UTC intends to prepare its PhD students to fit in with this new role and associate responsibilities.

UTC today has matriculated some 330 PhD students, 60% of whom are non-French nationals and awards between 60 and 80 PhD diplomas each academic year.
The policy aim of the university is to strengthen this pool of PhD students and to increase the number of its graduate engineers who choose to pursue HE studies with a doctorate, whether it be at UTC-Compiegne or at another university. In a knowledge-based and increasingly globalised economy, faced with some major challenges (climate change, depletion of natural resources, etc.), research and innovation have become an unavoidable driving force to create added value. In this context, PhD students and graduates are (and will continue to be) key players.
"PhD students represent the main driving force in academic laboratories", underlines Dr. Bruno Bachimont, Executive Director of Research at UTC. "They alone, practically, are in a position to commit themselves 100% to research activities and to carry out long and in-depth investigations. In every university of technology that has engaged strongly in research activities, the PhD student's represent at least 20% of the institution's student population. At UTC, currently the figure is less than 10% hence the importance for us at UTC to reinforce our research capacity".

An increasingly valuable passport for enterprise

Once a PhD student graduates, he/she discovers that job openings and opportunities in university and public research laboratories are limited, but not negligible, and in France and elsewhere in the OECD countries, it often takes several years before a stable, tenured position is secured. But the importance now of innovation should encourage enterprises to open their premises to more and more PhD recruits, in particular recruiting specialists in engineering sciences. "If you want to innovate, you must be able to identify and implement original solutions to as yet unsolved problems by mobilizing your knowledge, know-how and with off-the-shelf tools," explains Prof. Olivier Gapenne, Cognitive Science/Psychology and Head of the Doctoral School at UTC. "This statement in fact summarises quite well the training engineers receive. But again, the PhDs must increasing be able to address problems where existing solutions/tools are inadequate and therefore new tools and new knowledge are needed. This is an area of skills that PhD student acquire when they work in research activities".
In the opinion of experts, in France where the prestige attached to the engineering schools' diplomas masked the interest of going for the university's highest degree, viz., the PhD, things are now beginning to change. "Increasingly, the major industrial groups are recognizing the specific skills of PhD graduates and requesting their input",

UTC: OLIVIER GAPENNE, FORMER DIRECTOR OF THE UTC-PHD SCHOOL (NOW DEPUTY DIRECTOR) AND CHRISTINE PRELLE, THE NEW DIRECTOR.

notes Vincent Mignotte, director of the l'Association Bernard Gregory (ABG), a structure for over 40 years now has been assisting the world of PhDs to move closer to that of the entrepreneurial world. "What is new here is that SMEs are also recruiting PhDs and very often these small companies are faced with innovation challenges in a world where ruthless competition rules and they need staff capable of 'thinking diagonally and not traditionally. Today most thesis offers and job openings we post on our web-site come from the' SMEs. The major Groups, who were our mainstay customers 15 years ago, now forward their requests directly to the 'doctoral schools'". This observation is also shared by Clémence Chardon, Head of the recruitment service of Adoc' Talent Management, an agency that specialises in recruiting PhDs. "An increasing number of companies are recruiting PhDs today. Those that contact us are mostly SMEs or start-ups and their business lies mainly in advanced scientific and technical areas, such as aeronautics, biotechnologies, data sciences …". Moreover, a distinction to be made with engineering diplomas, some of which are not recognised elsewhere, is that the doctoral PhD degree is accepted round the world. It represents a precious passport for a high level international career. "In some counties, it seems ludicrous to entrust a managerial post to someone without a PhD, even if the person has been awarded a prestigious engineering diploma", says Vincent Mignotte. "This is one reason why French multinational groups are recruiting more and more PhDs".

Initiating future engineers to research activities

The trends we observe benefit especially to PhDs who already have an engineering degree. For example, we find those who were recruited in the context of the "Young PhD incentive" where a tax relief (reformed in 2008) was conceded to companies that recruited a freshly graduated PhD to a researcher post on a no-time limit contract basis*.

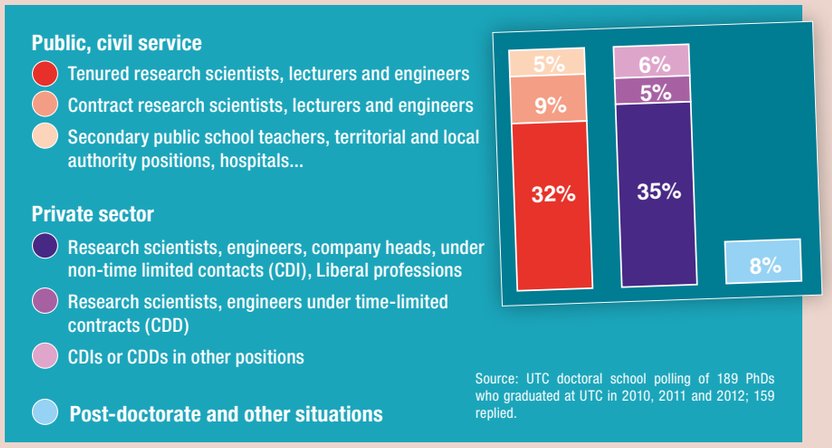
Today, only 4% of graduate engineers from UTC pursue doctoral studies at UTC. In order to increase this fraction, our University is considering an action plan to make UTC students more aware of the research world as and when they start their engineering courses – for example, giving them some small research projects or encouraging them to do one of their one-semester placements in a research laboratory (internal or external). "The challenge", underlines Olivier Gapenne, "is to forearm the students who do not pursue their studies beyond their engineering diploma. As the situation evolves, it is important toady to have them understand that the professions of research scientist and engineers are naturally different but not contradictory, nor exclusive one form the other. And if the engineers are working on a project with a company, it is in their interest to put themselves in the position of a research scientist, if only to be able to discuss matters with the PhD colleagues (or other academics) and to become involved themselves in the process of advancing our knowledge-base".
In order to attract more PhD students, including candidates from other HE institutions an d to provide a better visibility for recruiting officers as to high quality of training these PhD students will receive, the University has also implemented a quality policy programme over the past few years in regard to its PhD degree award, putting it on a par with the UTC engineering diploma. As is the case for other doctoral schools, UTC's school for example has set up training modules that are design to reinforce the 'employability factor' of its PhD graduates. The objective notably is to provide a clear insight into the entrepreneurial world, but this now a standard approach. Where UTC proves original is that we try to make them aware of the need – whilst being experts in their specialist fields – to build up and possess a solid scientific and technological culture in their specialty. "Whether they move towards the entrepreneurial world or to the public research sector, most of our graduates are not in fact recruited in their thesis specialty, but into a nonetheless close area of expertise", explains Bruno Bachimont. "They must therefore show their capacity to adapt rapidly to new subjects. Moreover, they will be increasingly expose to complex problems for which no single approach proves satisfactory. Last point here: private companies need experts to find solutions for specific technological obstacles, but they also need 'visionaries' capable of anticipating changes in their specialist areas and to enhance innovative products and processes. In other words, as far as PhDs are concerned more professionalism means more science".

Zero unemployed among UTC's younger PhDs

The high quality policy thrust of UTC also calls for valorisation of its PhDs. This is embodies in the Guy Deniélou Prize, the most recent edition of which took place on April 7, 2017. Every year, this Prize sheds light on the work of its younger research scientists population, selecting 4 recent graduates whose achievement were of special interest to a jury of experts.
As you read the experiences of these UTC PhDs in the next few pages, you will no doubt agree that the quality of their work deserves the recognition they get elsewhere: most of them were recruited very rapidly, often before they have made their public thesis presentation and this is confirmed by our polling enquiries. Globally speaking, the graduates, over the years 2010-2015, took between 2 to 3 months to secure their first job and it was noted, 3 years after graduation, that none of the PhD graduates (for years 2010, 2011 and 2012) was unemployed. 46% are currently employed in public service positions, 46% in the private sectors, the majority as lecturer-research scientists, research workers (as scientists or engineers) and all enjoy a stable job position. ■

* [Ministerial assessment of the impact of the "Young PhD » incentive in the Government's tax rebate programme - Report to the French Ministry in charge of HE and Research (MENESR), October 1915].

