I-SITE
UNIVERSITÉ
LILLE NORD-EUROPE

Transition(s).

[Chapter 4]

November 2021

OUR FOUNDING INSTITUTIONS

OUR SPONSORS

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CREATING A MODEL FOR A **Research-Intensive University**

Régis Bordet,
Managing Director of I-SITE ULNE Lille Nord-Europe

Three years ago, we chose to make the issue of transitions a central theme for I-SITE ULNE. Our starting point was the observation that our region and our metropolitan area, each characterised by a multitude of changes, would be an ideal real-life testing ground for the development of a comprehensive approach to guiding these transitions. The abrupt arrival of the pandemic highlighted just how necessary such a comprehensive response to complex questions can be, as in isolation, such complexity can give rise to contradictory solutions. In a way, in Lille, we were already prepared, and this was clear in our response to the COVID-19 pandemic. In the different chapters of this Transition(s) magazine, we have had the opportunity to shed light on the successful projects supported by I-SITE ULNE, which have steadily contributed to building up our reputation as a university of reference in this area. Although this issue has begun to receive interest from other French universities, we possess – in addition to the honour of having been first – at least two advantages that set us apart. The first is being at the heart of a geographical area that is moving forward with an ambitious plan for a third industrial revolution. Our world-class university research and education contribute to a number of regional and metro-area projects through our close ties with local authorities and businesses. Our second advantage resides in having built a regional cross-border initiative that today allows us to share our aspirations in this area with our European neighbours.

Now that the groundwork has been established for the interdisciplinary projects that enable us to ideally further our key theme – including through our four hubs, our graduate programmes, and our technology transfer framework – the time has come to go even further. The University of Lille – the future Experimental Public Institution (EPI) – must achieve its targets in terms of social responsibility, particularly through the United Nations' seventeen Sustainable Development Goals. The aim is to establish a new model for a research-intensive university capable of swiftly bringing solutions to society's challenges to the real world and feeding them back into its educational offering, from undergraduate studies forward, so that each of our students leaves their studies with the intellectual baggage needed to confidently face a complex world. The topics discussed in this fourth chapter of Transition(s) – from the experience of the "Res'eau" group to the creation of Ibrik to offer French language courses to adult migrants and the project to study the social acceptability of new energies – are robust examples of just the kinds of projects that we need to continue to pursue in the coming years. It is with this firmly in mind that we drafted the documents for the end of the

I-SITE's trial period, which we submitted on 30 July to apply for confirmation of our I-SITE status. This confirmation can officially occur once the visit to our site, scheduled for 18 November, and the final evaluation hearing, scheduled for the second half of January, have taken place. The new team selected in the 8-10 November elections will be tasked with continuing to pursue this ambition, but the University of Lille will not be able to succeed unless it continues to remain open to the rest of society. The think tank, which will work with local governments, businesses, non-profit organisations, and representatives from the world of art and literature, will enable us to jointly define local priority issues for our region that can then be used to inform the choices of the University of Lille. This is also true of our efforts to identify a dozen or so partner universities who share our overall vision. It is by following this path that the University of Lille, strengthened by its partners and its confirmed I-SITE status, will be able to fully assume its role in the national and international university landscape.

"Our top-notch university research and education contribute to a number of regional and metro-area projects through our close ties with local authorities and businesses."

3 questions with

Daniel Leca,
Vice-President for Universities, Research, Innovation, and European Affairs in the Hauts-de-France Region

How does the issue of transitions resonate on a regional level?

Our era is one during which transitions – be they environmental, digital, economic, social, or societal – are undergoing significant acceleration. The massive shifts to which this has led have driven the Hauts-de-France Region to make new and ambitious strategic choices. This, of course, brings to mind the Rev3 programme, but also our smart specialisation strategy, which aims to allow us to create the conditions for sustainable resilience in our region, to set ourselves apart, to spark the emergence of fields of excellence, to attract investment and talent, to innovate and to expand the job market.

What do you expect from academia in this respect?

University research helps us understand and plan ahead for certain challenges while offering novel and innovative solutions. It produces knowledge and analytical approaches that are crucial to our shared success. In light of this, academia is vital to assisting with the transitions taking place. This happens through research, of course, but also through initial and continuing education. In today's world, it is essential to train future workers and attract top talent.

I-SITE ULNE's activities are a leading example of the success that is possible in this area, thanks to the perfect synergy it creates between educational programmes, research, territory, and business.

How can the Hauts-de-France region be a model on a national scale?

In the Hauts-de-France region, we have strong aspirations for the future and we know that our strongest asset is our ability to collectively create the conditions for our success. An example of this is the Rev3 programme, which has provided assistance to 1,400 projects to date. The Region is also on the cutting edge in terms of the support it offers for scientific jobs, contracts with the most important research organisations, resource-related challenges, and the provision of resources for our laboratories. All of these activities are conducted in concert with our partners, because we know that the expertise of each of them is crucial. This is also true of the Regional Strategy for Higher Education, Research, and Innovation (SRESRI), which was the topic of significant dialogue and which we are now preparing to rework. The Hauts-de-France are thus intent on fostering the emergence of new talent and new models based on collaboration, excellence, and local implantation.

A SITE OPEN
to the rest of the world

From cooperation with Brazilian universities and multiple projects through the 3i network to hosting numerous international researchers, I-SITE ULNE has always encouraged exchanges with the rest of the world.

Hosting international researchers in the humanities and social sciences

A delegation of 29 humanities and social sciences researchers from Lille visiting the University of Kent in January 2020.

To help strengthen the international partnerships that its humanities and social science research units are involved in, I-SITE ULNE offers resources to enable them to host world-class researchers with strong international visibility. Following the "Changing culture, societies, and practices" hub's 2021 "International Fellowship" call for proposals **Roman Krakovsky**, a historian specialising in contemporary Central and Eastern Europe and member of the University of Geneva's Global Studies Institute, will take up residence at the IRHIS Historical Research Institute to work on a research project on the paths to modernisation for Central and Eastern Europe.
Tomas Epper of the University of St Gallen, who is internationally recognised for his work in the field of behavioural economics, will also be hosted by the *Lille Economics Management* research unit (LEM – CNRS UMR 9221). Working with researchers from the LEM and their counterparts from KU Leuven and Ghent University, he will direct a project seeking to identify behavioural barriers in the fight against climate change.

