



# RESEARCH & PARTNERSHIP

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## EDITORIAL

Université Bretagne Sud (UBS), founded in 1995, embraces its two missions of teaching and research. With its 6 components, 8 multi-site doctoral schools, and 14 multi-network research units, 6 of which are recognized and supported by the French National Centre for Scientific Research (CNRS), the university contributes to the construction of knowledge and its transmission.

UBS distributes and promotes its results in the service of society. With its 250 academics and 200 doctoral students, it is a major player in the research sector in the Brittany region, and it contributes to the international profile of the region. Almost 40% of the doctoral students are foreign nationals and over 10% of the theses are produced in joint supervision with European universities (e.g. in Italy, Switzerland, Portugal, Spain) and other international universities (e.g. in Tunisia, Algeria, Canada, Brazil, New Zealand, Lebanon, US).

Its scientific excellence is found in its four strategic education-related pillars, namely the sea, materials, cybersecurity, and data science. UBS has succeeded in identifying original and recognized research niches, hence developing numerous industrial and academic partnerships.

Regional and national economic players are regularly requesting new research partnerships, using its laboratories and technological platforms. Over 20 doctoral students in training through research programmes (CIFRE) indicate its strong links to socioeconomic partners.



Through the Université Bretagne Sud Foundation and its industrial chairs, the numerous public/private partnerships have developed ambitious projects in the strategic academic domains of the university, but also in such areas as personal assistance services and industry of the future that are part of the development of the territory. The young researchers working for their doctorate or post-doctorate studies in the UBS laboratories are at the core of this scientific process and are the best ambassadors of the expertise and know-how of the laboratories.

UBS promotes high-level research and contributes to numerous research networks, hence showing its vitality and the quality of the research carried out in its laboratories. This research guide shows the organization of research at UBS, its laboratories, its Foundation, and its technological platforms.

Enjoy reading!

Prof. Guy GOGNIAT,  
*Vice President Research.*

## RESEARCH AT UBS

UBS has developed a strategic vision of research based upon high-performance research in both theoretical and applied fields in the economic and social spheres. UBS research evolves in a large socio-economic territory and a regional and international scientific body, through numerous bilateral exchanges among laboratories.

UBS is a multi-discipline endeavor that embraces different research domains in the humanities and the science and technology fields. Based upon its strengths, UBS has developed its Centers of Excellence in Research and Innovation in the domains of Materials & Energy, Humans, Sea & Coastline, Digital Research, and Customs & Societies. These clusters bring competences together and uphold its projects both at the core and the boundaries of the various disciplines; these projects are structuring, innovative, promising, and they enjoy national and international visibility.

UBS is at the core of a dense regional and national scientific network. Its laboratories are involved in numerous actions of scientific promotion and development. It contributes to several investments for the future within which its expertise is widely recognized and sought. Firmly embedded in its territory, UBS is supported by numerous players in the Brittany region, agglomerations, and businesses. Through its research projects, it contributes to the activities of the competitiveness clusters (Sea Bretagne Atlantique, Images & Networks, Valorial, iD4CAR, EMC2), technopoles (AudéLor, VIPE), and the Tremplin Carnot AgriFood Transition.

The main challenges UBS faces in the process of differentiation and specialization are first to coordinate research around the main themes identified while supporting other research efforts and second to keep advancing in those domains that include its centers of excellence in research and innovation, in toto or in part.

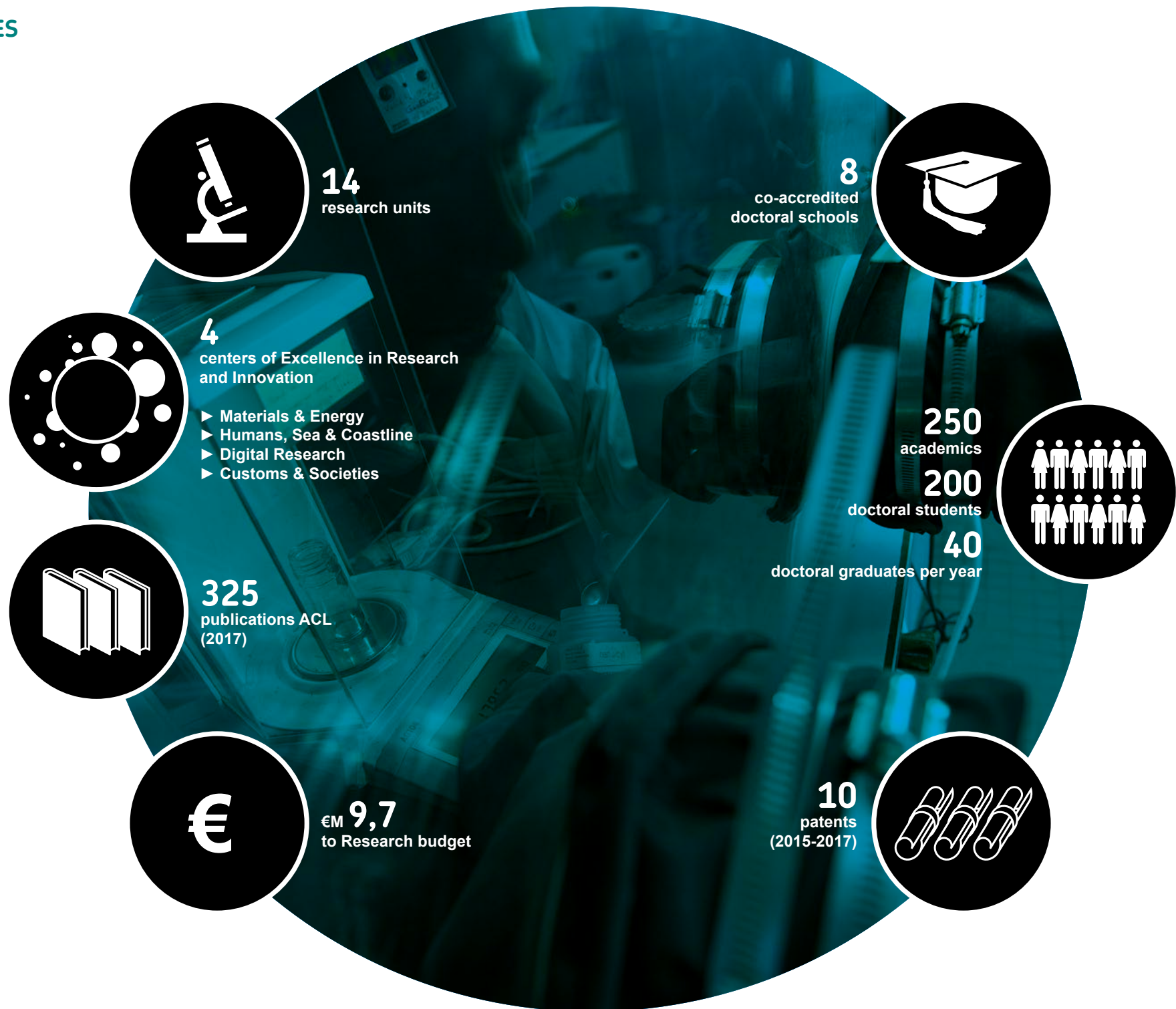
Through its dynamism and expertise, UBS has succeeded in becoming a major research player in Brittany. Its international reach and attractivity are continuously enhanced by the presence of an increasing number of prestigious international guest researchers and its collaboration with numerous research programmes. At the national and European levels, UBS supports various scientific programmes (ANR, FUI, H2020, Interreg, etc.) and is involved in networks of scientific excellence that enable the university to exert its influence beyond the national borders.



[YouTube link Film in English  
About Research at UBS](#)



## KEY FIGURES



## THE GOAL OF THE UNIVERSITÉ BRETAGNE SUD FOUNDATION IS TO BRING TOGETHER PRIVATE, PUBLIC, AND ACADEMIC PARTNERS FOR JOINT PROJECTS THAT CONTRIBUTE TO THE DEVELOPMENT OF THE TERRITORY

The Foundation is a place for action and exchange where the university and the socio-economic players work together on three missions:

### ► Experimenting and innovating

The Foundation encourages and supports the development of chairs, centers of innovation and collective thinking.

### ► Sharing

The Foundation supports the creation of a university digital community (students, alumni, and staff) and is active in the partnership mechanism «One company/One UBS graduating class».

### ► Supporting

The Foundation aims to support international mobility and student entrepreneurship through granting scholarships.

## Experimenting and innovating

**The ACT-TER Territory Knowledge and Action Chair** is a partnership project bringing together the university, businesses, public institutions, and local authorities. The Chair processes and enriches the socio-economic data that partners have selected to pool for greater knowledge of the territory and better informed decision making.