Professional situation of UTC PhDs 3 years after graduation

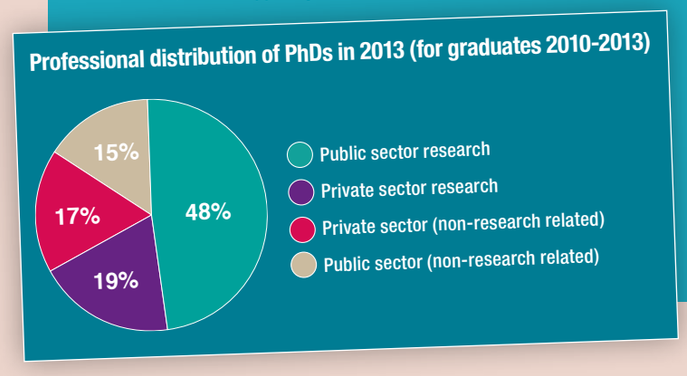


Source: UTC doctoral school polling of 189 PhDs who graduated at UTC in 2010, 2011 and 2012; 159 replied.

Professional prospects for PhDs in France

A clear-cut added value of the PhD with respect to the Master's degree 2

France awards around 14 000 PhDs per year, 40% of whom are non-French nationals. The most recent enquiry of the CEREQ (French national agency for analysis of qualifications) looking at the 3 year horizon mark of French national PhDs living in France, particularly the 2010 graduates (not including the health sector).
In 2013, the unemployment level, independently of the specialist area, was still relatively high: 9%. Nevertheless, it has dropped by 2 % over the decade. And of special note, the level is now below that of the Master's 2 degree, around 12% since 2010 but only 7% in 2007.
In contrast, however, it is higher than the comparable figures for graduates from the engineering schools (4%). However, the situation is highly contrasted depending on the specialty of the PhDs.



Advantage in computer sciences and applications, electronics and engineering sciences

PhDs in in computer sciences and applications, electronics and engineering sciences are those for whom the access to a first job is shortest in lead-time and who – 3 years after their graduation - have the lowest unemployment rate and the less employed under CDD (time limited) contracts. The fraction of those who are unemployed or under CDD contracts is higher than those with an engineering diploma but this can be explained by the difficulties inherent to securing a job in public research (for those who have chosen this career path). But they are almost all considered as being at management level and in terms of their median salaries can vie with the engineers.

Engineering diploma + PhD – the winning hand

PhD graduates who also hold an engineering diploma can access the employment markets easier than PhDs in the same specialty field but without an engineering degree. In 2013, three years after graduating, only 5% of the double degree category were still unemployed and 17% were engaged under time limited contracts (CDD). In the second single degree category, 12% were unemployed and 40% under time limited contracts.

Sources:
- 3 year Job horizon for PhD graduating in 2010 – Enquiry for Generation 2010, interrogation for 2013, CEREQ, Dec. 2015.
- Scientific employment status in France – joint report 2016. HE and Research Directorate General, Research and Innovation Directorate General.

"PhDs possess a primary asset: the capacity to dare propose breakthrough solutions"

Sector Group is a consultancy company that specializes in the field of risk identification management. It is an SME with 120 staff that employs 4 PhDs and is also recruiting a PhD students in the framework of a CIFRE contract (industrial agreement to train via research) with the UTC Heudiasyc laboratory. Their Chairman, Jean-François Barbet, spoke with our reporters.

Why are the specific skills of PhDs of interest to you at Sector Group?

I myself am not a PhD. I was initially trained as an engineer and as a research scientist: I began my professional career at the R&D Division of EDF (French electricity utility), to study various probabilistic ways to measure security factor in the domain of nuclear power production. That early career experience and my professional follow-on convinced me that if we want to develop activities that integrate innovative products and process, then the appropriate path is via research. And, given that PhD graduates are trained in research protocols, the PhDs possess a primary asset: the capacity to dare propose breakthrough solutions and to explore paths that are not yet covered in teaching courses or in industrial reference texts; in contrast, young graduate engineers has not been prepared to adopt this sort of attitude.

To what extent is this important for your company's activities?

Our work is spread over a wide range of activities: energy, railroad, automobile, aeronautics … one half of our projects relate to existing installations (for example, reinforced measures for nuclear power stations, integrating return on experience (ROE) and the other half on new subjects such as increased autonomy in road vehicles. In our fields it is important that we deploy considerable efforts on R&D to better meet our customers' needs and expectations today and to ensure our own future: we must learn all the time what the market-place is saying, today and tomorrow. Remember that the culture of research is doubt and this is primordial when you work in the field of risk identification and management.

What will be the area of work assigned to your CIFRE PhD student?

The answer here is predictive maintenance maths models, aids to decision to enable fine analyses when we are required to intervene in an operational system, therefore necessarily taking real conditions in to account. We are constantly working on research projects in partnerships signed with the universities: recruiting a PhD student is another way to build strong links with the academic world to enhance our R&D. But our objective must also be to recruit the graduate after his/her thesis years. This is all the more important that SMEs find it difficult to attract high level scientists, who indeed often prefer to join a major company structure. ■

* A CIFRE contract allows a company to receive a State subsidy to recruit a PhD student where the research work will be overseen by experts with a public laboratory.

Clément Zinoune
Clément Zinoune PhD, UTC, at the UTC-Heudiasyc Laboratory, engaged by Renault Automobile Group.

Designing, building *tomorrow's cars*

After presenting his thesis on driver-aids, Clément Zinoune joined a special team at the Renault research and development division working on the theme of driverless cars.

Clément gained his UTC degree majoring in Mechanical Engineering, with the elective specialty of Mechatronics and System Robotisation, plus a Master's degree (in parallel) on, flight dynamics and drone control systems at the University of Cranfield (UK). He could have stopped there (in terms of his qualifications) but, having spent a semester on a research topic, that convinced him that a PhD would also be in order – this turned out to be a very wise decision.
In 2011, he was accepted on a CIFRE contract with Renault to do a thesis on driver aids, under the academic supervision of Prof. Philippe Bonnifait, UTC-Heudiasyc. "At the time, Renault was orienting its product policy in favour of driver aids that made good use of the data provided by the vehicles on-board navigation system: for example, warning a driver when he/she takes a road bend too fast (as seen on a road map). The fact is that navigation systems do contain errors. My research was therefore focus on setting up a methodology to identify errors and correct them accordingly: when a vehicle passes the same spot several times, the system compares the real trajectory with what the nav.sat is indicating – this allows you to correct the cartography and make the driver aids more reliable. I did not want to commit myself exclusively to 'blue sky' research, i.e., 100% in a laboratory, but preferred to work on innovative subjects with a connection to industrial concerns. For me the CIFRE contract represented a perfect balance".

An efficient bootstrap

Clément Zinoune defended his PhD thesis in 2014 and was immediately recruited to join Renault's R&D Division, in a newly created unit on a highly strategic subject: driverless cars. "In the beginning, we were two and my role was to develop the cartographic data for the vehicle (directly in connection with my thesis) but also to study what form, what level, of intelligence to add to the navigation on-board system and his was quite novel for me. Today the team has 15 members and my job is to coordinate the development of the various bulldog blocks that constitute the vehicle's intelligence, each brick having its own pilot system". For some of the bricks, in particular vehicle localisation and perception of its environment, Renault is working with UTC-Heudiasyc Lab for whom the driverless vehicle is a flagship research subject. This represents a collaboration which, in March 2017, led to the creation of a joint lab (SIVALab, cf.intra p.2). Young graduate as he is, Clément Zinoune is obviously an active participant. ■

The project he is managing ... *is strictly FYEO = confidential*

Michel Boussemart
PhD, UTC, at the UTC-LMAC Laboratory, executive engineer at the Defence Research directorate (DCNS)

Michel Boussemart's thesis in applied mathematics relates to aeronautics. For the past 10 years he has been working for the DCNS (naval defense systems).

Michel first gained an engineering degree in computer sciences and their applications and a DEA (advanced diploma, equivalent to today's Master's 2 degree) in system control at UTC and then did his PhD under the CIFRE contract formula at Snecma (one of the companies in the Safran Group) under the academic supervision of Prof Nikolaos Limnios, UITYC-LMAC Lab.
Michel defended his thesis in 2001, the subject being development of theory and stochastic computations and methodology, plus aids to decision, in the area of aircraft jet engine regulation processors. "Very often, when we prepare for an engineering diploma, the aim is to rapidly integrate the entrepreneurial world. At that stage we are not necessarily, aware of what PhDs do and we tend to imagine them totally isolated from the world in their laboratory. Personally, I was fortunate inasmuch as Nikolaos Limnios dealt with concrete industrial applied maths projects in his lectures at UTC. It was this applied facet to research activities that I found interesting. That encourages me to register for a PhD under the CIFRE arrangement and this way I learned to use rigorous mathematical methods to identify and develop novel responses for industrial problems".