With support from I-SITE ULNE, the *Ancient History, Archaeology, and Literature* laboratory (HALMA) will also host **Orsolya Heinrich-Tamáska**, a specialist in early and late medieval architecture in Central and Southeastern Europe and research director at Leibniz Institute for the History and Culture of Eastern Europe (GWZO). Her research into shifts architectural, social, and landscape spaces as mirrored in peristyle constructions in late antiquity along the Danube River will require her to leverage a wide-ranging network of international researchers.

The 3i cross-border network: a multiplicity of projects

Since 2018, the I-SITE ULNE foundation has funded a large number of products involving its cross-border partners. In June, the 3i network (Ghent University, University of Kent, University of Lille, and KU Leuven) organised virtual workshops that drew 138 researchers from the site's different partner institutions to discuss four central themes: communities and wellbeing, nutrition and health, climate and energy, and ocean and maritime challenges. To consolidate or bring new collaborations to life, I-SITE ULNE also funded 21 projects to enable the creation of networks and the organisation of seminars, workshops, academic conferences, summer schools, and working meetings in Lille, Flanders, and Kent. A further aim of this funding was to bolster cross-border cooperation in an effort to secure additional funding, including from the EU. Among the projects that received support, a summer school for the joint regional "Blue Park" project was held in September 2021 with additional support from the Greater Lille Authority. Coordinated by Professor Bénédicte Grosjean (LACTH, ENSAP Lille), this summer school was jointly organised with the faculties of architecture at UC Louvain, KU Leuven, and VIVES (a social sciences university in Courtrai). With courses given at the La Condition Publique exhibition centre in Roubaix, the summer school featured 24 students from eleven countries. The emphasis was on diversity, both through the crucial issue of biodiversity and through the issue of social inclusion – so that everyone has access to the quality of life offered by the "blue park".

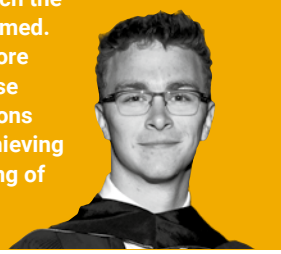
Learn more at https://grandplace.universitedelille2022.fr/

A summer school for the joint regional "Blue Park" project was held in September 2021 with support from the Greater Lille Authority.

Daniel Hallat, a student in a joint PhD programme at the University of Lille and the University of Kent, supervised in Lille by Professor Hugues Leroux (UMET) and in Kent by Professor Mark Burchell ("Astrophysics and Planetary Science" Group).

Why did you choose a joint PhD programme?
I decided to apply for this PhD programme because I think that there is unparalleled value in having multiple supervisors with different backgrounds and experience. I was also intrigued by the potential relationship between my research and the current space missions, with regard to the TEM-Aster project spearheaded by the University of Lille. This means that I am now part of an international consortium working on the Japanese Hayabusa2 space mission.

What are you researching and what are your career goals?
I study minerals (particularly phyllosilicates) which – once preserved in asteroids – might give us insight into life on Earth or the conditions under which the solar system was formed. I hope I can play a more important role in these kinds of space missions and contribute to achieving a better understanding of the natural world.

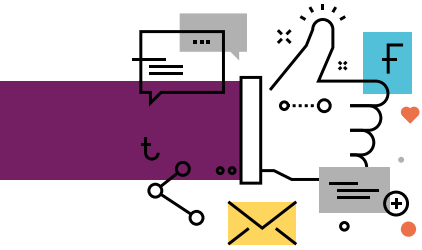


I-SITE ULNE in Brazil

For the I-SITE, cooperation with Brazilian universities is of strategic importance. The relations between the members of the Foundation and these institutions are extremely rich, thanks, in particular, to frequent student exchanges, a variety of joint research projects, and dual degree programmes. This observation led I-SITE ULNE to open a representative office in Brazil to further foster collaboration between the two countries. Located in the offices of the Consulate of France in Belo Horizonte, in the state of Minas Gerais, the representative office is there to offer advice to French and Brazilian students, faculty, and researchers interested in participating in an exchange, developing new projects, or learning about opportunities for working together. This year, an International Associated Laboratory (IAL) led by Professor Djamel Drider of the BIOECOAGRO research unit (UMR 1158), received joint funding from Minas Gerais's Universidade Federal de Viçosa (UFV). The aims of the project include performing bioprospecting in Amazon food matrices to locate high-value strains, developing functional and accessible foodstuffs, and looking for biomolecules capable of being used as alternatives to antibiotics. This partnership is bolstered by the research being conducted by two PhD students jointly supervised by faculty from UFV and the University of Lille and funded by the Brazilian government.

"I-SITE ULNE has worked to transform its international collaborations and partnerships by offering outside perspective that acknowledges that sharing knowledge and understanding is the key to education. The opportunity was seized to create the 3i network between the University of Lille, KU Leuven, Ghent University, and the University of Kent to work on regional projects and ensure excellence in future research, and covering a wide spectrum of topics ranging from the environment to healthcare."

Jeremy Carrette,
Professor, Dean for Europe,
University of Kent



ENCOURAGING INITIATIVES IN **teaching innovation**

Whether it is through experimentation via the Lille Learning Lab (LLL) project, the APACHES project that offers digital tools to spark changes in teaching practices, or software to visualise the stress levels of medical students developed under the ASH (Adaptive Simulation in Healthcare) project, teaching innovation is at the core of I-SITE ULNE's research concerns.

Coordinating research in the field of marketing

The ULNE CCT PhD Programme directed by Maud Herbert, professor at IAE Lille, University School of Management, offers an opportunity to coordinate and deploy a world-class international PhD programme for doctors in the field of marketing research known as Consumer Culture Theory. This research field has allowed the social sciences to be applied to marketing research to achieve a better understanding of the sociocultural and symbolic meanings of consumer actions and their dynamic relations with markets. This approach has had a significant impact both in academia and in the professional world since the 1990s. This hybrid educational offering (learning platform and seminars) enables the University of Lille to coordinate and improve the learning experience and the chances of success of PhD students while establishing a concrete international network that fosters exchanges and career prospects in academia.