**The D-CC Decision-making - Client Knowledge Chair** develops innovative processes for collecting, storing, and analyzing the client data in the service of companies. The GEOTERA Chair designs, implements, distributes, and uses innovative tools for archiving, viewing, processing, and the spatial analysis of geographical data in the service of sustainable land use planning.

**The GEOTERA Chair** designs, implements, distributes, and uses innovative tools for archiving, viewing, processing, and the spatial analysis of geographical data in the service of sustainable land use planning.

### The M@D Remain@Home Chair

The M@D Chair concerns the support provided to people with disabilities or those who are losing their autonomy, to enable them to remain at home. The M@D Chair is a joint project of the Engineering School of the Université Bretagne Sud (ENSIBS) and the IMT Atlantique, supported by the Université Bretagne Sud Foundation and the Mines-Télécom Foundation.

### Open Data, opening up the UBS public data

Within the goal of transparent public data, the Foundation aims to assist the University to open up its data in synergy with the activity of the chairs.

## Sharing

### The partnership mechanism between companies and graduating classes

As a genuine interface between the academic world and the socioeconomic world, the Foundation helps bring together students and territory players through partnerships. In association with MEDEF 56 and the professional orientation and integration division of the University, discovery actions are proposed (e.g. visits to companies, visits from professional people, mentoring projects). This is a win/win partnership with a proven track record; each year, there is an increasing number of partners and richer exchanges.

Over a dozen companies or institutions have joined the mechanism: Michelin, Yves Rocher, Isatech, Associations of Mayors and Presidents of EPCI 56, MGDIS, Banque Populaire Atlantique.

### University digital community - Alumni network

Setting up a network of alumni has proved to be an essential bridge between the Université Bretagne Sud and the socioeconomic world. This initiative is supported by the Foundation; the latter contributes to the creation of a University digital community (students/alumni/staff) constituting the foundation stone of the future network.

## Supporting

### Supporting international mobility

The Foundation assists students in their international mobility project, whether internship or studies abroad through granting scholarships. The Foundation defines the award criteria in agreement with the International Division of the Université Bretagne Sud.

### Student entrepreneurship

The Foundation wishes to support student entrepreneurship, which is a major issue in our territory.

# CENTERS OF EXCELLENCE IN RESEARCH AND INNOVATION

## MATERIALS & ENERGY

This scientific theme aims to reconcile industrial and technological development with sustainable development. Materials eco-design, energy savings in the production processes and the phases of use, and improving the digital simulation methods constitute the core issues of this project. Its goal is to develop avenues such as material sustainability, biosourced materials, new materials, and the shaping then in-service performance of these materials under different types of demands.

### Domains

- ▶ Chemistry
- ▶ Mechanics of Materials
- ▶ Energy

### Valorization

**Two centers of excellence in technology transfer in this domain strengthen this cluster:**

- ▶ Based in Pontivy, PRODIABIO (Processes, Environmental diagnosis, Bioresources) has been recognized as a technological platform by AFNOR since 2005. Its purpose is to foster and support businesses in their R&D and Innovation projects in the activity sectors of bioprocesses and biomass use. The structure brings together the Université Bretagne Sud and the three technical high schools in Pontivy;
- ▶ «ComposiTIC», a platform launched in 2013 specializing in manufacturing innovative composites through designing automated materials and processes in the domain of robotic fiber placement technology. The economic environment is highly supportive of this activity with the presence of companies such as Coriolis Composites in Lorient and Multiplast in Vannes, and the existence of Lorient Grand Large, which is responsible for the development of the Lorient offshore racing cluster. Since 2018, ComposiTIC has been recognized as a technological platform associated with three high schools in the territory.

### Keywords

Materials / Ecomaterials / Transport / Sailing / Thermodynamics.





# CENTERS OF EXCELLENCE IN RESEARCH AND INNOVATION

## HUMANS, SEA & COASTLINE

The maritime dimension is very present at Université Bretagne Sud, in terms of both teaching and research. This reflects important links with a geographical area both culturally and economically oriented towards the sea. Of the 14 UBS laboratories, almost two thirds are involved in maritime research, from antifouling paints to maritime history through sea-coastline relationships, embedded systems (marine drones), or materials, all of this with close links to training programmes. Furthermore, UBS is the administrator of the Sea Cluster Bretagne Atlantique and a member of the Marine Universities Network and the World Campus of the Sea. Numerous international partnerships have also been established with marine universities pooling research and teaching in relation to the sea.

The Humans, Sea & Coastline center of excellence has a significant role to play in asserting our maritime dimension, mobilizing all the diverse existing strengths, and bringing greater coherence to the various actions. Hence, we have been able to join the Marine Universities Network.

### Domains

- ▶ Maritime history
- ▶ Design of new materials for boat hulls
- ▶ Development of innovative antifouling paints
- ▶ Urbanization and land use
- ▶ Maritime safety
- ▶ Design of new sensors
- ▶ Client-driven data processing with decision-making support
- ▶ Biofilms
- ▶ Valorization of resources in terms of uses
- ▶ Flooding by the sea and coastal erosion
- ▶ Siltation and metallic contaminations of port areas
- ▶ Bioindicators of the quality of the present and past coastal areas
- ▶ Paleocoastal sites and variations of the sea level
- ▶ Public coastal observatory

### Valorization

The maritime dimension is very present at Université Bretagne Sud, in terms of both teaching and research. Of the 14 UBS laboratories, almost two thirds are involved in maritime research. Numerous international partnerships have been established with coastal universities also involved in research work and teaching programmes related to the maritime theme.

UBS has made Sea & Coastline one of its four centers of excellence.

This strategy of recognition and development has recently led to the creation of the Public Institute of Maritime and Coastal Studies called ARCHIPEL whose goal is to:

- ▶ Develop high-level research,
- ▶ Provide quality teaching,
- ▶ Strengthen the link between the university and society.

Because societal issues are always complex, answers cannot be simple or discipline-specific. The institute is strongly interdisciplinary and aims to pursue a three-pronged approach to «teach, develop, share», bringing together researchers, teachers, decision makers, entrepreneurs, and citizens.

### Mots clés

Biofilms / Bacteria / Biological resources / Probabilities / Erosion / Siltation / Management of coastal and maritime areas.



# CENTERS OF EXCELLENCE IN RESEARCH AND INNOVATION

## DIGITAL TECHNOLOGY

Digital technology is at the core of modern societies. It contributes to the development of all activity sectors and is part of all people's lives. Université Bretagne Sud has considerable expertise in this domain and has spearheaded actions in the domains of Personal assistance services and Factories of the Future.

- ▶ Cybersecurity is one of the two strategic subfields of the Digital Technology center of excellence. Université Bretagne Sud has selected to develop expertise in this domain very early. It is member of and contributes actively to the Cluster of Excellence for Cyber Technology (PEC) set up in Brittany with a national remit. In partnership with several establishments, its aim is to fight against cyber threats. The university is also partner with the Cyber West Challenge, a competition open to all economic projects in the domain of cybersecurity, with technopoles in Lorient and Vannes, together with Naval Group, Thalès, or Crédit Agricole.
- ▶ The second strategic subfield concerns Data Sciences. This sector has grown at a very fast pace for a number of years. The rapid developments in information technology, tools and methods of analysis, and storage capabilities, together with the search for more accurate forecasting of behaviors or natural phenomena have created a growing demand for specialists in data analysis.

### Domaines

- ▶ Cybersecurity
- ▶ Methods of circuit and electronic systems design, software architecture and middleware for complex systems
- ▶ Human-machine intelligence and interaction
- ▶ Data mining
- ▶ Signal and image processing
- ▶ Digital communication
- ▶ Probabilities
- ▶ Statistics and mathematical modeling and simulation of complex phenomena

### Valorization

- ▶ The Cyber Security Center combines academic research, company training to fight cyber risks, and student education. The center helps organize cyber defense for vital bodies, detect software vulnerability, and secure connected devices. The crisis management center generates genuine cases and uses sophisticated tools for detecting, analyzing, and addressing threats and attacks.

The Cyber Security Center utilizes the multidisciplinary scientific expertise of five laboratories in the domains of:

- mathematics (LMBA)
- information technology (IRISA)
- systems and communication (Lab-STICC)
- human management (LEGO)
- cognition and behavior (LP3C)

The related research programmes incorporate various topic areas from crisis management methodology to the investigation of human behavior in high stress situations.