A profile that makes all the difference

This methodological skill was not put to use immediately. When his thesis was accepted and the PhD awarded there was a crisis situation in aeronautics in the aftermath of the Sept.11, 2001 attacks in New York. This also led Michel

Boussemart to widen the scope of his activities and redesign his career path. For several years, he was recruited to various engineering posts in a number of different companies.
In 2007, he moved to the DCNS Group. “I was recruited as an SLI architect (integrated logistics support), and my role was to design the full maintenance programme for a submarine and I think I was hired more as an engineer than as a PhD. Over time, I was able to add the extra research dimension to my work as I in, fact wanted to do. Since 2013, I have been in charge of a confidential project with a high software content, and for which my PhD background was clearly an advantage for me compared with the other candidates for the position. As the recruiters saw things, there was an advantage here in terms of architecture optimization and system maintenance programmes. But I also make use of my research scientist background to speak at international conferences on industrial issues such as operational safety factors and assessment. It also helps increase the notoriety of the DCNS Division and allows us to keep a watch on development of new knowledge that can trigger or enhance innovation”. ■

A social science expert in *the Big Data world*

Lénaïk Léyoudec presented his PhD thesis in computer sciences and their applications under the academic supervision of Professor Bruno Bachimont, in the framework of a CIFRE contract associating the UTC laboratory and a start-up. Today Lénaïk is a consultant with this start-up company.

Perfect Memory is a start-up founded in 2008 by a UTC graduate Steny Solitude. Its field of business activities is that of data management. The company has developed a technological platform to collect raw data which are’ transformed into ‘digital capital assets’, i.e., knowledge that can be used in numerous domains (marketing, trade, document management …) and has customers in divcerse sectors (media, distribution, banks and insurance, defence …).
Lénaïk Léyoudec discovered the start-up in 2012 when he was doing a Master’s degree in history and the history of art, with the elective specialty in valorization of cultural heritage. “I chose to do my degree dissertation on valorization of private audiovisual heritage. At that time, Perfect Memory was also working in the same area and had designed a tool to manage family-related information: “Famille®”. I did my end-of-studies placement with them”.

When semiotics fosters technologiocal reserach

It was at this occasion that the idea came to be to do a CIFRE contract PhD on how to edit family films, using a unique approach close to the research philosophy of UTC-Costech Lab work: bringing in social sciences and especially semiotics : to generate editing and ergonomic recommendations to improve the Family® service offer.
“The objective is to provide users with an interface that enables them to annotate AV archives to enhance circulation of souvenirs in family circles”, explains Lénaïk Léyoudec. “For this purpose, I studied a corpus of 20 or so films, sequence after sequence, identifying recurrent ‘markers’ which I decomposed into signs which I analyzed to propose new functionalities in the Family® Web app. To illustrate there is the face-camera position (the person filmed is looking straight at the camera)”.
“My research provided the scientific basis for Perfect Memory which will, lead on to registration of patent claims,” underlines Steny Solitude. “The issue of how we can annotate archives – which the PhD student Léyoudec studied – is also valid for B2B operations (Business to Business). When this question is analysed, comparing the work for ‘silent’ family films and the solution for a major industrial group, a large fraction of the question has been solved”.

Lénaïk Léyoudec
Lénaïk Léyoudec, PhD, UTC, at the UTC- Costech and Heudiasyc laboratories and Consultant for a start-up

Building up the ‘employability’ factor

Lénaïk Léyoudec – who presented his PhD dissertation in January 2017 – was recruited on a no-time limit contract (CDI) basis as a semiotic and user experience consultant to design the solutions developed by the start-up. “To a large degree, I built up my employability during my CIFRE contract, inasmuch I had already received operational missions on behalf of Perfect Memory. This was not easy: the corporate world is not at all comparable with the academic world and in a start-up nobody really has any spare time to help you adapt to a professional context. But it was this experience that enabled me to clearly find my heading: I was able to continue working in my specialty area, whereas as often social science graduates orient themselves towards sectors other than those of their original specialty”. ■

His flagship theme: *cybersecurity*

Mohamed Sabt is one of the 4 laureates of the annual Guy Deniélou 2017 Prize for UTC's PhDs. His research work has already led to practical fall-out applications, throwing light on the loopholes in the security of two systems (one of which is Android) and opened the way for him to join a start-up company.

Mohamed Sabt hails from Bahrein and came to Compiegne. He first followed intensive French language classes for 6 months, studied for his engineering diploma majoring in computer sciences and their applications, a Master's degree on 'smart' transportation systems … Then, in 2013, he joined Orange Labs (Orange's R&D Centre), doing a CIFRE contract PhD, under the academic supervision of Prof. Abdelmadjid Bouabdallah, UTC-Heudiasyc Lab.

He presented his thesis in December 2016, on smartphone security for sensitive apps such as on-line payments. "To begin with, I studied the limits of today's technologies using a proven security protocol – a sub-branch of applied maths which enabled me to determine if a system is "safe" or not and to identify its loopholes. With this method, I was able to identify several vulnerabilities in two largely used systems – the key warehouse of Android (which houses the cryptographic keys for the OS) and the SCP secret protocols of GlobalPlateform, a consortium of smartcard leaders. Six months before I published my results – I informed the Security Team at Android so they could fix the loophole(s) and also contacted and GlobalPlatforme, who immediately set up a task force to take my analyses into account".

A profile that makes all the difference

It nevertheless remains true that proving the safety factor (or lack of) for a complex system using only mathematics is a time-consuming operation. Again, modern

Professor Abdelmadjid Bouabdallah, Director of UTC's Computer Science Department and research scientist at the UTC-Heudiasyc Lab, answers our questions

From UTC-Heudiasyc's standpoint, what was the challenge of Mohamed Sapt's PhD thesis?

Cybersecurity is a strategic theme where UTC-Heudiasyc scientists have a set of world-class skills that have been recognized over the past 15 years. The research team has designed several innovative solutions in this field, one of which is currently under development with a start-up project. Mohamed Sapt's thesis (which covered several challenges in a new domain) reinforced our team's expertise and the importance of our collaboration with Orange Labs, a partner with whom we have been working since 1998 and who recruit PhD graduates, notably from those we have trained at UTC.

How can you encourage student engineers to become interested in pursuing their studies with a doctoral thesis?

My belief is that they should be induced to look at research activities far before envisaging to sign up for a PhD. In this light, Mohamed Sabt is a good example. To begin with, we proposed that Mohamed take on a small research project on smartphone transactional security in the framework of a collaboration with Orange followed by an in-house placement with Orange. And to the extent that he displayed a high degree of interest for research activities, we drew up a thesis subject with Orange Labs that we thought would interest him. This is an approach we have employed with several of our obviously talented students.

mobile phone technologies evolve very fast. Mohamed Sabt therefore chose to explore a complementary path. “In order to offer better protection for some of the smartphone’s sensitive apps, it is possible to run them on a TEE, short in English for trusted execution environment), implemented on a specific component and which runs in parallel with the main OS (for instance, Android). In this way, if the main system comes under attacked the parallel system is not and the data/functions are preserved. To optimize the process, I proposed a methodology based on a very advanced cryptographic protocol which enables the users to make “apps” running in a TEE to be even more secure”.

Mohamed Sabt
PhD UTC, with the UTC-Heudiasyc Lab, recruited by a start-up

So, what did Sapt learn from this work? “Gaining new in-depth knowledge, of course but more than that: doing my PhD is a way to have a go at a problem nobody before you has done; managing a first big project lasting 3 years; building up a critical cultural outlook by analysing numerous and often contradictory scientific papers on the subject; learning to draft one’s own high-level articles”. These are among the skills that Mohamed Sabt chose to offer to a star-up founded by some former employees of Orange Labs: Dejamobile, developing secure on-line payment protocols. “My mission with them is to offer an expert’s eye on short term apps for Dejamobile and to anticipate technological progress in the field to preserve our lead in security issues and solutions. In a business company context, you cannot afford to do just basic research. And, for the time being this is what I wanted to do – applied research, with the advantage that this is exactly what start-ups do, viz., they take risks to rapidly deploy innovative solutions”. ■

“When I saw the VAE* developing, *I decided to join in*”

Florent Bouillon, an engineer with the Safran Group, 45 years old, chose the VAE path to prepare and defend a PhD this under the academic supervision of Prof. Zoheir Aboura, UTC-Roberval Laboratory.

Why did you choose to do a PhD?

After gaining my engineering diploma, I decided to join Aerospatiale, attracted as I was by programmes such as Ariane V – and from that point on, I was always engaged in R&D activities. Today my position is in structural programme development with Safran Ceramics – Safran’s “excellence’ centre for research on very high temperature resistant materials. The subject chosen for my PhD came through discussions with my colleagues: foreigners who are not familiar with the French engineering diploma were surprised that I did not have a doctorate, and indeed many people in France thought that my work was more akin to a PhD research scientist than a ‘classic’ engineers working hands-on, so to speak. And the idea sort of grew me and as I saw the VAE scheme developing, I decide to join in.