"PhD programmes like this constitute significant strides in educational innovation, because PhD studies are sometimes left by the wayside or blended with overall educational approaches that are useful, but require the addition of more specific content."

Maud Herbert,
Professor at IAE Lille, University School of Management

Inauguration of the Lille Learning Lab in September 2021.

Lille Learning Lab: Experimenting with learning and teaching

Established and funded by I-SITE ULNE with additional financial support from the Greater Lille Authority (MEL), the University of Lille's Lille Learning Lab (LLL) project aims to foster teaching innovation by creating innovative educational spaces. Inaugurated on September 22, the LLL plans to equip three campuses by January 2022. The Pont de Bois campus will be equipped with collaborative internet-enabled rooms (enabling cooperation, projects, experiments), the Moulins campus will have access to a brand new mock courtroom, and an amphitheatre equipped with group tables will be made created for students in pharmacology. These spaces will be built with distance, hybrid, and simultaneous remote/in-person learning in mind. The Lille Learning Lab also aspires to become a hotspot for research in the field of learning analytics and its effectiveness for the University of Lille's CIREL laboratory, particularly within the framework of the TELS (Technology Enhanced Learning Spaces) academic chair and the partnership with KU Leuven's ITEC research centre. Designed as an initial milestone, the LLL has been designed to grow in the future. One of the major issues at stake in the confirmation of the consortium's I-SITE status is the continuation and expansion of the LLL.

Online training in project management

I-SITE ULNE was involved in the development of the project management MOOC* and its hosting platform, OpenEdX. This freely accessible project management training course is taken by roughly one thousand students from I-SITE partner institutions each year. It is also the world's first certification-granting online training course. More than a quarter of a million learners have signed up for it since its inception. A true hotspot for scientific research, it has also allowed researchers to collect "Big Data" analytics data to explore changes in learners' behaviour: dropout rates, peer review, work schedules, flow, etc. In all, four research teams have used the course as the starting point for some 20 published articles.

*Massive Open Online Course

Working to achieve personalised learning

Created in 2019, the APACHES project aims to transform teachers' educational practices by providing the digital tools needed to facilitate the assessment of students' skills. These tools, built to allow for the inclusion of novel educational activities, enable teachers to collect learning analytics data that they and researchers can then analyse. This last point is the cornerstone of the SUCCESS dissertation, begun in 2020 as part of a joint PhD programme with KU Leuven and IMT Nord-Europe, supervised by Wim Van Der Noortgate and Anthony Fleury. This research aims to provide computer models to dynamically adapt and customise students' learning environments to offer them assistance and enable them to learn in an optimal way. SUCCESS is working to develop new ways to measure student learning and recommend the most appropriate educational content using techniques that combine approaches rooted statistics and computer science. Luis Alberto Pinos Ullauri has begun work on this dissertation, and successfully completed his first year at KU Leuven with the ITEC team; he has continued to pursue this research at IMT Nord-Europe's CERI SN centre since October 2021.

Analysing the stress levels of medical and nursing students during simulations

At the PRESAGE health simulation centre, the ASH (Adaptive Simulation in Healthcare) project, which was created two years ago, aims to develop new tools to assess the behaviours and the emotions experienced by medical and nursing students during the various simulations they are put through. The aim is to help debrief students so that simulations can then be adapted. Since the inception of the project, objective methods of stress detection have been developed using physical and physiological data from EMPATICA bracelets worn by 169 sixth-year medical students. This research was the subject of the project's first publication by computer scientist Dr Yujin Wu. Student stress visualisation software for teachers has also been developed and is currently undergoing testing. Recently, new methods for merging several types of data have also been developed and are awaiting publication.

"Detecting emotions involves human cognition. It is an essential component of human intelligence. It allows us to better understand our own mental activities and behavioural motivations, all while improving communication and feedback between humans and machines. Achieving precise and robust understanding of our emotions is the prerequisite for the emergence of more advanced artificial intelligence."

Yujin Wu,
ASH project PhD candidate

INNOVATING
in close concert with the socioeconomic world

I-SITE ULNE constantly strives to strengthen its ties with businesses. Through different events and projects, it encourages further innovation outside the confines of academia.

Lille's researchers showcase their skills in the field of water with the "RES'eau" group

The I-SITE has greatly contributed to fostering interdisciplinary public/private initiatives on local water issues, allowing it to leverage its extensive expertise. This group brings together twelve partners involved in the R&D and management of water in the Greater Lille area. Together, they form a group of peers who exchange their knowledge, expertise, and real-world experience. The aim? To develop a shared understanding the local hydrological cycle in the region. This includes building a scientific community specialised in water issues in Greater Lille, offering a complete, integrated, and interdisciplinary approach to the issues that are identified, and helping improve water management practices through scientific experimentation. The RES'eau group is structured around three interrelated and complementary themes that enable it to offer responses to specific issues: water as a resource for human consumption (subject to qualitative and quantitative constraints), rainwater management, and the quality of the collection systems (improvements to overflow discharge practices and water treatment systems, the concept of smart river monitoring, etc.). Lastly, the very interactive nature of this group has enabled it to create interdisciplinary projects, three of which are in the process of being accepted: an EU "LIFE" project on automated network management that incorporates a CIFRE (industrial training through research) PhD dissertation in partnership with Suez, a project on rainwater infiltration (funding from the Water Agency/MEL/Region), and a partnership project funded by the Hauts-de-France region that covers the group's three focus areas.

To learn more, visit www.collectif-res-eau.fr

Making academic facilities and skills available to businesses

To facilitate the access of companies – and particularly SMEs – to academic know-how and research equipment, thereby fuelling public-private research partnerships, the University has, in collaboration with the Hauts-de-France Region, created the University of Lille's Plug in Labs portal. This platform makes the skills offerings from Lille's 64 research units and 47 technology platforms both visible and understandable. Every one of the University's research areas is represented – from science and technology to the humanities and social sciences, from law, economics, and management to life and health sciences, all with their multiple applications: energy and the environment, digital technology and robotics, chemistry and materials, health and nutrition, cultural and creative industries, transport, bioeconomics, societal transitions, etc.
Businesses can receive private assistance to better meet their needs. Through the Hauts-de-France Plug in labs site, they can also extend their research to other laboratories in regional academic institutions.

http://www.isite-ulne.fr/index.php/fr/annuaire-des-competences

Melvin Dilger, PhD student at UMET, working on a project funded by I-SITE ULNE, the Hauts-de-France region, and a global multinational that is a leader in the manufacturing of expanded polymers.