- ▶ The Agile Cyber Systems for industrial Production - SCAP industry of the future is an initiative of the Lab-STICC research laboratory at the interface of industrial engineering and digital technologies. This technological platform is an extension of the transversal research orientation Digital Factory & Manufacturing (DFM). The platform SCAP industry of the future underpins the scientific, consulting, and expertise projects in four major domains of the industry of the future:

- virtual factories: the goal is to model and simulate an industrial site, a production line, or a position in the logistics chain to identify its terms of reference and analyze its technical and human performance.
- digital factories: by structuring the information about the whole set of activities of the production factory, companies may foster improved management, response capacity, and agility. The digital factory is based upon the use of connected devices, the urbanization of industrial information systems, data engineering, and industrial cybersecurity.
- Human beings at work: the Lab-STICC research laboratory conducts research in domains incorporating digital and psychological dimensions such as ergonomics or cognitive psychology. The work also incorporates cobotization, ecological HMI, or the mental load in comprehensive approaches of human-system interactions.
- Data analysis: Producing information within digital factories allows the exploration of industrial production data, which may help towards greater informed decision making that takes into account numerous factors in order to achieve more agile management of digital factories.

### Keywords

Cybersecurity / Cyber attacks / Cyber defense: cyber threats / Cyber range / Cryptography / Governance of companies / Model-driven engineering / Cobotics / Industrial cybersecurity / Data analysis / Cooperation humans-systems.







# OUTWARD-LOOKING ATTRACTIVE RESEARCH

With its marked international dimension, UBS supports collaboration between its teams and foreign universities.

## RESEARCH COLLABORATION

All the research laboratories at UBS engage in international research collaboration. Through its researchers, Université Bretagne Sud is involved in almost 250 collaborations in 55 countries. Most are situated in Europe, then about 19% in Asia, 16% in North America, 10% in Africa, 4% in South America and 2% in Oceania. The university focuses upon the quality of collaborations that produce co-publications, thesis joint supervision, and/or participation in joint projects .

## RECEIVING RESEARCHERS AND FOREIGN DOCTORAL STUDENTS

Receiving international researchers (academics, researchers, doctoral and post-doctoral students) constitutes a major element in the strategy of achieving an international dimension.

The Research & Partnership Office (SRP) supports international research activities through the International Researcher Office (IRO), operating to receive foreign scientists and encourage doctoral student mobility through setting up specific mechanisms.



## THE EURAXESS NETWORK

This network helps mobility and receiving foreign researchers.

Created at the initiative of the European Commission in 2004, the network provides close, individual, and free assistance to foreign researchers and their families:

- ▶ to facilitate the required procedures for guest researchers, contract doctoral students, post-doctoral students, and academics;
- ▶ to help foreign researchers prepare their stay, installation, and administrative procedures in their day-to-day life: social security, retirement, taxes, family allowance, etc.

## INTERNATIONAL AGREEMENTS

- ▶ 200 doctoral students 16% of whom benefit from joint supervision with, in particular, Tunisia, Algeria, Morocco, Germany, Portugal, Italy, Romania, Russia, Burkina Faso, Brazil, Canada, Indonesia, Malaysia, India.

## CALLS FOR TENDER

In order to promote and strengthen the visibility of its international research dimensions, Université Bretagne Sud proposes various support tools:

- ▶ short stays for foreign Professors (1 or 2 weeks): 20 guest academics annually from Japan, Australia, United States, Canada, Peru, Germany, Tunisia, Turkey, Egypt, Spain, Ireland, Malaysia, India, Indonesia, China, Korea, Slovenia, Mexico, etc.
- ▶ Outgoing mobility of doctoral students.

## EUROPEAN PROGRAMMES

Université Bretagne Sud uses the European Projects Platform 2PE, a mechanism designed to promote the European dimension in Brittany and upon the partnership cluster of the SRP to assist with setting up European projects. To assist the regional researchers and their projects, the 2PE team is involved in close collaboration with the 14 UBS laboratories and the SRP.



THE LABORATORIES





## UMR 6285 LABORATORY IN INFORMATION SCIENCES AND TECHNOLOGY, COMMUNICATION AND KNOWLEDGE Lab-STICC

The scientific project of Lab-STICC is encapsulated in the title «From sensors to knowledge: Communicating and deciding».

The laboratory is organized around three centers that give concrete expression to the goal of relating people and communication systems:

- ▶ the MOM Department (Microwave, Optoelectronics, and Materials) focuses upon materials, sensors, and microwave antennae;
- ▶ the CACS Department (Communications, Architectures, Circuits and Systems) uses its multiple expertise regarding systems design, algorithm/architecture interaction, new methods for multisensor systems optimization, and the use of advanced mathematical methods to meet the constraints of «discretization»;
- ▶ the CID Department (Knowledge, Information, Decision) is devoted to the methods used for collaborative decision making to use information generated by a variety of sensors.

Telecommunications are the main domain of application of the laboratory, particularly regarding the sea, the environment, defense, and some activities related to the domain of healthcare.

## STAFF

- 521 members, including
- ▶ 235 researchers (35 UBS)
  - ▶ 207 doctoral students (27 UBS)

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## PARTNERS



## SCIENTIFIC DOMAINS

Information and Communication Sciences and Technology.

## APPLICATION SECTORS

Defense, Information technology and software, Logistics /Transport, Telecoms.

## EXPERTISE

CAD tools for electronics.  
Electronic architecture design.  
High-speed signal processing architecture (error correcting codes, demodulation).  
Digital methods and optimization, software/hardware/communication for self-adaptation methods in uncertain environments.  
Sensor networks and intelligent environments (habitat, disability, sailing, environment), software engineering (modeling, real time, embedded OS, code generation).  
Decision support in crisis situations: smart communication of information.  
Human cooperation - autonomous systems.

## SPECIFIC EQUIPMENT

Platform to assess the security of electronic circuits.  
Radio communication platform.  
Systems environment for personal assistance.  
Tools and development maps on FPGA.

## SCIENTIFIC COLLABORATION

**International:** Numerous partnerships with foreign universities (Thailand, Italy, Canada, Australia, US, UK, Germany, Brazil, Peru).

## INDUSTRIAL COLLABORATION

**International:** 12 cooperation projects with international companies (UK, Greece, Japan, Vietnam, US, Germany, Norway, Korea).

## 2 PLATFORMS

- The Cyber Security Center dealing with the protection of embedded systems and connected devices;
- SCAP Industry of the Future dealing with cyberphysical systems in industrial protection.

## KEYWORDS

Telecommunications / Communications / Digital / Embedded systems / Statistics / Security.



## UMR 6074 INSTITUTE OF RESEARCH IN COMPUTER SCIENCE AND RANDOM SYSTEMS IRISA

IRISA (Institute of Research in Computer Science and Random Systems), created in 1975, is a joint research unit (UMR) for information technology, artificial intelligence, digital signals and images, and robotics. Covering all these topic areas, IRISA is the largest research laboratory in Brittany, present on the campuses of Rennes, Vannes, and Lannion.

Within UBS, IRISA develops activities in several information technology domains:

- ▶ software architecture
- ▶ image synthesis and analysis
- ▶ complex image processing
- ▶ gesture interaction
- ▶ data mining
- ▶ mobile information technology
- ▶ business intelligence

UBS researchers contribute to 4 of the IRISA UMR:

- ▶ ARCHWARE (software architecture)
- ▶ CASA (communication and services in intermittent connectivity networks)
- ▶ EXPRESSION (complex data mining, analysis, synthesis, multimedia and interaction)
- ▶ OBELIX (environment observation through complex imaging).

## STAFF

805 members, including  
▶ 318 researchers (26 UBS)  
▶ 252 doctoral students (22 UBS)

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## PARTNERS



## SCIENTIFIC DOMAINS

Bio-information technology, systems security, new software architectures (manycores, Cloud computing), virtual reality, artificial intelligence.

## APPLICATION SECTORS

Environment, Healthcare, ICT, Information technology, Transport, Logistics, Multimedia.

## EXPERTISE

Large-scale systems.  
Networks, telecommunication, and services.  
Architecture.  
Language and software engineering.  
Digital signals and images, robotics.  
Media and interactions.  
Data and knowledge management.

## SPECIFIC EQUIPMENT

GenOuest platform for bio-information technology.  
GRID'5000 platform.  
NEURINFO platform.  
5 robotics platforms  
IMMERSIA virtual reality platform.  
MOCAP gesture-capture platform.  
Cybersecurity platform.

## SCIENTIFIC COLLABORATION

**International:** various laboratories (UK, Belgium, Germany, Switzerland, the Netherlands, Italy, Spain, US, Canada).  
**European projects :** kic EIT Digital

## INDUSTRIAL COLLABORATION

**International:** Texas Instr., IBM, Google, Intel, etc.

## VALORIZATION

Research results are invested into numerous collaborations with industrial partners. IRISA research has given rise to several start-ups.