Florent Bouillon
VAE PhD student at the UTC-Roberval Laboratory, recruited by the Safran Group

What is the procedure leading to the VAE diploma?

I authored a dissertation (170 pages) with the title “Contribution to methodological development when justifying and certifying composite materials for use in aeronautic structures”, which I shall present and defend in June. It is a standard synthesis of research and work carried out during my professional engineering career. The aim was to present methods developed top assess and certify the behaviour of structures assembled with a new composite material to ensure that it complies with the operational service constraints and the specific safety regulations that are specific to the aeronautic sectors. Another objective was to demonstrate that the work I had accomplished in my professional environment was at the same level of quality as that of a classic PhD student. However, a VAE dissertation has an extra feature, compared with the classic PhD thesis. VAE candidates are invited to analyse their previous experiences, over and above the scientific results and achievements. Taking the time needed to analyse one’s own track record is not at all easy, but is amazingly enriching.

5
PhD students annually via the **VAE** scheme currently at UTC

When all is said and done, it is a demanding exercise. I thought I would need a year and a half (max) but in fact I took three years remembering that at the same time I was in charge of a project at Safran, Ceramics (with a topic related to my PhD thesis): to manage the certification of a ‘world first’ part with a composite on a ceramic matrix to be installed in a civil aircraft.

Why did you choose UTC-Roberval to write your dissertation?

Lénaïk Léyoudec – who presented his PhD dissertation in January 2017 – was recruited on a no-time limit contract (CDI) basis as a semiotic and user experience consultant to design the solutions developed by the start-up. “To a large degree, I built up my employability during my CIFRE contract, inasmuch I had already received operational missions on behalf of Perfect Memory. This was not easy: the corporate world is not at all comparable with the academic world and in a start-up nobody really has any spare time to help you adapt to a professional context. But it was this experience that enabled me to clearly find my heading: I was able to continue working in my specialty area, whereas as often social science graduates orient themselves

towards sectors other than those of their original specialty".

What personal benefits do you think you will draw from a PhD award?

Avant tout, un plaisir et une fierté personnels, ce qui était ma motivation première. Ensuite, le titre de docteur est reconnu à l'international. D'autre part, pour favoriser l'innovation, Safran a mis en place une filière d'experts, qui Above all other considerations, there is my pleasure and pride, and these constitute the first source of my motivation. Secondly, the title "Dr" is recognised internationally. Moreover, in order to enhance innovation, the Safran Group has set up a family of experts, with three levels – corporate experts with one of the Group's companies, experts for and with the Group and emeritus experts. I myself am a corporate expert and, even if it is not an 'open-sesame' key, a PhD is a form of proof that can help me become a Group expert. But I must add that my personal objective – shared by the Safran Group – is to be able to work in an interaction with the academics and not just sub-contract research projects on a customer/supplier basis. By investing time, efforts and energy to gain my PhD, I, in fact, gathered the assets to progress even further and this is enriching for me, for the Group, and for the partner laboratories

450
PhD graduates
and **185**
PhD students with the Safran Group

You are now recruiting PhDs yourself – what profiles are you looking for?

Safran Group likes PhDs and recruits a lot of PhD students under CIFRE contracts. Often, in research clusters we mostly find young PhD students who already have an engineering diploma, to the extent that a 'double degree' (PhD + engineer) is an advantage and after defending their dissertation thesis, many are recruited by the Group. But it is not always obvious to find candidates here. ■

* delivery of a state diploma on the vetted basis of at least 3 years professional experience.

Thesis Prize
The Airbus Safran Launchers poster Prize
2017

His field of expertise : *metallurgical analyses*

Benoît Dylewski is one of the laureates of the Guy Deniélou 2017 Thesis Prize. Benoît did his thesis work at UTC-Roberval in a project theme that involved the RATP (Greater Paris Public Transport consortium); the RATP recruited Benoît Dylewski after his PhD award.

With increased train passenger capacities and, consequently, their increased loads, the issue of rail cracks by fatigue has become more acute. How can we prevent this risk leading to a rail catastrophic break? This was the core question of Benoît Dylewski's thesis, a major issue for rail transport companies (as well as for UTC with its numerous projects in this field and its role as founder member of the "institute for technological research" Railenium, one of the institutions created by the Government under its incentive programme "Investments for the Future".
This thesis is part of the Railenium framework initiated by the UTC-Roberval Lab and Cerfiver and was supervised by two Roberval research scientists, Salima Bouvier and Marion Risbet. "My job related to a Cerfiver project directed by the RATP (as the industrial partner)", explains Benoît Dylewski. "I carried out experimental analyses on rail segment samples provide by the Paris Region rail services, with the objective to characterize the microstructural, physicochemical and mechanical changes that accompany increased load factors. I then compared the experimental data with digital modelling results. This approach enabled me to improve our understanding of gradual deformation and cracking of rails – which was the main objective – but also to issue some recommendations to improve predictive maintenance and to avoid catastrophic rail failures".

A real added value

The three years were especially rich for Benoît Dylewski: "Over and above the expertise I gained in this specialist field, I also acquired the mastery of experimental analytical tools and methods more than when I was doing my engineering diploma studies. I also enjoyed an in-depth experience of partnership research between an academic research laboratory and an industrialist. I was able to take part in

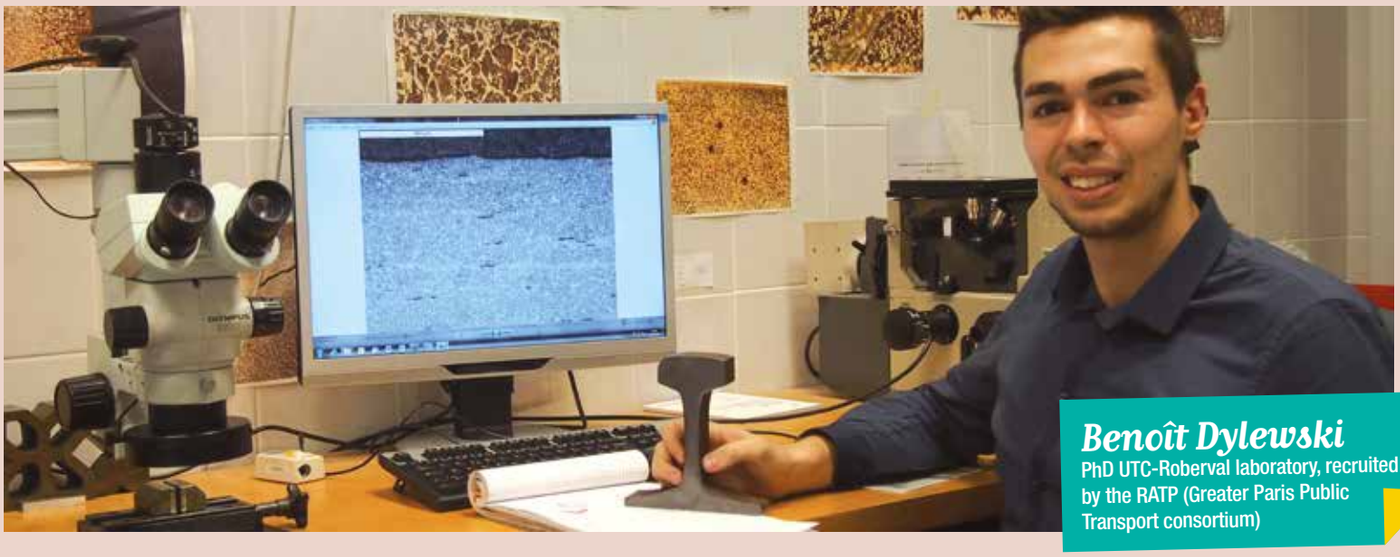
Rémy Foret , Executive Director of the RATP-LEM Test Laboratory, answers our questions

We saw that end-2016, the RATP-LEM lab (which employs 70 staff) recruited 3PhDs, not counting Benoît Dylewski. Is this a deliberate policy decision?

In fact, we do not have any specific desire to recruit PhDs rather than engineers, but it is not by chance that we do recruit them. They display technical aptitude and skills in terms of analysis, abstraction, and their capacity to frame questions … all of which is of interest to us as employers. We definitely need people capable of analysing complex data generated via our test protocols. Moreover, in order to preserve the legitimacy of our company, we must necessarily innovate, identify and implement new methodologies, new test protocols and equipment and this presupposes that we possess a state-of-the-art technological review, feasibility studies, development programmes. Tasks like these are akin to research activities and it is here that the skills of a PhD are very important.