Ibrik: a programme to teach French to adult migrants

Ibrik is an innovative, inclusive, and solidarity-driven French as a foreign language (FLE) school that seeks to serve learners from a variety of backgrounds. Anyone arriving in France for the first time can build their own custom-tailored course programme thanks to short, personalised training courses composed of 6-12 hour course modules, each with a clearly identified objective that offers learners responses to urgent, specific needs. Beyond its ambition to offer language courses to learners from a multitude of backgrounds, Ibrik also works to support non-profit organisations in Lille that offer assistance to unaccompanied minors and first-time migrants, who increasingly face language-related integration problems. Founded by Imaad Ali and Mariame Camara in association with Emmanuelle Canut and Juliette Delahaie, professors of language science and members of the University of Lille's STL (*Savoir, textes, langage* – Knowledge, Texts, and Language) laboratory, the Ibrik project is a continuation of the Migra-FLE project (a linguistic assistance programme for newly arrived migrants).

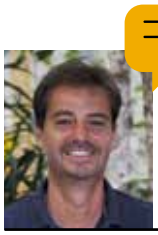
"Since the I-SITE ULNE Foundation's very creation, SATT Nord has been pleased to act as a privileged partner for its activities in favour of economic partnerships, the promotion of research, and technology transfer."

Fabrice Lefebvre,
Chairman of SATT Nord

PhD students at the heart of collaboration with businesses

One part of the **Agriculture 4.0** revolution also involves precise monitoring of resources for each plot. For example, the company Sencrop is currently involved in deploying small, internet-enabled weather stations. It has partnered with INRIA'S FUN team, which is working to optimise wireless communications from these sensors in places not covered by mobile cellular networks. As part of this partnership, Sencrop, I-SITE ULNE, and the Hauts-de-France Region (ERDF) are jointly funding a PhD dissertation authored by Brandon Foubert under the supervision of Nathalie Mitton. Brandon has designed a new dynamic and adaptive routing protocol for these networks that takes advantage of the fact that they can be equipped with several communications technologies (Wi-Fi, cellular, LoRa, etc.) that are combined as needed in response to sensor data and available signal frequencies. The aim is to reduce energy use while ensuring sufficient time and throughput for various data-intensive applications.

The transition from combustion vehicles to electric vehicles has resulted in a radical change in the materials used, and these must be adapted to suit new requirements. In particular, the inherent risks associated with batteries means that the plastic used in electric cars must have superior fire-resistance capacities. Within the Materials and Transformations Unit (UMET), Dr Maude Jimenez (University of Lille) and her colleagues are working on a comprehensive solution to this issue by inventing the materials of tomorrow for the electric-vehicle market. Through a partnership with a private business entity that signed on to jointly fund a PhD dissertation with I-SITE and the Hauts-de-France Region (ERDF), these researchers are working on a project that aims to elucidate the ignition mechanisms of these complex materials and engineer unique solutions that meet the specifications of car manufacturers while still factoring in environmental constraints.

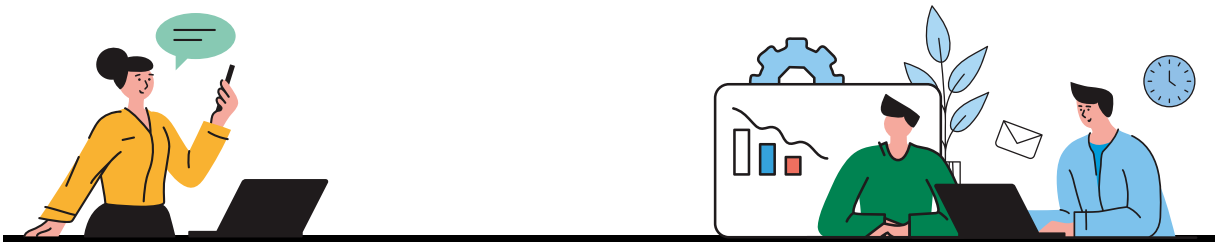


"For Decathlon, the ambition to forge a strong university has created new possibilities for improving exchanges with students and alumni on important themes such as the digital transformation, eco-friendly design, and sports medicine. It offers businesses a strong opportunity to develop open innovation projects on the topics covered by its hubs."

Alexandre Abad,
Decathlon, VP for Sportslab R&D

MADE-IN-LILLE INITIATIVES CROWNED

winners of major national calls for proposals



WILL: Welcoming Internationals to Lille

Several I-SITE ULNE partners were selected as part of the Investments for the Future Integration and Development (IDéES) CFP. With an overall budget of €12.4 million, the WILL project (Welcoming Internationals to Lille) aims to attract top talent and improve the way international students, researchers, and faculty are onboarded so that they can seamlessly integrate the site's member institutions.

The Maison Internationale

Located on the Cité Scientifique campus in Villeneuve-d'Ascq, the Maison Internationale offers students assistance not just with the full range of their administrative formalities, but also with their social and cultural integration. Its assistance covers all administrative and day-to-day matters (housing, healthcare, transport, insurance, banking, or internet/telephone) in addition to help with mastery of the French language.

International fellowships to boost Lille's academic potential

On the research front, the WILL project offers funding for international fellowships that aim to boost the scientific potential of I-SITE ULNE's institutions. The objective is to attract talent to the I-SITE's themed hubs to improve the visibility and quality of their research, thereby enhancing the University's academic excellence and international standing. These world-class researchers will bring new skills to Lille, working hand in hand with research teams from Lille all while maintaining their activity in their home institution.