**LMBA**  
Laboratoire de Mathématiques  
de Bretagne Atlantique  
UMR6205 - CNRS/UBO/UBS

## STAFF

105 members, including  
▶ 60 researchers (20 UBS)  
▶ 25 doctoral students (13 UBS)

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## PARTNERS



## UMR 6205 BRETAGNE ATLANTIQUE MATHEMATICS LABORATORY LMBA

LMBA brings together the majority of mathematicians in West Brittany. The research areas cover a large part of mathematical domains, from theoretical aspects to the more applied ones, such as algebraic and differential geometry, mathematics physics, topology and groups; dynamic systems, probability and statistics; control, differential games, digital analysis, and image processing.

Three main topic areas are structured around teams and seminars:

- ▶ Geometry and topology;
- ▶ Dynamic systems, probability and statistics;
- ▶ Analysis, stochastic phenomena, and applications.

## SCIENTIFIC DOMAIN

Mathematics and their interactions.

## APPLICATION SECTORS

Banking / Insurance / Energy /  
Environment / Eco-activities / Industries /  
Information technology & software / Logistics /  
Transport / Healthcare / Telecommunications.

## EXPERTISE

Quantum invariants / Foliation /  
Probability / Random walk / Random media /  
Statistics / Statistical analysis /  
Statistical training / Image  
Processing / Mathematical modeling /  
Numerical analysis / Deterministic and  
stochastic control / MegaWave2 software/  
Data Science.

## SPECIFIC EQUIPMENT

Unit library, member of RNBM  
(National network of mathematics libraries  
GDS2755 of the CNRS):  
10,000 books, 50-odd periodicals.

## SCIENTIFIC COLLABORATION

**International:** Numerous research teams  
(Germany, Canada, UK, United States, China,  
Columbia, Peru, Brazil, Algeria, Vietnam, Japan,  
Russia, Spain, Norway).

**European projects:** Breuds (exchanges  
between Europe and Brazil) and Portonovo.

## PLATFORM

The Cyber Security Center uses  
the multidisciplinary expertise of research  
laboratories, including the LMBA.  
The mathematics part of research involves  
mathematics and statistics.

## KEYWORDS

Algebraic and differential geometry /  
Ergodic Theory / Probability/ Statistics/  
Applied Analysis / Image / Asymptotic analysis.



## STAFF

- 40 members, including
- ▶ 22 researchers (16 UBS)
  - ▶ 10 doctoral students (8 UBS)

## CONTACT UBS

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## PARTNERS



## EA 3884 MARINE BIOTECHNOLOGY AND CHEMISTRY LABORATORY LBCM

The research programme aims to study biofilms mainly in a marine environment and blue biotechnologies, using complementary know-how in microbiology, molecular genetics, algology, analytical chemistry, organic synthesis, and chemistry-physics.

The activities of the laboratory are structured around two topic areas:

- ▶ Biofilm and microbiome;
- ▶ Blue biotechnologies (valorization of marine resources, mainly algae, antibiofilm natural molecule search, bioremediation, etc.).

## SCIENTIFIC DOMAIN

Microbiology, biology, chemistry, biotechnology.

## APPLICATION SECTORS

Biotechnology / Cosmetics / Renewable marine energy / Sailing / Environment / Fishing / Healthcare.

## EXPERTISE

Marine biofilms and microbiome / Biofilm research tools: chemical and biological tools and imaging / Analytical chemistry: Mass Spectrometry Infrared, Microscopy: Confocal with laser scan, electronic scan / Molecular biology: quantitative PCR, cloning, mutagenicity / Proteomic biochemistry / Cellular biology: microbiology, cellular culture/ Organic chemistry: polymer synthesis/ Biochemical composition analysis of vegetal biomass, extraction and purification of natural molecules, evaluation of antibiofilm, antiviral, antibacterial, antioxidant activities.

## SPECIFIC EQUIPMENT

Imagery: confocal laser scan microscope. Epifluorescence microscopes, Scanning electronic microscope.  
Analytical, physical, and organic chemistry: MALDI-TOF / LC-Q-TOF mass spectrometers chromatography (HPLC, CG), Infra-red spectroscope, spectrofluorimeter.  
Microbiology, biochemistry, cell and molecular biology: microbiology security hoods P2 laboratories, Mono- and bi-dimensional electrophoreses (proteomics), Classical and real-time PCR.

## SCIENTIFIC COLLABORATION

**International:** numerous research groups (Denmark, Germany, Belgium, Bulgaria, Canada, US, Mexico, Australia, Morocco, Madagascar, Tunisia and Malaysia).

## VALORIZATION

Through the ecotoxicologic platform, LBCM proposes expertise in its domains of competence such as ecotoxicologic evaluation of extracts, molecules or coatings. The platform proposes four main analyses:

- In situ study of antifouling/antibiofilm effectiveness in static or dynamic modes
- Lixiviation of formulation (conforming to AFNOR doses);
- Ecotoxicologic tests on marine microorganisms;
- Dosing of metals in aqueous, residual solutions, lixiviats.

## KEYWORDS

Biofilms / Bacteria / Algae / Marine sponges / Organism - abiotic surface interactions / Cell-cell interfaces / Bioremediation.





Institut de Recherche Dupuy de Lôme  
UMR CNRS 6027

## UMR 6027 DUPUY DE LÔME RESEARCH INSTITUTE IRDL

IRDL brings together research activities in the domain of Sciences for the Engineer in Brittany, mainly in the area of renewable marine energy and shipbuilding. Through its numerous collaborations with industrial partners in the maritime domain, IRDL links pure research, engineering, and technology.

IRDL is structured into four Thematic Research Hubs (PTR):

- ▶ PTR 1/ Composites, nanocomposites, biocomposites.
- ▶ PTR 2/ Multi-material assemblies
- ▶ PTR 3/ Structures, fluids, and interactions.
- ▶ PTR 4/ Energy systems.
- ▶ PTR 5/ Sustainability of heterogeneous materials.

## EFFECTIFS

303 membres dont :

- ▶ 106 chercheurs (53 UBS)
- ▶ 113 doctorants (88 UBS)

## CONTACT UBS

Université Bretagne Sud

Director:

Pierre-Yves MANACH

[contact@irdl.fr](mailto:contact@irdl.fr)

IRDL Assistant-Director:

Sylvain CALLOCH

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<http://www.irdl.fr/>

## TUTELLES



## SCIENTIFIC DOMAINS

Chemistry, Mechanics of Materials, Energy.

## APPLICATION SECTORS

Aeronautics / Aerospace / Agriculture /  
Automotive / Building sector /  
Civil engineering / Energy / Marine renewable  
energies / Environment / Eco-activities /  
Marine sector / Healthcare.

## EXPERTISE

### Thematic Research Hub 1 (PTR1)

Composites, nanocomposites, biocomposites:  
Identification and characterization of polymer,  
fibrillar, or mineral meso-structures with dynamic  
structuring in the presence of interfaces or in  
confined conditions.

Research strands:

- Design of new eco-composites;
- Design of stimulative nanocomposite systems;
- Rheology and modeling of composite environment flows;
- Polymers and composites for automated implementation;
- Characterization of composites under dynamic loading.

### Thematic Research Hub 2 (PTR2)

Multi-material assemblies: Development,  
characterization, and modeling of techniques  
enabling the assembly of materials of different  
kinds for long service life in severe  
environments.

Research strands:

- Study and optimization of assembly processes;
- Characterization of the long-term performance of assemblies;
- Development of hybrid assembly techniques for hybrid/composite structures.

### Thematic Research Hub 3 (PTR3)

Structures, fluids and interactions: Materials  
and structures behavior in interaction with their  
environment and/or the manufacturing  
processes.

Research strands:

- Structures, fluids, and interactions;
- From shaping to dynamic behaviors.

### Thematic Research Hub 4 (PTR4)

Energy systems: Design, characterization  
and optimization of operations in use.

Research strands:

- Thermal and energy;
- Energy and electromechanical systems.

### Thematic Research Hub 5 (PTR5)

Sustainability of heterogeneous materials:  
Modeling and forecast of materials  
and structures health.

Research strands:

- Non-linear behavior of heterogeneous materials;
- Material and structural fatigue and sustainability.

## SPECIFIC EQUIPMENT

IRDL uses a first-class test and measures  
center at both national and international levels.

This means IRDL needs to acquire  
considerable means for testing and  
measurement and observations at a large range  
of scales, from microstructure to minstructure.

These means involve generic themes:

- Characterization and observation at nano and microscopic levels;
- Characterization at macroscopic level;
- Pilot development, prototyping, and design;
- Software programs and scientific computing.

## SCIENTIFIC COLLABORATION

IRDL demonstrates strong capacity to find  
funding for the projects ANR (14), FUI (25) or  
European projects such as H2020 and Interreg  
(4).