What specific profiles are of special interest to you?

When we consider hiring people, we have them fill in a questionnaire to assess their scientific and technical skills, and to evaluate their managerial potential. Our scientific and technical criteria are very stringent and an engineer who has only had project management eXperience may well not fit the bill. But there again, a PhD with a 'pure' lab scientist profile, no special talents for management and no experience at all of the industrial world will not a priori comply either. What we prefer are the PhDs with an engineering diploma who did their thesis in a CIFRE contract or who have had some previous industrial experience.



Benoît Dylewski
PhD UTC-Roberval laboratory, recruited by the RATP (Greater Paris Public Transport consortium)

international conferences and I taught too at UTC, which allowed me to disseminate my research results. That was a real added value in respect to my engineering diploma".

Before presenting his thesis, in December 2016, Benoît was recruited by the Test & Metrology Lab (LEM) of the RATP consortium. The LEM Lab has three specialty sectors – mechanical engineering, electricity and physico-chemistry – and carries out a wide and varied range of tests and measurements for all the ingredients of urban transportation (rolling stock, infrastructures, equipment, stations: lab experiments to assess, for example, parts provided by suppliers to ascertain that they comply with technical specifications, or analysis of failed parts … but there are also in situ tests to certify new rolling stock or to measure air-quality in the Paris underground system. Benoît Dylewski is a QA test engineer specialist of metallic part failures who works in the mechanical engineering division of LEM.
"When I began my PhD, I did not know whether I was going to look for a job in industry or prefer to be a lecturer cum research scientist. Finally, after 3 years in a lab environment, I decided the industrial world was more attractive. But I don't exclude the possibility of returning later to academic research activities. ■

His employer: *one of the best universities in China*

A large fraction of UTC's PhDs look for a first appointment in the academic world. For instance, Baochao Wang, who presented a thesis on non-renewable energies, under the supervision of Professors Manuela Sechilariu and Fabrice Locment, UTC-Avenues Laboratory.

In China, as is the case in France, the number of PhD graduates coming onto the market-place largely exceeds the number of positions offered in HE and public research establishments, hence more and more young PhDs are looking to the entrepreneurial world for a first job. Baochao Wang, as soon as he had successfully presented his thesis in 2014 was recruited as lecturer cum research scientist at one of China's best universities, the well-known Harbin Institute of Technology (HIT).
His passport to China was the doctoral degree in the framework of a programme associating the Chinese government agency supporting university student and staff mobility, viz., the China Scholarship Council (CSC), and the French networks of Universities of Technology (UTs) and the INSA engineering institutes. "In the beginning, I prepared for a Master's degree in Electrical Engineering at HOIT and had not then thought about doing a thesis", says our young PhD. "But my Father advised me to pursue to the doctoral degree to widen my career prospects. I applied and went for an interview at HIT and discovered that the CSC could award me a doctoral degree scholarship, for other Chinese students who wish to present themselves for a PhD in one of the French UTs or at an INSA.

Baochao Wang
PhD at the UTC-Avenues Laboratory, Lecturer cum research scientist at the Harbin Institute of Technology (HIT), China

A strategic subject: "smart" electric micro-networks

In the framework, of this international mobility programme, UTC's Avenue Laboratory proposed a thesis subject in one of their mainstream research areas – smart electric micro-networks integrating (at the scale of a building: a renewable electric power generator (notably PV solar panel arrays), a power storage system and a classic power back-up generator. The challenge here is to produce electricity, manage production and consumption in such a way as to feed the building at the lowest cost and privilege, wherever possible, the renewable power source. And Baochao Wang adds: "Renewable energies represent a strategic field and I found this highly interesting. The very idea of doing a 3 1/2 year PhD in France (where it usually takes 4 to 5 in China) also attracted me. I sent my application to UTC-Avenues and they selected me. But, before leaving for France I signed a contract with HIT authorities who pledged to hire me on my return to the extent that Chinese universities hold in high esteem the quality of French HE institutions selected by the CSC to send Chinese nationals abroad.
All of this represents a highly demanding set-up with discovery of a new language and a foreign country … my experience in France was sometimes hard, but very rewarding for me. "Of course, not only did I acquired a lot of complementary in-depth knowledge in electrical engineering, but in addition too learned how to organise research assignments and how to draft a paper for a scientific review. In France you enjoy have a culture for organization, going as far as (and including) how to write correctly which I must admit is not the case in China!" ■

The team of the PhD School at UTC

4 « Excellence » Prizes 2017

The Guy Deniélou 2017 Thesis Prize

The Guy Deniélou Thesis Prize rewards the excellence of technological PhD research conducted at UTC and the professional skills and potential displayed by our PhD students.

THÉOPHILE GAUDIN
ISABELLE PEZRON

Théophile Gaudin for his work on biomass

The ARC Prize

Théophile's work consisted in developing ways to assess the performance of surfactants needed for detergents and cosmetics. The renewable surfactants he studied come from sugar compounds, so as to encourage alternate sources to fossil resources, in the majority of uses today.

MOHAMED SABT
ABDELMAJID BOUABDALLAH

Mohamed Sabt on cyber security

The Société Générale Prize

Mohamed research focused on smartphone security factors, for sensitive operations such as on-line payment. He was thus able to propose an advanced cryptographic methodology that enabled such operations to be made more secure.

Laura André on methanisation

The Hauts-de-France Environment Prize

Her thesis proposes an alternative to liquid phase methanisation and focuses on removing the scientific and technological difficulties for dry path methanisation, also called the "discontinuous phase" technology and this enables farm manure to be more efficiently valorised.

LAURA ANDRÉ
ANDRÉ PAUSS
THIERRY RIBEIRO - UNILASALLE BEAUVAIS

Benoît Dylewski on Railroad security factors

The Airbus Safran Launchers poster Prize

Rails segments can undergo cracking due to metal fatigue and, in a catastrophic configuration, could lead to derailing of a train. After analysing samples for the Paris RER rail lines, Benoît was able to study significant microstructural, physicochemical and mechanical features and, consequently, to make recommendations for preventive maintenance operations.

BENOÎT DYLEWSKI

The video of the 2017 Guy Deniélou Prize ceremony (and previous editions) can be viewed at:

http://webtv.utc.fr

Notre quotidien > Valorisation & stratégie d'innovation

A new look at the full history of wastes

As a research engineer at IRSTEA*, Dr Christian Duquennoi is (and has been for a long time) an enthusiast when it comes to wastes and 'garbology' (the science of wastes). He was rewarded by a "Public category" Prize and a Heart-throb media Prize at the annual Roberval Prize event. His book « Les déchets du big bang à aujourd'hui » [Wastes from the Big Bang to Today]. Interaction reporters talked with the author.

DID YOU KNOW THAT ?

Over 30 years, the UTC Roberval Prize preselection committees have critically assessed close on 6 000 books, from 31 French language speaking countries.

Jamy Gourmaud (with his co-author Jérôme Mignard) was awarded the "heart-throb" prize by local Oise school-goers for his TV programme "Le monde de Jamy: dans le secret des bâtisseurs [Jamy's world- building trade secrets".

D'où vient votre passion pour les déchets ?

Well it is a scientifically passionate field, despite the somewhat revalorized connotation it still occasionally carries. It is a highly transverse area which call for both basic hard sciences and social sciences. It is a universal theme. All living creatures and the universe itself produce wastes. It is not something specific to Mankind! In a sense, it gives a photographic negative of the organisms or structures that produce them. It is thanks to wastes that astrophysicists characterize stars. Sociologists and archaeologists analyse how societies operate by analysing the contents of garbage cans. The way we deal with wastes says a lot about social styles and life-styles … The associate industrial sector now calls for extremely complex technologies. Numerous professional opportunities are offered to engineers and scientists. My personal path allowed me to study questions of storage and confinement of wastes (which can be radioactive and/or household wastes). Currently, I am investigating bio-processes that enable you to extract molecules of interest (notably alternatives for hydrocarbon) from organic wastes.

What are today's major contemporary challenges?

These challenges are both qualitative and quantitative. Some of today's wastes are comprised of materials which did not exist previously, e.g., synthetic polymers. Ecosystems have not had sufficient time to evolve. They are incapable of metabolizing wastes or transform them into toxic residues. Moreover, volumes of wastes are constantly increasing. Not only is the world's population going to double up over the next 50 years, but each human is consuming more and more, globally speaking. In France, we discard 12 times more garbage than an inhabitant of Paris in the Middle Ages. The industrial revolution brought with it some radical changes, but the most important evolution of the situation only goes back a few decades. Up to the 1950s, everything and anything that could be recycled was collected and re-used. Since that time, we have witnessed a transition into a consumer society (in the 1960s) and the quantities of wastes involved literally exploded, given that, on one hand, the products on sale were constantly renewed and were accompanied, on the other hand, by an over packaging trend.