A network of ambassadors abroad

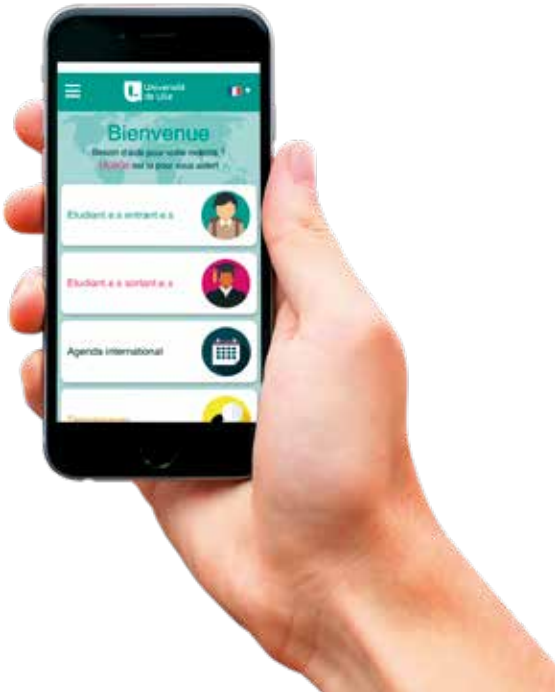
The WILL project also renders it possible to create and maintain a worldwide network of representatives from the University. As true ambassadors at partner universities, they will – among other things – be in a unique position to provide information to international students looking to pursue their studies in Lille.

"The way we host international students and faculty is a major factor in our international appeal. The attention and substantial funding granted by I-SITE ULNE via the WILL project, which aims not only to attract talent, but also to strengthen the Maison Internationale through expanded services for the international academic community, is proof of the University of Lille's aspirations to be an example to follow in this area."

Philippe Cordonnier,
Executive Vice-President for International Relations at the University of Lille

A new "mobility" app

In support of the WILL project, the Ministry of Higher Education and Research and I-SITE ULNE have funded the creation of the new ULillGo app. Simple and intuitive, it helps students complete their administrative and academic formalities before, during, and after their trip with tools, offers, advice, and tips. This allows international students studying at the University of Lille to regularly receive information throughout their stay on housing, food, campus life, cultural activities, and events organised by the Maison Internationale. Students preparing to leave also have access to a variety of information to help them prepare for and successfully navigate their trip.



The excellence of I-SITE ULNE's equipment confirmed

The recent selection of the Investments for the Future 4 programme's Equipex+ projects has brought fresh perspective to the structuring of the technological platforms of excellence at the University of Lille, with funding for the site in the amount of approximately €10 million over the next seven years.

"With nine of Lille's projects selected among the 50 winners of the latest Equipex+ CFP, our site has successfully demonstrated the excellence of its platforms and is now reaping the benefits of its previous investments."

Clarisse Dhaenens,
Vice-President for Science and Technology Research, in charge of platforms

In the field of high-speed digital communications

The Flux Equipex project has contributed to the further development of FiberTech, one of the three French fibre-optics manufacturing plants. It has led to the creation of the ADD4P Equipex+ project, a network coordinated by Lille that aims to develop 3D printing solutions for innovative optical fibres. A continuation of the REFIMEVE+ Equipex project, T-REFIMEVE Equipex+ draws participation from over 30 European metrology laboratories and uses fibre optics to offer the scientific and industrial communities frequency references from high-precision atomic clocks.

In the field of nanotechnologies

The Nanofutur Equipex+ project is the successor to the Excelsior Equipex project, with boasted significant expertise in electronic nanocharacterisation, and Leaf, with its laser structuring equipment for flexible multifunctional electronics. Coordinating a network of 27 regional manufacturing plants, Nanofutur will enable I-SITE ULNE to overcome the scientific and technological challenges involved in manufacturing new generations of electronic components.

In the field of robotics

The Robotex Equipex project, which brought together a national network of experimental robotics platforms, will be reinforced by the Tirrex Equipex+ project, the aim of which is to consolidate this national network by working with nineteen partners seeking to achieve advances in the fields of humanoid robotics, XXL robotics, micro/nano robotics, autonomous robotics, aerial robotics, and medical robotics.

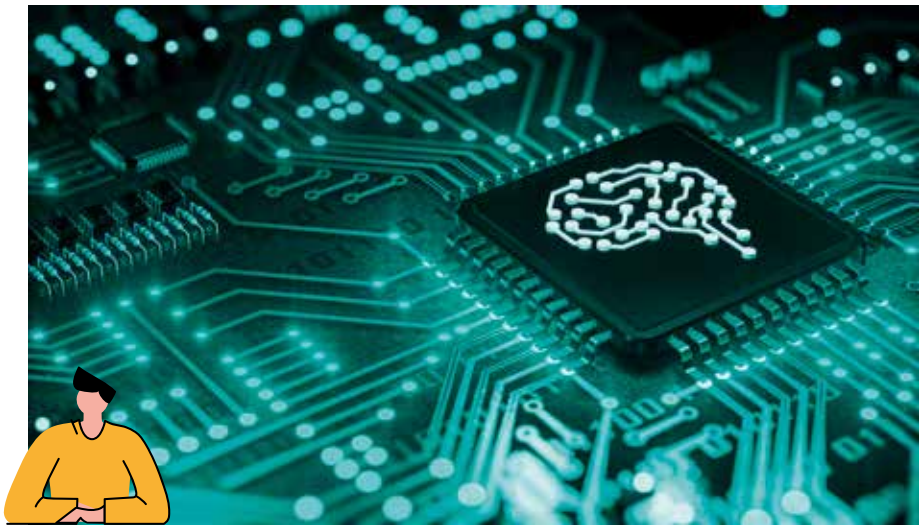
In the field of the humanities and social sciences

The Continuum Equipex+ project, led by Paris-Saclay University, is the successor to the Irdrive Equipex project in the field of Visual Sciences and Cultures. Not only will this new Equipex+ project further the development of research projects that combine digital technology and cultural heritage, it will also enable additional research into the field of virtual reality by securing Lille's participation in a national consortium of 30 cutting-edge technology platforms.

In addition to these different technology platforms and networks of technology platforms, the MESONET Equipex+ project will, as a continuation of the FIT Equipex project – itself designed to offer a platform for providing different technologies (IoT, wireless networks, cloud computing) – work to create computing clusters known as "mesocentres" to enable large-scale scientific computing applications, the long-term objective being to establish a dedicated distributed infrastructure to coordinate HPC-AI activities in France.