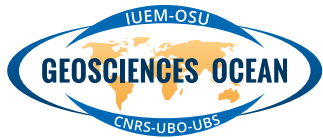
## TECHNOLOGICAL PLATFORMS

- CompositIC: Technological platform specializing in the automated manufacturing sector for materials and additive manufacturing;
  - PRODIABIO: Technological platform specializing in the agrifood sector.
- 

## KEYWORDS

Thermodynamics / Energy efficiency / Isolation / Energy Storage and conversion / Ecomaterials.





## STAFF

- 101 members, including  
▶ 40 researchers (4 UBS)  
▶ 26 doctoral students (1 UBS)

## CONTACT UBS

Université Bretagne Sud  
Site Director:  
David MENIER  
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<http://www.univ-ubs.fr/fr/recherche/strategie/laboratoires/laboratoire-geosciences-ocean-lgo.html>

<http://www-iuem.univ-brest.fr/lgo/fr>

## PARTNERS



## UMR 6538 OCEAN GEOSCIENCES LABORATORY LGO

LGO is a pluri-disciplinary geoscience laboratory encompassing geology, geophysics, geochemistry, sedimentology, and paleontology related to paleoclimatology, paleobiosphere and human settlements. Research is applied to Earth's mantle, crust and surface, paying particular attention to modern and ancient ocean regions. The laboratory examines the ocean bottom and bedrock from the deep seas to the coastal regions and the land-sea interface.

LGO is incorporated into:

- ▶ the European University Institute of the Sea (IUEM).

A few researchers are also part of:

- ▶ the Naval Hydrographic and Oceanographic Service (SHOM);
- ▶ the Centre for Studies and Expertise on Risks, Environment, Mobility, and Urban and Country Planning- Water Sea and Rivers (Cerema - Water Sea and Rivers);
- ▶ the Institute for Energy Transition (ITE) France Marine Énergies (FEM).

## SCIENTIFIC DOMAINS

Marine science, geology, geophysics, ecology, paleoclimatology.

## APPLICATION SECTORS

Marine and coastal environments / Marine and coastal human activities / Renewable marine energy / Extreme events and resilience / Initial and continuing training.

## EXPERTISE

Marine and coastal sedimentology.  
Sedimentary morphodynamics.  
Tectonics and structural geology.  
Dynamic geomorphology.  
Micro-organisms and biodiversity.  
Geochemistry.  
Hydrodynamism and coastal instrumentation.  
Variable temporal scales.  
ICZM and human activities.

## SPECIFIC EQUIPMENT

Topography: DGPS, tacheometer.  
Hydrodynamics: current meter heave buoys, pressure sensors, CTD probes light seismic waves (Sparker source, Delph system acquisition, 6-trace flutes).  
Bathymetric sounder Simrad EM3002 (platform mapping 10 - 200m).  
5 - 10 bottom seismometers (OBS)  
MicrOBS model (Ifremer patent).  
5 bottom geodetics stations.  
Mass spectrometer (several) and microprobe  
Sedimentary dynamics: Altus@NKE.  
Sediment removal: dump, core drilling  
Granulometry: sieve and laser.  
Turbidity, filtration.  
ArcGis, Mike 21, Swan, X-Beach, KoGeo software.  
Drones.

## SCIENTIFIC COLLABORATION

**International:** UK, Italy, Germany, Spain, Tunisia, Morocco, US, Japan, Brazil, Australia, Ethiopia, Cameroun, Guinea, India, Malaysia, etc.

## KEYWORDS

Coastal environment / Sediment transport / Erosion-Siltation / Morphosedimentary Functioning / Paleoclimatology Bioindicators / Marine level.



## EA 7462 GEOARCHITECTURE TERRITORIES, URBANIZATION, BIODIVERSITY, ENVIRONMENT Geoarchitecture

The research team associates human and social sciences to the diverse disciplines of planning and environment. Its main characteristic is complementarity, whether disciplinary, methodological, territorial, and biogeographical, that targets four characteristic territory sets: urban spaces, ordinary natural spaces, protected land natural and semi-natural spaces, and spaces of the land-sea continuum.

The laboratory focuses its work upon three unifying research strands:

- ▶ Strand 1: «Dynamic approaches of natural urban territories»;
- ▶ Strand 2: «Heritage management»;
- ▶ Strand 3: «Practices, customs, and representations».

### STAFF

- 75 members, including
- ▶ 28 researchers (5 UBS)
  - ▶ 20 doctoral students

### CONTACT UBS

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Site Director:  
Ronan LE DELEZIR  
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<http://www.geoarchi.net/rech/intro>

### PARTNERS



### SCIENTIFIC DOMAIN

Geography.  
Social and economic geography  
Anthropology and sociology.

### APPLICATION SECTORS

Architecture / Urban planning / Development  
and social sciences.

### EXPERTISE

Management of natural spaces.  
Analysis and planning of urban projects.  
Analysis of local policies.  
Restoration ecology.  
Territorial diagnosis.  
Citizen participation and territory governance.

### SCIENTIFIC COLLABORATION

**International:** several universities (Canada,  
Czech Republic, Slovakia, UK).

### KEYWORDS

Landscapes / Coastal and maritime planning  
/ Urban planning / Architecture / Sustainable  
development / Environment / Governance.





## FRE 2015 TIME, WORLDS, SOCIETIES LABORATORY TEMOS

TEMOS deals with the four periods of history, from Antiquity to the present. Research focuses upon diverse geographical spaces and diverse human organizations, stressing pluridisciplinarity, hence numerous collaborations with other disciplines: humanities, law, political science, geography, life sciences, medicine, environment.

The research strands involve three directions:

- ▶ childhood, gender, and traces of self; Shifting individualities and subjectivities;
- ▶ Biological resources and knowledge construction: movements and customs;
- ▶ Communities and plurality: authorities, violence, and coexistence.

## STAFF

121 members, including

- ▶ 55 researchers (16 UBS)
- ▶ 66 doctoral students (17 UBS)

## CONTACT UBS

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[www.temos.cnrs.fr/](http://www.temos.cnrs.fr/)

## PARTNERS



## SCIENTIFIC DOMAIN

History.  
Archeology.  
Marine sciences.

## APPLICATION SECTORS

Administration / public sector.  
Initial and continuing training.  
Business assistance services.  
Tourism.

## EXPERTISE

History of plants and archeology of organic products.  
Maritime and coastal history.  
History of childhood and youth.  
History of women and gender issues.  
Archives and digital humanities.  
Political and religious history.

## SCIENTIFIC COLLABORATION

**International:** Universities of Louvain and Brussels (Belgium), Lasi (Romania), Montreal and Sherbrooke (Canada), Cadix, Las Palmas (Spain) Széged (Hungaria), Agadir (Morocco), Geneva, Fribourg (Switzerland), Porto (Portugal).

## KEYWORDS

Sea / Coastline / Environment / Biological resources / Customs/ Conflicts / Knowledge / Norms / Communities / Violence / Gender.



## STAFF

- 78 members, including
- ▶ 53 researchers (12 UBS)
  - ▶ 25 doctoral students (2 UBS)

## CONTACT UBS

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<https://www.univ-brest.fr/hcti>

<http://www.univ-ubs.fr/fr/recherche/strategie/laboratoires/laboratoire-heritages-constructions-dans-le-texte-et-l-image-hcti.html>

## PARTNERS



## EA 4249 HERITAGE AND CONSTRUCTIONS IN TEXT AND IMAGES HCTI

The main research focus of this unit is "lines of power", developed around three main strands and several programmes:

- ▶ Strand 1: "Spaces" and "the sense of Belonging in the Americas" programme;
- ▶ Strand 2: "Norms" and "Intertextuality and the world of biblical representation";
- ▶ Strand 3: "Crossroads" and "Identity construction and borders" programme.

## SCIENTIFIC DOMAINS

History.  
Cultural studies.  
Language and literature.  
Linguistics.

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## APPLICATION SECTORS

Culture, heritage.  
Initial and continuing training.  
Documentation.  
Translation.

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## EXPERTISE

Document analysis and criticism.  
Satirical iconologies.  
Knowledge of history.  
Civilization studies (English -and Spanish-speaking countries).  
Literary studies (Francophone, Anglophone, Hispanic studies).  
Linguistics.  
Pedagogy.  
Cinema.

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## SCIENTIFIC COLLABORATION

**International:** 20-odd research teams (Germany, Argentina, Australia, Brazil, Cameroun, Canada, Spain, US, Ethiopia, UK, Guinea, India, Italy, Japan, Malaysia, Morocco, Mexico, New-Zealand, Romania, Tunisia, etc.).

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## KEYWORDS

Heritage / Conservation / Writing/ Text / Image /  
Film analysis / Language / Gender / Customs /  
Minorities.