Do wastes also represent important economic and scientific opportunities?

We are in fact faced with unused matter! It can provide for a large number of new job opportunities. We might even go as far as comparing ecosystems and human societies. In a natural environment, approximately 30% of living organisms spend their time re-using wastes. In France only 0.4% of professional jobs are in this field. To conclude, we have a wide margin to improve matters!

> Agricultural and industrial activities, to the extent that they account for 96% of waste tonnage produced, are now the most involved in the circular economy concept and industrial ecology

Where has been the most significant progress been made since you began your career?

Since the early 1990s, all French waste tips have been remodelled so as to prevent contamination of the underlying soils and the environment. Regular inspection checks are made to monitor the release of waste liquids (lixiviate) and gas (especially CH4). France is not the wayward, stroppy pupil as some say but there can be highly variable situations since it is an area that depends to a large extent on local authorities. The European Union has considerably modified its rules, recommendations and regulations here. Before these decisions and guidelines the techniques the most commonly used were landfills and incineration – these are only used now as a last resort. Less wastes, their re-use and recycling, must henceforward be privileged. Citizens are becoming increasingly and better informed and aware. Agricultural and industrial activities, to the extent that they account for 96% of waste tonnage produced, are now the most involved in the circular economy concept and industrial ecology. Thanks to the very existence of wastes, a new form of economy is now coming to be. ■

COMMUNICATION

Scientific journalism tops the bill

The Roberval Prize (organised by UTC) has been running for 30 years now, for the purpose of selecting and rewarding HE books, specialist documentaries and general public publications that involve - to a greater or lesser extent - technologies. Some renowned personalities, such as George Charpak and Pierre-Gilles de Gennes (both Nobel Prize winners) were Roberval Prize laureates. The current 2017 edition, the ceremony for which will take place in December) includes a new category (scientific journalists' work, whatever the format). Applications are registered up to April 30 each year.

Technologies are increasingly influencing our life-styles and Society in general. The UTC Roberval Prize was initiated by the Founder President Guy Deniélou, with the aim to encourage and enhance dissemination of science and technologies for the benefit of the public at large who question the scientific community about today's challenges. Scientific and technical journalists are inevitable and necessary go-betweens for the public and the scientists themselves, and with this new category in the Prize, those selected will be duly rewarded for their role. There is an association, the Association des journalistes scientifiques de la presse d'information (AJSPI) with close on 240 members (in printed press, radio, TV and on-line media) which is a partner to the new formula. "Up till now there has never been a scientific French-language journalists' prize and this induced UTC to create with us a special Prize for paper publications, new media, blogs, web-documentaries, animated image/text …", explains Viviane Thivent, President of the AJSPI. The 'competition' covers items published or disseminated in 2016, and aims specifically at rewarding scientific journalists in their editorial staff configurations. "The main publications in France only allow a small surface fraction to scientific reporting", adds the President of an association which organises numerous conferences and meetings for research scientists.

Encouraging other forms of journalism

This new Roberval Scientific Journalist prize will be awarded by decision of a jury of 5 French and European journalists among a preselection made by lecturer scientists at UTC as well as by personalities from both academic and industrial spheres. The Prize also carries a 2 000 euro reward, reflecting the notoriety of the awardee's work and production among the academic and economic professionals. "The financial perk notably serves to encourage (and assist) publication in book form or in-depth reports as is practised in Anglo-Saxon countries", notes Audrey Mikaëlian, a member of AJSPIs Bureau, who initiated this collaboration with UTC. Her documentary "Animats, des espèces en voie d'apparition »["Animats, a species in danger"], at the core of which were the robots inspired from functions observed in the animal world which had already won a "heart-throb" prize in the 2015 Roberval Prize palmares. That particular experience encouraged her to pursue the adventure. "I was able to exchange with the public at large about my film, notably with some youngsters following a BTS diploma Robotics programme, which is something that doesn't happen regularly in my field". She was a member of the 2016 Jury which enabled her to discover some original works that blended arts, philosophy and science. Beyond the promotion of some especially noteworthy works, this journalist-producer also works for TV channel (E=M6, Arte …) and is an enthusiast when it comes to getting to know one's professional sector better. Only a few months separate us now from hearing who the 2017 laureate(s) is(are).■

COMMUNICATION

In support of scientific editing

Dr Elisabeth Brunier, a UTC lecturer cum research scientist has been Delegate General for the Roberval Prize since 2013. One of the fundamental objectives of this event is to defend French language publications (in a wide connotation) inasmuch as the threat from digital on line supports and the omniscience of English are real.

Apart from the Roberval Prize pre-selection process and the laureate awards ceremony, conferences are also regularly organized about the publications and media that cover technology-intensive topics. UTC's Delegate General for the Roberval Prize chaired a session in March 2016 on scientific edition at the Brussels Book Fair and on this occasion was able to exchange with editors and academics from Belgium and Switzerland about the specific difficulties encountered in this sector. The University Presses of Liege, Namur and Brussels, long standing partners to our event, were present. The Presses polytechniques et universitaires romandes whose publication « La physique autour de nous – de l'observation à l'innovation » [Physics around us – from observation to innovation »] was the 2016 laureate for the Higher Education category, were there too. Whereas TV programmes are quite common among the Belgian candidates, it was nonetheless a good opportunity to make the Prize better known among Belgian editors. The language was one of the questions raised by our French speaking neighbours. As Delegate General Bruner sees it, support for French language scientific edition goes beyond the purely cultural aspects. "In order to explain complex scientific notions, it is important to be able to use all the nuances of one's mother tongue." It was attempted for just one edition of the Prize, the example being some books for young people translated into French. "An English language book translated into French had

lots of mistakes and lacked precision, “lost” during the translation”.

From an economic point of view, the state observed is somewhat alarming even if each year the selection committees receive high-quality books vying for the Prize. But students tend increasingly to consult publications on-line and the unit prize of the book format has become too expensive for them and their limited budget. At the institutional level, publication of a book is not highly rated in assessment of an academic career. The HE Roberval Prize category therefore is especially relevant to valorising the work of university professors. “Reference manuals are often published near the end of a long and rich experience with the students and thus represent high level pedagogical tools”, she insists. The future of scientific publications may also lie outside lecture-halls. Beyond academia, the Delegate enjoys recalling that the Roberval Prize has a commitment to the public at large. Dissemination of science and technologies lies at the heart of the challenges even though lot still remains to be done in this area. In contradistinction to other purely scientific prizes, the UTC Roberval Prize focuses on technologies, an ever-present question ion our societies today but still distant from general public concerns. Progress here is visible and the attractiveness of the Prize is growing every year. “The Roberval Prize award ceremony at Compiegne’s prestigious Imperial Theatre has increased its attendance year by year and, in addition, this year’s General Public author and Roberval Prize laureate and media heart-throb enjoyed excellent sales figures”, adds Elisabeth Brunier, the ceremony’s organizer and Master of Ceremonies. There are grounds to imagine that more French speaking authors will feel motivated to participate in this international event. ■

Two Roberval Prize laureates but also Nobel Prize winners

Georges Charpak, was awarded the 1992 Nobel Prize in Physics for his invention an d development of particle detectors, in particular "for his invention and development of particle detectors, in particular the multiwire proportional chamber",; he likewise was awarded the Roberval Prize in 1999 for his DVD « L’eau dans la vie quotidienne : la main à la pâte » [Water in everyday life: the Hands-on ‘Main à la pâte’® programme]; edited by Odile Jacob Multimédia, the Ecole des Mines, Nantes and Jeulin, with Bella Bouaziz, Coco Djossou, Robert Germinet, Josiane Hamy, Yves Janin, Ludovic Klein, Carl Rauch, Alain Schmitt and Henri Verdier as co-authors.

Pierre-Gilles de Gennes, was awarded the 1991 Nobel Prize in Physics "methods developed for studying order phenomena in simple systems can be generalized to more complex forms of matter, in particular to liquid crystals and polymers". He was also awarded a special HE Roberval citation for his book « Gouttes, bulles, perles et ondes » [Droplets, bubbles, pearls and waves] edited by Belin (Paris) with David Quéré and Françoise Brochard-Wyart as his co-authors.