COORDINATING RESEARCH IN THE FIELD OF **artificial intelligence in Lille**

Innovative and forward-looking, the human@Lille project – part of I-SITE ULNE's "Human-friendly digital world" hub – builds on the recognised excellence of the research carried out in Lille. It strives to remain open to other disciplines and fields, and in particular to other I-SITE hubs, and aims to ensure that the technology it discovers is transferred to society at large.



The human@Lille cluster's focus is centred on responsible approaches to AI. One significant issue in this area is that of acceptability. It is impossible to readily accept what one does not fully understand. This notion requires that the results provided by AI be understandable. As such, any predictions or decisions must be delivered to users along with information that enables them to understand the underlying laws at work and to build their own vision. Only then can individuals and communities fully reap the benefits of the tools made available by an understandable AI, enabling them to behave more intelligently and apply a more inclusive approach to their reasoning and their actions. Clearly,

Smart digital catalysis: a revolution in chemistry

The central aim of smart digital catalysis is to develop an innovative approach that simultaneously combines high-throughput catalytic screening (made possible in particular by the REALCAT Equipex project) to accelerate the collection of experimental data, theoretical chemistry to improve predictions of catalyst performance, the humanities to assess the impact of processes, and AI to cut the time needed to analyse data. This approach will allow optimised, safer, and more environmentally friendly catalytic processes to be developed for the chemical industry – and biorefineries in particular. SmartDigiCat is an inter-hub industrial chair coordinated by Sébastien Paul at UCCS ("Planet" hub), CRIStAL, and Inria ("Digital" hub). Three private companies are also involved in SmartDigiCat: Solvay, for the chemistry aspects and the development of new catalytic processes; Horiba for advanced materials characterisation methods (including Raman spectroscopy and correlative microscopy); and the startup Teamcat Solutions, a UCCS spin-off. SmartDigiCat boasts a total budget of €2.5 million (I-SITE, MEL, academic and industrial partners) over 3.5 years. It will train four PhD students, two engineers, three postdoctoral researchers, and five master's-level trainees in the field of smart digital catalysis. A complementary €1.8 million ANR project (the Plastiloop 2.0 industrial chair, also in partnership with Solvay) has been fully funded and will commence in January 2022. In all, over €4 million will be devoted to the furthering the smart digital catalysis concept at I-SITE ULNE over the next four years.

this is an interdisciplinary challenge that must be addressed from multiple angles. To achieve this goal of acceptability, fundamental research, situated at the very core of what *makes* AI, must be undertaken so that improved algorithms are better able to offer explanations for understandable predictions. Research is also needed into the interface between users and AI, by transferring AI-based approaches to practical areas, which should include the implementation of PoCs (Proof of Concept).

Three focus areas

Specifically, research into the core of AI is centred around three scientific focus areas:

- **Developing AI that integrates deep learning technology but is based on machine learning for reliability** and utilises reinforcement learning algorithms capable of making inferences in the face of uncertainty. In this first area, three dissertations have been jointly funded through the AI_PhD@Lille ANR programme, in addition to an Expand project funded by I-SITE ULNE and the AppRenf reinforcement learning project.
- **Developing AI that is explainable and compliant**, leveraging systems that produce results that are explainable (intelligible reasoning for results) and compliant (compliance with legal requirements) from disparate data. This second area has resulted in the creation of two teaching and research fellowships funded by the ANR and I-SITE ULNE (the BACCARAT and SHERLOCK projects) and a jointly supervised PhD dissertation made possible via the PEARL project.
- **An AI that protects privacy**, i.e. that responsibly safeguards personal data and complies with ethical rules and regulations. In this last area, I-SITE ULNE has funded the TIP project, three dissertations via the AI_PhD@Lille programme, and an industrial chair jointly funded by the MEL: Luxant-ANVI (involving CRIStAL, the IEMN, and Luxant Group).

"Creating and strengthening innovative ecosystems, which act as drivers for the attractiveness and economic transformation of our region, is one of the six focus areas in our Strategic Plan for the Economic Transformation of the Territory, particularly as regards cybersecurity (the Cyber Campus), artificial intelligence, and, generally, digital technology. The MEL has supported the I-SITE from the outset because it is convinced that through research and partnerships with local businesses, it is one of the fundamental pillars of these ecosystems. It has chosen to tackle the issue of these ecosystems head on, and I couldn't be more pleased."

Bernard Haesebroeck,
Vice-President for the Economy, Employment, Research and Higher Education at the Greater Lille Authority (MEL)

Research in the fields of application of AI

Several projects have been conducted in some of the very disparate fields to which AI can be applied, ranging from health to palaeontology – and this includes exceedingly interdisciplinary projects.

One application of AI in **an industrial setting** (with the company Ferme de la Gontière) took the form of collaborative project to create a mushroom-picking robot (Champibot), a project jointly funded by the I-SITE and the Hauts-de-France region.

In the **healthcare** field, a POC combining AI and massive amounts of health data (in partnership with the "Precision Health" hub's Phenomix cluster) received assistance from I-SITE ULNE and the MEL. The e-LoDi professorship programme – co-funded by MEL – was also instituted. Its aim is to create a centre for technological innovation in pharmacology. Also worth noting are a dissertation in AI and health (AI_PhD@Lille programme) and a PEARL project between LilNCog and CRIStAL.

In the field of robotics, a thesis was completed in soft robotics. Two national PhD dissertation awards (Robotics research network and Macs research network) were awarded to PhD candidates who completed their dissertations in Lille.

In a very different field, an AI_PhD@Lille dissertation was completed on the topic of a neuromorphic approach for the analysis of **atmospheric data**.

The **humanities and social sciences** are also involved in research into AI, with a POC on AI's applications for the study of social behaviour in virtual reality with SCALab (the Cognitive and Affective Sciences Laboratory) and CRIStAL.

Lastly, a PEARL project was initiated in the field of palaeontology.