## STAFF

- 91 members, including
- ▶ 56 researchers (9 UBS)
  - ▶ 35 doctoral students (6 UBS)

## CONTACT UBS

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## PARTNERS



## EA 1285 PSYCHOLOGY LABORATORY: COGNITION, BEHAVIOR, COMMUNICATION LP3C

Research falls within the realm of experimental psychology, social psychology, cognitive psychology, the psychology of ergonomics, the psychology of development and education. Research strands include:

- ▶ The social construction of knowledge;
- ▶ Behavioral influence;
- ▶ Performance, socio-performance and learning;
- ▶ Variability, evaluation, remediation.

## SCIENTIFIC DOMAIN

Psychology.

## APPLICATION SECTORS

Healthcare, social, ICT, commerce.

## EXPERTISE

Learning processes and disorders  
Development, developmental disorders,  
and cognitive ageing.  
Constructing gender identity.  
Accepting social roles.  
Statistical modeling of attitudes and behaviors.  
ICT usage.

## SPECIFIC EQUIPMENT

Tobioculometers (eye-trackers).  
ZSpace.  
ViSaGe system.  
(generating visual stimuli ).  
Colorimeter (ColorCal).  
Spectrometer (SpectroCal).  
Driving simulator.  
Diverse experiment rooms.

## SCIENTIFIC COLLABORATION

### International:

Brazil (University of Sao Paulo), Canada (University of Québec, University of Sherbrooke, University of Montréal), Belgium (University of Liège), Louvain-La-Neuve), US (University of California), Italy (University of Trieste, University of Padova, University of Bologna, University of Turin), Suisse (University of Geneva, University of Lausanne), Taiwan (National Chengchi University).

## KEYWORDS

Experimental psychology / Cognitive Psychology / Social Psychology / Differential Psychology / Developmental Psychology.



## EA 7480 LAW RESEARCH LABORATORY Lab-LEX

The Lab-LEX laboratory focuses research upon three main themes:

- **Vulnerability:** understanding the notion of vulnerability as applied to natural persons, legal persons, structures and spaces, and legal instruments of vulnerability in various fields of private law, public law, European law, and human rights;
- **Governance:** analysis of the various meanings of the terms territorial governance (coastline, decentralization and deconcentration), European governance, corporate governance (nonprofits, cooperatives, foundations), employment trends in public and private sectors;
- **Litigation:** Research on the changes in courts (through litigation strategies, jurisdictional policies, modes of legal proceedings, understanding and executing judicial decisions); the notion of risk, risk prevention and amicable settlement; alternative modes of conflict resolution.

## STAFF

- 55 members, including
- 49 researchers (18 UBS)
  - 36 doctoral students (11 UBS)

## CONTACT UBS

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<https://www.univ-brest.fr/lab-lex/>

## PARTNERS



## SCIENTIFIC DOMAIN

Law / public law / Private law/ Criminal law and Criminal science / European law / Human rights / Healthcare and social affairs law.

## APPLICATION SECTORS

Administration / Local authorities / Nonprofits / Jurisdictions / Bar / Notaries / Legal assistance / Businesses / Banking / Insurance / Distribution Social affairs / Healthcare / Defense and security.

## EXPERTISE

Recognized expertise in the field of vulnerability and ageing and specifically in the domains of vulnerability (housing, debt, liability, social affairs, healthcare, access to rights, etc.) risk management (contractual, property, health, natural) and governance (territorial, European). Expertise provided to local institutions and socio-professional role players (Departmental Board, Préfecture, Bretagne Atlantique Hospital Centre, Morbihan departmental board for access to rights, ethics committees). Expertise also provided to research evaluation bodies.

## SCIENTIFIC COLLABORATION

**International:** several universities (Italy, Spain, Canada, Vietnam, Mexico, Columbia, Brazil, Costa-Rica).

### UBS Master:

- Public law - legal consultants for public action;
- Private law - contractual practice and business litigation.

## KEYWORDS

Litigation/ contracts, dependency  
Human rights / Governance / Healthcare  
Safety at work / Judge / Coastline / accommodation  
Digital / heritage / prevention  
Responsibility / vulnerability.





## EA 2652 WESTERN ECONOMICS AND MANAGEMENT LABORATORY LEGO

The Western Economics and Management Laboratory is composed of a team of pluridisciplinary researchers specialized in economic sciences and management sciences whose goal is to contribute to the creation, development and dissemination of knowledge.

The multi-site LEGO brings together researchers from:

- ▶ UBS,
- ▶ UBO,
- ▶ IMT Atlantique.

## STAFF

- 118 members, including
- ▶ 93 researchers (34 UBS)
  - ▶ 25 doctoral students (7 UBS)

## CONTACT UBS

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Site Director: Yolande PIRIS  
[yolande.piris@univ-ubs.fr](mailto:yolande.piris@univ-ubs.fr)

<http://www.labo-lego.fr/>

## PARTNERS



## SCIENTIFIC DOMAIN

Economic sciences.  
Management sciences.

## APPLICATION SECTORS

Public or private sector organizations.  
Banking / Insurance.  
Commerce / Distribution.  
Human resources.  
Finance.  
Communication.  
Environment / Eco-activities.  
Business assistance services.  
Individual assistance services.

## EXPERTISE

- **Digital, networks, territories:**  
Digital transformation in organizations,  
Uses of ICTs and digital networks,  
Territory development, tourism;
- **Responsible practices and food:**  
Healthcare and food, sustainable  
development, CSR;
- **Governance and resilience of organizations:** governance and shareholder activism, Responsible finance, valuation of financial assets;
- **Occupational health and well-being:** occupational health, working conditions, time, workplace organization and new kinds of work, professional equality, absenteeism.

## KEYWORDSKEYWORDS

Digital / Territory / Sustainable development /  
Food/ CSR / Marketing / Governance /  
Organization / Responsible finance / Human  
resources / Occupational health.



## EA 7469 PLURILINGUALISM, REPRESENTATIONS, INFORMATION ON FRANCOPHONE EXPRESSION, COMMUNICATION, SOCIOLINGUISTICS PREFICS

The work of PREFICS focuses upon the language and communication dynamics of the organization of contemporary social spaces, whether the latter are defined formally (e.g. organizations, cities) or more informally (networks, geographical spaces).

At both national and international level, the team is viewed as having developed important work in the research domains of:

- ▶ plurilingual francophone sociolinguistic and didactic dynamics;
- ▶ organizational shapes, norms, and recompositions arising from the emergence and development of ICTs.

## STAFF

- 96 members, including
  - ▶ 51 researchers and associate-researchers (4 UBS)
  - ▶ 45 doctoral students

## CONTACT UBS

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<https://www.univ-rennes2.fr/prefics>

## PARTNERS



## SCIENTIFIC DOMAIN

Language sciences.  
English and Anglo-Saxon languages  
and literatures.  
Information and communication sciences.

## APPLICATION SECTORS

Administration / Public sector.  
Communication / Audiovisual.  
Initial and continuing training.  
Business assistance services.  
Individual assistance services.

## EXPERTISE

Action research in the domains of healthcare,  
social action, social economy, analysis of  
policies relating to disabilities and ageing.  
Consulting related to the social development of  
policies concerning accommodation, schooling,  
leisure, and sport.

## SPECIFIC EQUIPMENT

Discipline and international reference  
Databases (e.g. the Francophone  
sociolinguistic bibliography - BSF -  
<http://www.bibliographie-sociolinguistique.com>

## SCIENTIFIC COLLABORATION

**International:** French Institute in Algeria,  
École Normale Supérieure d'Alger, University of  
Alger2 (Algeria), University Ibn Tofail (Kénitra/  
Morocco), University Masaryk of Brno (Czech  
Republic), University of Fribourg (Switzerland),  
University of Macerata (Italy), University of  
Tarragone (Spain), University of Leipzig  
(Germany), University of Landau-Koblenz  
(Germany), University of Cambridge (UK),  
University of Oxford (UK), University of Oslo  
(Norway), Université de Montréal (Québec-  
Canada), Centre d'études ethniques des  
universités montréalaises), Université de  
Moncton (Nouveau-Brunswick-Canada),  
University of Gainesville (Florida-US),  
Université Normale de Chine du Sud (Canton).

**European projects:** CITIZENSHIP EACEA  
Programme, IPEPI of CELV Project of the  
European Council.

## KEYWORDS

Information and communication sciences /  
Organizational communication / Language  
sciences (sociolinguistics -social didactics)  
Plurilingualism / Francophone countries.



## STAFF

- 52 members, including
- ▶ 22 Researchers and researcher-associates (2 UBS)
  - ▶ 14 doctoral students

## CONTACT UBS

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## PARTNERS



## EA 3149 SOCIOLOGY STUDIES AND RESEARCH LABORATORY LABERS

Research is conducted in three areas:

### ▶ Healthcare and society:

Issues of healthcare in contemporary societies are viewed in terms of research focused upon health production configurations. They involve patients, their circles (family, friends), and healthcare professionals. Research is also conducted on populations with disabilities and/or ageing. Key issues involve the effects of healthcare policies, health services, and more generally public policies relating to healthcare careers and the organization of care work.