PUBLICATION

The B-side of doping

With his recent publication « Le dopage sans duperie » [Doping without cheating], Pierre Steiner, lecturer-cum-research scientist who works at the UTC-Costech Laboratory offers us and his readers a philosophic view on doping in particular and also on high-level, professional competitive sports in general.

The issue of doping are widely debated by both sports buffs and armchair athletes too and is indeed a subject of conversation that nobody addresses indifferently. Beyond certain polemic cases appearing in current news, the various points of view here reflect different vision of sports activities and the connections they have with technologies. “The moralizing over-simplistic way in which the media handle the subject made me want to analyse the arguments used by the tenets of anti-drug warfare”, explains Dr Steiner, a philosopher specialist of epistemology as well as the relationships between Society and technologies. His book endeavours to go beyond this analysis, beyond the calls for health preservation, equitable sports an d the “natural” virtues of doing sport. He sees doping not as an exception to the rule but as an omnipresent phenomenon that is hidden, from sight. This phenomenon would be the unavoidable corollary of the search sportsmen have to win, to beat all other competitors and attain newer, higher performances records. Quoting examples of improved physical capacity thanks to the absorption of substances going back to Antiquity, the author to what extent competitive sports and doping have been tied together since very early times. In more general terms, he refuses the notion that a “pure” sport without the adjunct effects of technology ever existed: “Any sport requires a minimum amount of infrastructures and other equipment to practice and certain specialties have been totally upset by the arrival of new equipment”.

An anti-doping struggle with paradoxical results?

While some envisage the anti-drug fight as the only way to guarantee an athlete’s health and his or her equal chances among other competitors, Pierre Steiner sees this as highly debatable. Although little attention is paid to possible sanitary outcome of the demands in the sports arena for performance and showmanship, the question of drugs monopolises our total attention. Banning drugs could produce more adverse effects that possible authorization under certain conditions. Dangerous use of drugs without proper medical control, drug trafficking, and inequality of chances would be enhanced by these illegal moves. He goes as far as suggesting that that there is a special category in each discipline that admits doping. He sees classifying of products and processes used as ‘conventional’ and not ‘codified’. He underscores the idea that it is often difficult to oppose “natural” from “artificial” sources. “For example, we can admit athletes being placed in a hypoxic tent to increase production of red blood cells, where as we condemn use of substances produced naturally by the body such as certain hormones”. Pierre Steiner also rejects the idea that doping changes radically the ranking of competitions? “Is the inequality created by drug-taking superior to the differences in access to most recent training protocols or to increasingly expensive training equipment?” In absence of precise research on doping substances, can we not admit that the resolution sports events overestimates drug impact, comparted with other factors? “Let is recall that in cycling sports the advent of the Shimano derailleur gear change in the 1920s had led to predictions of total change in ranking, and even the weakest riders winning stages …” , concludes Pierre Steiner with a mild twist of irony. ■

AGENDA

interactions.utc.fr • www.utc.fr

International Conference on Industrial Engineering • May 3-5, 2017
UTC hosts the 12th International Conference on Industrial Engineering, the world's largest scientific event of French speaking researchers in this broad field (CIG2017). The topic for the 2017 edition of the conference is "Digital and organizational innovations to meet the challenges of factories of the future" human centred for strategic development of know-how and performances.
http://webtv.utc.fr > Notre quotidien > Valorisation & stratégie d'innovation

Finale of the competition "Fleur d'Éloquence" [Rhetoric Flowers] • Tuesday May 9, 2017
The oratory competition "Fleurs d'éloquence" [Rhetoric Flowers], organised by the Cultural Service of Paris-Sorbonne Cluster and UTC, is open to all students matriculated at one of the member institutions in the Sorbonne-Universities cluster. The final round will be held, as last year, at the Bibliothèque Nationale de France (Quai François Mauriac, Paris) May 9, 6:30 pm. The subjects will be set in advance of the competition and the candidates will be invited to develop their arguments in a limited delivery time.
www.fleursdeloquence.com

6th Edition of the JETSAN Conference
May 31- June1, 2017
The University of Orleans will host the 6th edition of the JETSAN Conference (special days on remotely monitored health care), co-organised with UTC-BMBI (Biomechanical and Bio-Engineering sciences). The theme this year will be "Connected Health". The objective is to hear state-of-the-art talks about new technologies, new methods and applications in the field of remote health care.

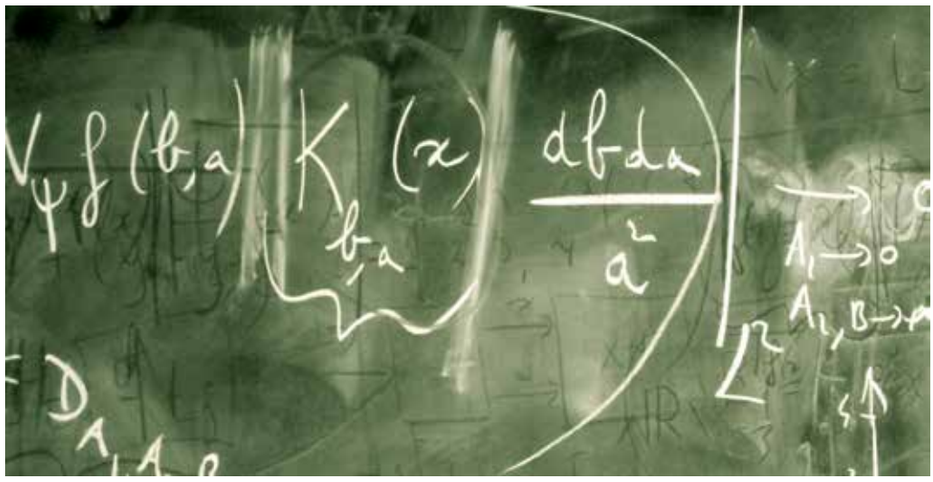
Summer schools at the Daniel Thomas Innovation Centre
www.utc.fr/international/ecoles-internationales-institutionnelles-eei.html

Creative Interaction for Dance, Music, Painting
June 26-July 9, 2017
This summer school invites participants to approach dancing, Music and Painting via VR (Virtual Reality) interfaces. Attendees at the Super School will also be able to better understand virtual environments (with VR helmets), in an immersion room and when fitted with movement sensors. The objective of the school is to explore and design creative and innovative interactions in virtual or augmented environments.

Culinary Science for Tastier, Healthier Food
July 17-28, 2017
UTC will again be organizing a summer school on the theme "Culinary Science for Tastier, Healthier Food". This school allow the participants to familiarize themselves with basic foodstuffs used in agro food preparations for texture and additives. Two days in the programme will be set aside specifically for French culinary arts and products.

4th Edition of the Imaginarium Festival
June 3-4, 2017
The 4th edition of the Imaginarium Festival will take place June3-4 at Margny-les-Compiègne at the multi-event venue Le Tigre. Over and above the concerts, numerous local events are planned alongside an association village.

SPECIAL LECTURE



Quantum mechanics front-stage at UTC

March 16, 2017, Prof. William A. Goddard III, Charles and Mary Ferkel Professor of Chemistry, Materials Science and Applied Physics at the California Institute of Technology (Caltech), Director of the Materials and Process Simulation Center (Caltech-MPSC) accepted the invitation of Fahmi Bedoui, Associate Professor at the MPSC, and senior lecturer at UTC-Roberval

This opportunity enabled the emeritus American research scientist to give a lecture on multiscale modelling and digital computation, in nanomaterials and complex molecular systems. "Questions like these represent major future challenges. They are primordial in certain fields such as energy, for example. We must develop sources of green electricity (solar and hydraulic, notably). This requires we identify and implement storage processes, create new and more efficient materials for this very purpose that cost less and are environment friendly. In my laboratory, that is exactly what I am trying to do", says Prof Goddard while at UTC.

Professor William A Goddard III, who graduated from UCLA and Caltech, is a world famous specialist in solid-state physics. After solving some quantum physics problems, he gradually widened the scope of his research to address theoretical chemistry and multi-scale modelling of complex chemical systems. His investigations were often conducted in collaboration with industrial partner-clients. "I myself have set up several companies which enjoyed a fair among of success in the market-place", says William, amusingly. He now plans to orient his work to the health and environment sectors. His aim is to improve the efficiency of active ingredients in drugs, as well as the accuracy of their therapeutic action/delivery, while reducing as far as possible any unwanted side effects. "In essence, I'm seeking ways to deliver a personalised drug treatment to patents that would prove far more efficient than what we do today", adds Prof. Goddard.