ENCOURAGING
interdisciplinary approaches

30 PEARL PhD dissertations to boost Lille's interdisciplinarity

Under the European Commission's MSC* actions, the PEARL PhD programme will jointly fund 30 dissertations each supervised by two researchers from different fields of expertise. The PhD students will work at the crossroads between two teams by building interdisciplinary ties in response to new challenges. Some of these dissertations involve Lille's engineering schools, such as ENSAIT and Centrale Lille. Orfeas Plastiras's PhD research concerns "Porous materials for the capture and decomposition of coronaviruses", and is being jointly supervised by Christophe Volkringer (UCCS – Centrale Lille) and Anne Goffard (CIIL**). These new interdisciplinary collaborations, which are real assets for Lille's scientific community, also benefit PhD students in terms of personal and professional development. Leonid Piner, a PhD student with an engineering background who is working on "Microfluidics for the analysis of pancreatic-adipocyte communication in the context of type 2 diabetes" under the dual supervision of Jean-Sébastien Annicotte (EGID***) and Anthony Treizebré (IEMN****), is more than ready to confirm this: "I see it as an exciting challenge to apply the physical knowledge of microfluidics and microelectronics to research on the development of diabetes. I enjoy this fascinating collaboration between these two research teams because it gives me the opportunity to acquire their respective knowledge and experiences."

* Marie Skłodowska-Curie
** Centre for Infection and Immunity of Lille
*** European Genomic Institute for Diabetes
**** Institute for Electronics, Microelectronics, and Nanotechnology

"Technical textiles, which have now become smart and internet-enabled, are currently undergoing important advances that require a combination of various skills, including process engineering, materials science, electronics, and digital, mechanical, and chemical engineering. Interdisciplinarity has thus become the key to furthering credible and effective innovation."

Eric Devaux,
Director of ENSAIT (National School of Textile Arts and Industries)

Electric transport, energy governance, and social acceptability

As a continuation of the Innovative and Carbon-Neutral University Transport (CUMIN) project – the aim of which is to make the Cité Scientifique campus a model in the field of electric transport – the ERICA project, led by the Territories, Cities, Environment & Society (TVES) research unit with support from researchers at the Laboratory of Electrical Engineering and Power Electronics (L2EP), is developing research on the inclusion of renewable energies in the charging infrastructure for electric vehicles. The project brings together an interdisciplinary team using an approach that combines expertise from I-SITE ULNE's "Planet" and "Societies" hubs. Its aim is to elucidate the technical aspects of the technologies being used while working through issues tied to energy governance, the geographical location of this energy infrastructure, and its acceptance by users and inhabitants.

The ERICA project ("Renewable Energy for Electric Vehicle Charging Infrastructure: Acceptability, perception, challenges, governance"), coordinated by Élodie Castex, Faculty of Economic, Social and Territory Sciences, Territories, Cities, Environment & Society (TVES) research unit (ULR 4477).

Technology in the service of perception

Neurologically inspired information processing – or "neuromorphic engineering" – is an emerging field in which artificial systems are developed on the basis of the physical properties of networks of living neurons. With knowledge acquired from information processing, nanoelectronics, and neuroscience, researchers at the IEMN & IRCICA laboratories are developing networks of learning-capable artificial neurons and synapses that are the cornerstone of the revolution taking place today in the field of artificial intelligence. Meanwhile, the field of "neuro-biosystems" – the aim of which is to improve or replace failed neuronal functions using hardware devices (biosensors, multi-electrode chips, neural prostheses) – is booming. The convergence of these fields offers promising prospects for the IEMN's development of new therapeutic "biomimetic" hardware solutions and new strategies for repairing defective areas. Ultra-low-energy retinal implants have shown themselves to be a promising approach to restoring sight to patients suffering from conditions such as age-related macular degeneration.

In the field of human-machine interfaces, the L2EP and CRIStAL laboratories are currently working to develop haptic devices at IRCICA capable of producing programmable physical effort controlled by users' finger movements. The H2020 Marie Curie "Multitouch" project coordinated by L2EP aims to analyse and take advantage of sensory multimodality (vision, hearing, touch) to improve overall user perception in interactions. This project will enable the development of multi-modal interfaces capable of integrating and synchronising sensory stimulations that respect the human brain's interpretative abilities. In addition to the various applications associated with the wide range of touch interfaces currently in use, these interfaces might also prove useful in a healthcare setting, including assistance for visually impaired people for whom tactile feedback is vital, tactile rehabilitation following loss of sensitivity (stroke, diabetes), assistance in learning to read for children with difficulties in this area (including dyslexia).

Creation of an academic chair in the area of metropolitan transitions

The first workshop of METROFORUM – the metropolitan transitions academic chair – was held from 16-18 September. Multidisciplinary, spread across multiple sites and held in a friendly atmosphere, this workshop drew just over thirty students from the three partner institutions (University of Lille, National School of Architecture and Landscape of Lille, and Sciences Po Lille) for discussions on the theme: "Inventing the metropolitan campuses of tomorrow". The programme included field visits, a meal and exhibition at Baazar St-So, group project workshops, and presentations at Plaine Image's Imaginarium in Tourcoing in front of a panel made up of professionals from academia, the design field, and student life. The students were given the opportunity to present six forward-looking projects that imagined the metropolitan campuses of tomorrow, with an emphasis on contributing to bettering our shared existence, the natural world, shared governance, and sharing buildings and teachings through three main themes: "Life in a university metropolis", "Time and the university" and "Making metropolitan campuses".

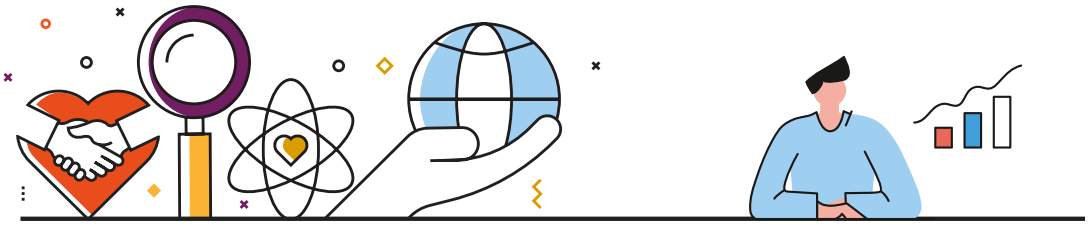
Coordinating engineering studies in Lille

Within the general framework of the coordination among the players involved in I-SITE ULNE's engineering offering, three areas with high levels of potential synergy were identified: "engineering and health", "engineering and energy", and "engineering and textiles". In all, €600,000 will be invested in these themes, with investment in the first two already under way.
In the field of **health engineering**, the deployment of the "Health Engineering Heaven" toolbox will bring I-SITE ULNE's engineering and health actors together to work on early, predictive, multimodal, generalised diagnosis and minimally invasive precision therapies, with the involvement of multidisciplinary groups of students from various institutions.
In **the field of energy**, the idea is to build a continuum of energy (from materials to the energy system to the component) by enabling actors at different levels to cooperate on joint projects in the fields of energy production, storage, and recovery.