### ▶ Territories and mobility:

This research strand focuses upon the practices of use and social representations of territories. Locum of the tensions between mobility and migrations on the one hand, and sedentariness and anchoring on the other (of self and others), territories reveal key social issues.

### ▶ Culturalities:

Research focuses on cultural and social practices that may be related to specialized and dedicated institutional mechanisms (education, work commitment, sport and leisure activities) but can also be conducted outside of institutions.

These research strands are complemented by three transversal themes:

- Gender,
- Work,
- Digital.

## SCIENTIFIC DOMAIN

Sociology.  
Anthropology  
Ethnology.  
Demographics.  
Social history.

## APPLICATION SECTORS

Administration / public sector.  
Initial and continuing training.  
Healthcare / Social / Medical-social.  
Nonprofit sector.  
Local development.

## EXPERTISE

**Healthcare and society:** research on healthcare professions, occupational health, ageing, disabilities.

**Territories and mobility:** research on innovation and shared lodging.

**Culturalities:** research on social and socially responsible economy, education, and youth policies.

### Actions conducted:

Qualitative and comparative analysis -  
Evaluation - Applied research and action  
research - Scientific consultancy and support  
Organization of symposiums -  
workshops - seminars - conferences.

## SPECIFIC EQUIPMENT

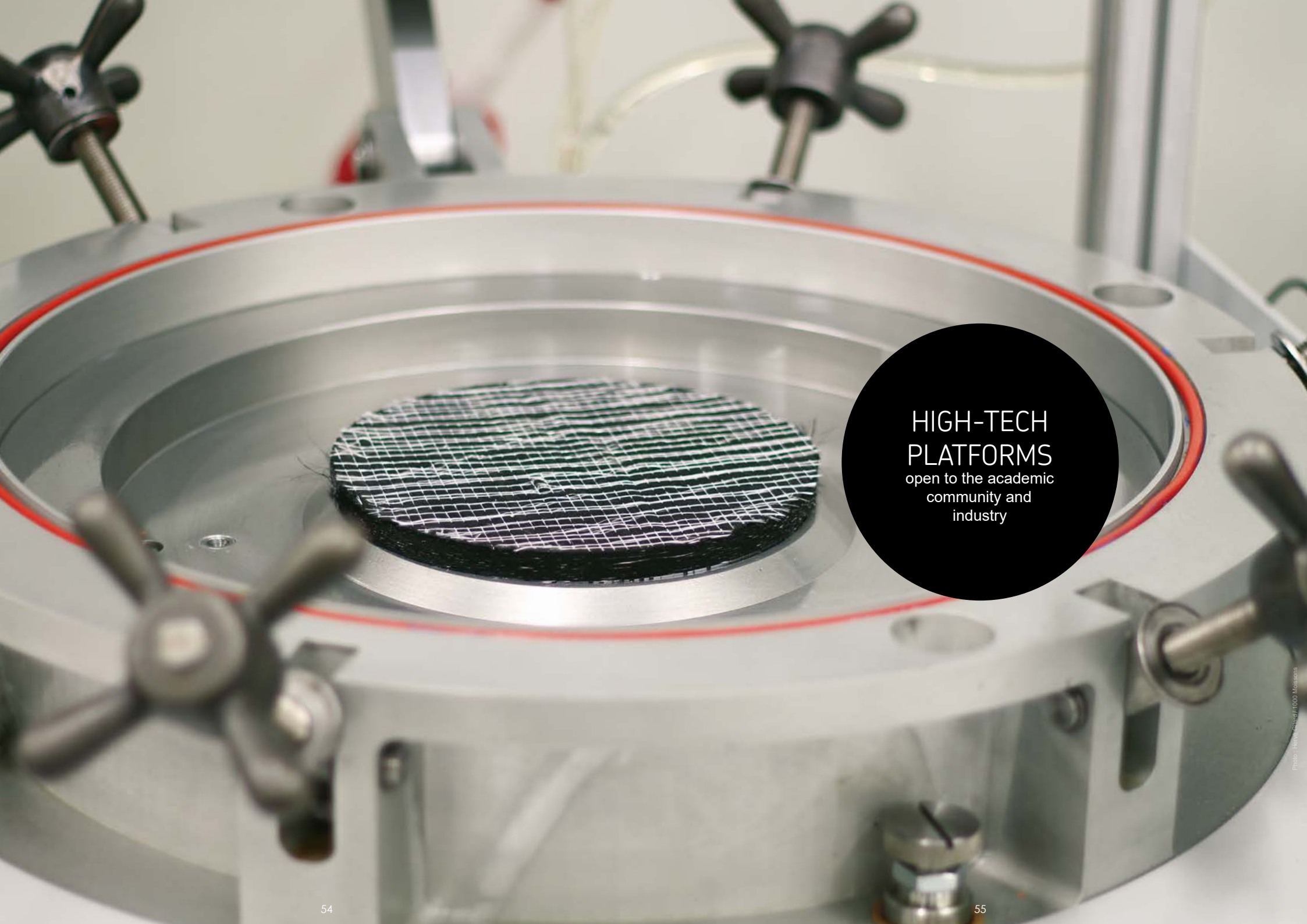
Data collection equipment (images, sound).  
Data analysis and storage software.

## SCIENTIFIC COLLABORATION

**International:** several European and international laboratories (Spain, Switzerland, Canada, Mexico and Chile).

## KEYWORDS

Sociology of healthcare / Social changes  
Social sciences of cities / Social  
problems / Sociology of families.



**HIGH-TECH  
PLATFORMS**  
open to the academic  
community and  
industry



## COMPOSITIC TECHNOLOGICAL PLATFORM



Photo : Hervé Gilard / 1000 Mots.com

The CompositIC technological platform specializes in implementing innovative composites through the design of materials and automated processes around robotized fiber placement technology and 3D printing.

Around the additive processes of fiber placement and of materials, the objective of the CompositIC technological platform is to introduce research and development programmes on the design, qualification of composite parts and eco-composites of complex forms and the industrialization of their manufacturing.

This work is conducted in partnership with the main industrial players from various sectors (automotive, sailing, renewable marine energy, etc.).

It also promotes the transfer of know-how and helps SME/SMIs evolve towards automated layup technologies and working conditions that are more environment-friendly.

### CONTACT UBS

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Scientific head:  
Yves GROHENS  
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<http://www.compositic.fr/>

### SCIENTIFIC DOMAIN

Chemistry.  
Mechanics of Materials.  
Robotics  
Electronics.

### APPLICATION SECTORS

Aviation/aerospace.  
Agriculture.  
Automated/ robotics  
Automotive.  
Building/Public works.  
Defense  
Electronics / electrical  
Marine renewable energies.  
Industries.  
Logistics/ transport  
Mechanics.  
Marine sector.  
Sailing.  
Business assistance services.

### EXPERTISE

#### Robotized processes:

- Robotized fiber placement technology in thermoplastics and thermosets;
- Coupling with plastics processing technologies (injection, thermoforming, infusion, RTM);
- Coupling with other additive technologies (e.g. 3D printing).

#### Making transformable semi-finished products with robots:

- Making semi-finished products on demand (tape impregnation) in thermoplastics;
- Formulation of bio-composites (fibers and bio-based matrices) for making tapes.
- Formulation of functional matrices (conductor tapes for heating and sensing).

#### Testing semi-finished products and end composites

- Porosity level, US analysis, X-ray tomography
- Mechanical tests (traction, compression, peeling, fatigue);
- Ageing tests (UV, Humidity, Temperature).

### SPECIFIC EQUIPMENT

Robot for the automated placement of continuous fibers (Coriolis and TPT at Multiplast).  
Coating system for fibers for making semi-finished products (SCAMEX).  
Analysis systems for defect assessments in parts.  
Machine for mechanical fatigue testing (INSTRON).  
Additional electronic techniques.  
Techniques for studying «material health».

### KEYWORDS

Composites / Robotics / Additive manufacturing.

## PLATFORM SCAP INDUSTRY OF THE FUTURE

### CYBERPHYSICAL AGILE SYSTEMS FOR INDUSTRIAL PRODUCTION

**SCAP Industry of the Future** is an initiative of the Lab-STICC research laboratory at the interface of industrial engineering and digital technologies.

This platform is an extension of the transversal research orientation Digital Factory & Manufacturing (DFM).