As Prof. Bedoui sees it, "the various approaches adopted by Prof. Goddard are certainly highly theoretical but they could help in the design and development of innovative materials and, furthermore, the industrial challenges here are important. For that reason alone, we saw numerous company representatives who attended his lecture". ■

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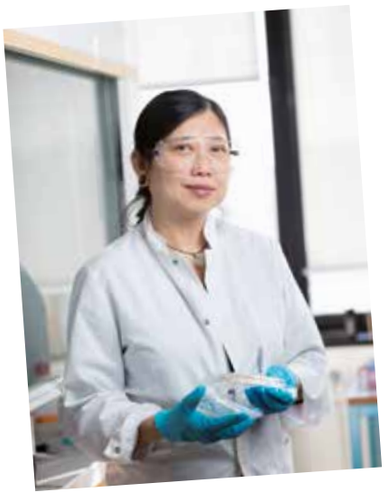

ACADEMIC REWARD

A CNRS Crystal Medal
goes to a research scientist at UTC-GEC

Jeanne-Bernadette Tse Sum Bui who works as a CNRS Research Engineer at the UTC-GEC Lab (Enzyme and Cell Engineering) has been investigation properties of Molecularly Imprinted Polymers (MIPs) for the past 11 years. The recognised excellence and the innovative nature of her work have merited her award of the CNRS Crystal Medal, which alone is a "first" for UTC.

Created as it was in 2001, this national level 'competition' looks at work done by 'research engineers', by lab. technicians and 'admin' support staff for the quality and originality of work that often is largely ignored in comparison with research scientists' production and publications. The application file is presented by the hierarchic superior of the « candidate" based on the last two annual reports that record the quality of the scientific results obtained. In the vase of Jeanne-Bernadette, it was Prof Karsten Haupt – a world specialist in bio-mimetic polymers – who registered her. "My career has evolved gradually, recalling that when I began, I was a simple lab. worker and now I have the responsibility to supervise doctorial theses and can sign as corresponding author in scientific reviews – I see this Medal as a true recognition of my career", says Jeanne-Bernadette Tse Sum Bui, specialist in a field which has numerous industrial applications. "I started in the framework of a research programme with a Canadian company who wanted to develop anti-doping-drug tests to detect presence of testosterone in urine samples. Thus, I developed some MIPs to detect certain cancer bio-markers and now I am working with some major groups on applications in the area of odors and their perception", explains our research engineer, who also greatly enjoys passing on her knowledge and know-how to her students.

UTC among the world leaders in the MIP field

Our totally devoted research engineer spends her time, partly on lab experiments, part teaching and part writing scientific articles, expending the same energy in all! "Our field is highly competitive an d so if we do noty do a sufficient number of lab tests and trials, then we won't accumulate a sufficient number of results and of it take too long to get them accepted for review publication, the other will get there first", and as she adds, this means scarifying some weekends to the write-ups. Her research projects last generally between 6 months a d 3 years and often are in collaborative contracts with industrialists or partner laboratories in the EU. Thy can be feasibility trials lasting a few months or long-term research to identify commercial, market-ready solutions. Her recent participation in a project with L'OREAL had a large international echo. The idea explored here consisted of adding MIPs to a deodorant, to capture those molecules responsible for BO (body odour). After a few years research, studies are now under way with various materials to identify possible industrial DO product combinations. UTC is among world leaders in this area of MIPs and is defending its place among the other front-line innovative runners, thanks the high quality of the UTC-GEC teams. ■

START UPS

A next generation antitheft bike-lock

As every cyclist is aware, it is necessary to have a decent antitheft padlock for your bike, but often the device is cumbersome and takes time to install and lock. Having taken account of this, Benoît Thomas, matriculated in his first year at UTC, had already imagined during his final year at lycée the design of an innovative antitheft device that uses RFID technology (radio frequency identification); he called his invention the Antivel.

Benoît was a high school student at Nesles, in the north France department of Pas-de-Calais, went to a Fab'Lab to learn about CAD (computer aided design), 3D printing and how to programme and use an Arduino card module. Five months later, he presented his prototype to the "Innovez" competition, organized by the magazine Science & Vie Junior and he was laureate at the final round, judged February 22, 2017 at the Palais de la Découverte, in Paris. The Antivel comprises a control box which houses the electronics and a slot to insert a card with an RFID microprocessor, connected to a second piece of equipment attached to the bike's rear wheel. "When the user stops riding, he/she just takes out the card", explains Thomas, '"enabling the lock bolts to block the wheel. Moreover, if you try to steal the bike when the lock is "on", an alarm is triggered. The system is unlocked when the card is reinserted". Now Benoît would like to improve his system "for example by connecting the two parts in a single box which would lead on to a Smartphone "app" to lock/unlock". In assist him to pursue the development work needed for his project, Benoît has been selected to join the European Innovation Academy (cf. IN SHORT intra). ■

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With a whiff of innovation

Ever since she graduated from UTC in 1992, Astrid Rutkowski has been working in luxury bottles for perfumes and cosmetics with the industrial glass-making Group Pochet. Her passion for this sector has enabled her to progress professionally and to enjoy self-fulfilment in a world where innovation and transverse functionalities are key values.

It was during her end-of-studies placement at UTC that the young graduate who majored in mechanical engineering, elective specialty QA (quality assessment) came to know the Pochet Group established in 1623 as a family business and which now has 5 000 personnel. Now, some twenty years later, she has moved up to the top of the managerial ladder and has no regrets as to her track-record. "I did have an opportunity with Renault Cars in Mexico but I preferred to work with a product that combined technicity, design, aesthetics", explains Astrid who has since become head of Development and Innovation with the Group, as of July 2016. Controlling the complete value chain and engaging in close relationships with the Group's customers were also strong reasons for her choice. Indeed, she recommends similar adventures for all "general engineering" graduates from UTC: "In this specialty field, there are lots of room for improvement in the industrial processes involved and this alone offers magnificent prospects in terms of the intellectual challenges – it is an specialty where we engineers can still enjoy a complete overview of a product from design to production line finish and QA".

A promising industrial experimental field

Thanks to a 'polyvalent' training background and her capacity too, acquired at UTC, to integrate new knowledge, Astrid familiarized herself with a field that initially was totally unknown to her. Her first position in QA control brought her a transverse, in-depth, understanding of how the enterprise Pochet operated and let her discover just how complex this field is. Seven years' experience provided the solid bases for her to progress. She moved to a Development positingand was there until last year. Her career path was a sort of revelation of accumulated experience. "My current responsibilities in innovation-intensive activities are a logical follow-on to the functions I discharged before and QA allows you to pinpoint when things go wrong, whereas development allows you to implement solutions to the problems you have identified and finally, innovation paves the way to imaginative, future products". Astrid was the first woman to hold a managerial position with the company and thereby was able to observe and accompany numerous evolutions of the Pochet Group as one of the lead companies in the specialty sector of luxury bottling. "There have been quite a few technical and organizational innovations since I joined the Group and production now is almost entirely automated, with a lean management approach completing the "family' management policies that I found when I first joined them", recalls Astrid who now manages a team of 70 staff.

Through her years of experience, she has enriched her engineering skills using approaches that also take into account market trends. But even in the luxury markets, technical engineering excellence and high-level aesthetics are no longer self-sufficient to guarantee one's place in the market-place. Astrid Rutkowski has observed a widening scope of the core business "The competition forces us to get involved in more diversified roles where we must now propose solutions better adapted to uses and not just products that comply with customers specifications". Improving, for example, how lip-gloss tubes work is just one improvement in product design. We launched a study with the main gloss brands (those who actually formulae and make the gloss itself) and also with consumers, to avoid the gloss colours degrading the external aesthetics of the sticks. "When you are seeking to produce an impeccable luxury item, there is no advantage at all if the product is smeared each time you use it". Simultaneous use of different materials also tend stop complexify production. We must also aim at reducing the as yet excessive amount of residues. With some 400 new product developments each year in its catalogue, the Pochet Group is continuously taking on new engineering challenges. The luxury bottling sector represents an industrial experimental field which prove s particularly innovative. Astrid Rutkowski invites young "general" engineers, especially those who graduate from UTC, to discover a specialist area that could prove highly promising for their choice of career. ■

BIO EXPRESS

1992 Head of the Bottle Quality Service for Verreries du Courval

2000 Director of Development and Innovation - Rexam Dispensing Systems

2007 Director of Development and Innovation for Bottle Division at Pochet du Courval

2016 Director of Development and Innovation with the Groupe Pochet

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Photos p. 1, 5, 6, 7, 10, 14 and 19 (JB. Tse Sum Bui)
Translation by
Alan Rodney, BABEL TWO
Printing
Imprimerie Lesaffre

UTC-CS 60319
60203 Compiègne Cedex
www.utc.fr

Imprimé sur papier certifié
ISSN 2267-9995

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