Acoustic tweezers to trap cells

Many practical and research applications require being able to carefully manipulate individual cells, to move them, to measure intercellular interactions, etc. The traditional approach, which consists of trapping cells in laser beams (an "optical stretcher"), is limited because it requires high intensities. Working with the Paris Institute of Nanosciences, the team led by Michael Baudoin, a researcher at IEMN, has developed a revolutionary technology, "acoustic tweezers", which use sound waves rather than lasers – with 100 times greater efficiency! To achieve this significant advance, published in Nature Communications, it was necessary to leverage the different nature of waves. The process included the use of photolithography to manufacture a 3 mm chip capable of producing a spherically focused "acoustical vortex". This project, which initially received "ERC generator" and "Early Incubation" funding from I-SITE ULNE, has had multiple positive outcomes. Michael Baudoin was inducted into the Institut Universitaire de France. Eight publications were featured in prestigious journals. A patent application was filed. And, lastly, a high-profile post-doctoral student was recruited with funding from the Hauts-de-France region and the I-SITE via the "Talent Attraction" programme.

STUDENT PROJECTS
in service of innovation



Day after day, I-SITE ULNE strives to encourage its student community to pursue unique initiatives, projects, and experiments. Among the innovation-boosting projects are Xperium, new campus improvements, access to sports and fitness facilities, and additional sessions for graduate programmes.

Xperium: On Your Marks, Get Set, Challenge!

A showcase for research partnerships in Lille, Xperium – housed in the Lilliad Innovation Learning Centre – offers the general public exhibition spaces and experiences provided by researchers themselves on themes that change approximately every two years. Each year, a challenge is issued to undergraduate and upper secondary school students from the Greater Lille metropolitan area on the theme of the current season. With guidance from experts in each relevant field, they have a full day to imagine and design original, innovative solutions to the challenges they are assigned. Everything is done to offer them full assistance in bringing their project to fruition and guiding them in ideal conditions to the moment when they finally present their results to a panel of experts. This panel then selects the best projects and the teams behind them receive one of the Xperium Challenge prizes. Yet another Xperium challenge event on the overarching theme of "images" was held on October 19 for the fourth year's contest, entitled "Kaleidoscope! Images in Every Science".

Students: a starring role in campus improvements

As the future expanded University of Lille 2022 begins to take shape, its member institutions have begun a phase in which participatory democracy and dialogue are given pride of place. Among the initiatives is the participatory budget programme launched this June, made available to member-institution staff on the collaborative platform "Grand'Place". Built around the theme of quality of life in the workplace, this initiative has allowed staff from the University of Lille, ENSAPL, ENSAIT, Sciences Po Lille, and ESJ Lille to reimagine their working environments. After the completion of an initial proposals phase over the summer of 2021, staff will now be given an opportunity to vote for their favourite proposals and exercise control over some of the future investments to be made for workplace equipment. In 2022, another participatory budget will be launched along these same lines, this time specifically for students. The aim will be to encourage them to play an active role in shaping their campuses by allowing them to suggest investments into equipment and the creation of new university spaces in concert with their counterparts at other member institutions.

Learn more at https://grandplace.universitedelille2022.fr/

"We hope that this initiative will spark strong interest from staff and students and enable different parts of I-SITE ULNE to be brought even closer together – an essential first step in the birth of our new future federated university."

Régis Bordet,
Managing Director of I-SITE ULNE Lille Nord-Europe

Lille's graduate programmes return for a new year!

This year, the four graduate programmes associated with the I-SITE's hubs will offer teaching to over 700 students in 32 specialities. These world-class educational programmes combine master's and PhD studies with work on fascinating interdisciplinary research topics and offer scholarships to attract foreign students. Students were given the opportunity to take part in start-of-term symposium days in September, in the form of workshops, lectures, exchanges with researchers, visits to research laboratories, and poster presentations – all in a friendly and festive atmosphere. This was a first for the graduate programme built around the "Changing culture, societies and practices" hub.

Theatre without borders

Compagnie 8, a university theatre company created in 2019, is composed of students and alumni from the University of Lille. Its aim is to create and publish theatrical works and to edit and publish books. It is committed to increasing access to cultural and artistic works and expression for students, including, in particular, through its "Onde Théatrâl" project (**www.ondetheatrale.fr**).

A stage play published in three partner universities

For Compagnie 8's "Episode 4", co-directed by professors Hélie Claire (Université de Lille) and Margherita Laera (University of Kent), the theatre company benefited from I-SITE ULNE's support. Students from Lille, Ghent, and Kent met for two weeks in Canterbury, England, to create a stage play that will be recorded and made available free of charge on its site and the University of Lille's WebTV service. When the recording has been made, a masterclass will be held on the process of creating an artistic work across borders. The script will also be published and distributed free of charge in each of the three partner universities. The international student thespians will come together in Ghent and Lille for in-person readings. To round off this collaboration, a clown workshop will be taught in Kent by French actor and artist Gilles Defacque, while a poetry workshop will be conducted in Ghent by French poet and playwright Géraldine Serbourdin.
Compagnie 8 performed at the University of Lille Festival. It was awarded the prize for best script at the Youth is Great Festival organised by Le Grand Bleu (a state-recognised theatre organisation in Lille) and the entrepreneurship prize from Créa Talents (Pictanovo, Hauts-de-France Region).

In 2019, the University of Lille and I-SITE ULNE entered into an agreement to provide funding for access to the University's sports and fitness facilities for students and staff of the future member institutions of the experimental public institution. The funding covered the cost of the 2019, 2020, and 2021 academic years.

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