SCAP Industry of the Future underpins the scientific, consulting, and expertise projects in four main domains of the industry of the future:

- ▶ **Virtual factories:** the goal is to model and simulate an industrial site, a production line, or a position in the logistics chain so as to identify its terms of reference and analyze its technical and human performance.
- ▶ **Digital factories:** by structuring the information about the whole set of activities of the production factory, companies foster improved management, response capacity, and agility. The digital factory is based upon the use of connected devices, the urbanization of industrial information systems, data engineering, and industrial cybersecurity.
- ▶ **Human beings at work:** the Lab-STICC research laboratory conducts research in domains incorporating digital and psychological dimensions such as ergonomics or cognitive psychology. The work includes cobotization, ecological HMI, or the mental load in comprehensive approaches of human-system interactions.
- ▶ **Data analysis:** producing information within digital factories allows the exploration of industrial production data, which may help towards greater informed decision making that takes into account numerous factors in order to achieve more agile management of digital factories.

## CONTACT UBS

Lab-STICC  
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## SCIENTIFIC DOMAIN

Virtual factories, digital factories, human beings at work, data analysis.

## APPLICATION SECTORS

All industry sectors; parts manufacturers; software publishers.

## EXPERTISE

Integrated management packages; Automation - robotics; Cobotics – penibility – humans-systems interfaces; industrial security; IIoT.

## SPECIFIC EQUIPMENT

Conveyor-based industrial pilot line;  
PLC - industrial networks Industrial cybersecurity components and systems;  
Cobots; ERP, MES, SCADA, WMS;  
Pallet truck.

## KEYWORDS

Model-driven engineering; Cobotics; Industrial cybersecurity; Data analysis; Cooperation humans-systems.

## PLATEFORME TECHNOLOGIQUE AU SERVICE DES ENTREPRISES

**PRODIABIO** (Process, environmental diagnosis, bioresources) is a technological platform specializing in the domain of processes. It possesses a technology park bringing together managers of the various partners.

The platform organization and functioning, accredited in 2005, meet the specifications required by the Ministry of Higher Education and Research, which entitles it to the technological platform label, obtained in July 2009 and renewed in 2019.

The platform provides local companies access to tools originally designed to teach R&D, product upgrades, and support for their innovation projects.

**PRODIABIO** partners with four education institutions (lycée Le Gros Chêne, lycée Fulgence Bienvenue, Lycée St Ivy and Lorient University Institute of Technology (IUT) whose competence domains are complementary. The platform gives companies access to a set of technical facilities. It is set up at the center of the technological hall of the Pontivy IUT and the food engineering hall of the lycée Le Gros Chêne.

It uses the resources provided by local and territorial authorities, the State, and the ERDF funds, a dedicated coordinator, and the human competences of the teachers, technical staff, and students (training projects, internships, etc.) of the partner institutions, staff of the companies, and a R&D engineer.

Its services are entitled to a tax rebate.

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### SCIENTIFIC DOMAIN

- Biotechnology
- Chemistry
- Environment
- Bio-Industry

### APPLICATION SECTORS

- Agrifood
- Cosmetics
- Environment / Eco-activities
- Industries
- Healthcare

### EXPERTISE

- Chemical process engineering: Processes, bio-processes / Valorization of co-products / Extraction, Purification, Filtration- Drying, Atomization, Freeze-drying / microbiological chemical analysis / Granulometry, viscosity measuring.
- Food and culinary engineering: Product development / Improving existing recipes / industrialization of recipes.
- Maintenance and automation of processes: improving processes.

### MISSIONS

PRODIABIO assists companies with the following:

- Des pre-studies, sizing and diagnosis,
- Prototype development,
- Process improvements,
- Physical-chemical and microbiological analyses or product characterization.

### SPECIFIC EQUIPMENT

CHEMICAL PROCESS ENGINEERING:

- Atomization tower, Lyophilisator
- Dynamic high-pressure driver, filtration driver
- Chemical reactor filters
- Peltier effect rheometer
- Laser granulometer
- Chemical and bacteriology laboratory equipment

FOOD AND CULINARY ENGINEERING

- Sensorial analysis room
- Cold preparation room
- Cooking room
- Agrifood hall (300 m<sup>2</sup> with industrial drivers)

### KEYWORDS

Processes / Bio-processes / Transformation of matter / Chemical engineering / Extraction / Purification.



## CYBER SECURITY CENTER TECHNOLOGICAL PLATFORM



As early as 2012, Université Bretagne Sud entered the domain of cybersecurity.

Pioneer in the field, UBS is one of the few universities to provide such a comprehensive offer in this crucial sphere for the future: the Cyber Security Center brings together academic research, training courses for businesses regarding the cyber risks, and student education.

With its industrial and State partners, the UBS Cyber Security Center helps organize cyber defense for Vital Importance Operators (e.g. water networks, power plants), detect software vulnerability, and secure connected devices. Its «Cyber Range» generates genuine use cases and uses sophisticated detection, analysis, and remediation tools.

In 2013, UBS launched the first cyber defense training and education courses for engineers in France:

- ▶ immediately followed by the «Trustworthy computing» engineering degree (given the SECNUMEDU label by the ANSSI, the French National Cybersecurity Agency),
- ▶ in 2017, the Master degree in Cybersecurity of Embedded Systems was launched,
- ▶ in 2019, a professional cybersecurity degree will be launched.

This momentum is also supported by research laboratories with recognized expertise, utilizing several key strands ranging:

- ▶ from the study of behavioral factors,
- ▶ to secure crypto-processors.

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Film in English on  
 Cybersecurity at UBS

### A UNIQUE TOOL: THE CYBER SECURITY CRISIS MANAGEMENT CENTER (C4) OR CYBER RANGE

UBS possesses a Cyber Range in Vannes: it is a 150 m<sup>2</sup> space, equipped with high-tech training rooms and virtualization platforms where students and businesses learn to deal with cyber crisis management.

The Cyber Range works as a digital sandbox completely cut off from the Internet: students and businesses experiment on cloned, but disconnected, real life systems. The strength of this tool is that it encourages the implementation of exercises for SMEs, companies, or large administrations.

### RESPONDING TO TODAY'S AND TOMORROW'S CHALLENGES

What are the major cyber attack techniques currently used? What are the actions businesses may use to avoid being passively subject to these digital aggressions? What are the effective strategies towards cybersecurity?

The digital transformation brings new services to businesses and institutions, but it also induces problems. We now have 1 new malware program every 4 seconds; 18 million French people were hacked in 2016, namely a 76% growth vs. 51% in 2015, according to the latest data provided by Orange Cyber defense. It takes 3 minutes to hack a new connected device: security video cameras, printers, smart thermostats, etc. The billion Internet-connected devices are extremely poorly protected.

The pioneering spirit of UBS enables the university to remain one innovative step ahead in the domains of training (creating new sectors), research (bringing together several laboratories), and in developing the technical platform for simulation and management of cyber crises.

In the heart of Brittany, a region that has become a «cyber center of excellence», Université Bretagne Sud has been recognized since 2013 as an expert in the domain of cybersecurity training and research. SMEs, SMLs, institutions, communities, etc.: the cybersecurity issues at stake concern all the actors.

### FOUR MAJOR AREAS OF EXPERTISE

- **Education:** teaching students at all levels about all aspects of cybersecurity;
- **Training:** training in cyber crisis management;
- **Awareness raising:** raising the awareness of any organization (in particular SMEs, SMLs, and local authorities) of cyber threats;
- **Research:** conducting applied and immediately operational R&D from a transdisciplinary perspective.

### ACADEMIC RESEARCH SEEKING TO REACH THE HIGHEST LEVEL

Cybersecurity research at UBS has four main goals:

- to increase the expertise of UBS in cybersecurity issues;
- to bring together all cybersecurity skills within UBS;
- to make the Cyber Range the common area for experimentation and exchanges for the various laboratories;
- to foster the emergence of transdisciplinary projects.

These various research strands are conducted by several laboratories: Lab-LEX, Lab-STICC, LEGO, and IRISA.

### Research hinges on five main strands:

#### • Strand 1: Security of embedded systems

The goal of this specific activity is to work on secure processors and to develop secure hardware, advanced arithmetical solutions, and secure architecture.

#### • Strand 2: Security of industrial systems

The goal is to evaluate the consequences of cyber attacks upon industrial systems, to conduct security modeling, and to formalize resilience

#### • Strand 3: Security of systems of socio-technical systems - surveillance-oriented security technologies (SoSTS)

Modeling the security of systems of systems in all its components: human, technical, legal, etc. and identifying all vulnerabilities.

- **Strand 4: Big Data and Cybersecurity**

This work is focused upon the detection of anomalies from the perspective of human behavior. Results seek to propose new innovative approaches.

- **Strand 5: Cybersecurity and human beings**

This work is focused upon governance issues, and in particular the management of cybersecurity in businesses through qualitative and quantitative analyses of behavior, decision-making processes, and communication.

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## KEYWORDS

Cybersecurity / Cyber attacks / Cyber defense / Cyber threats / Cyber Range / Cryptography / Business governance.







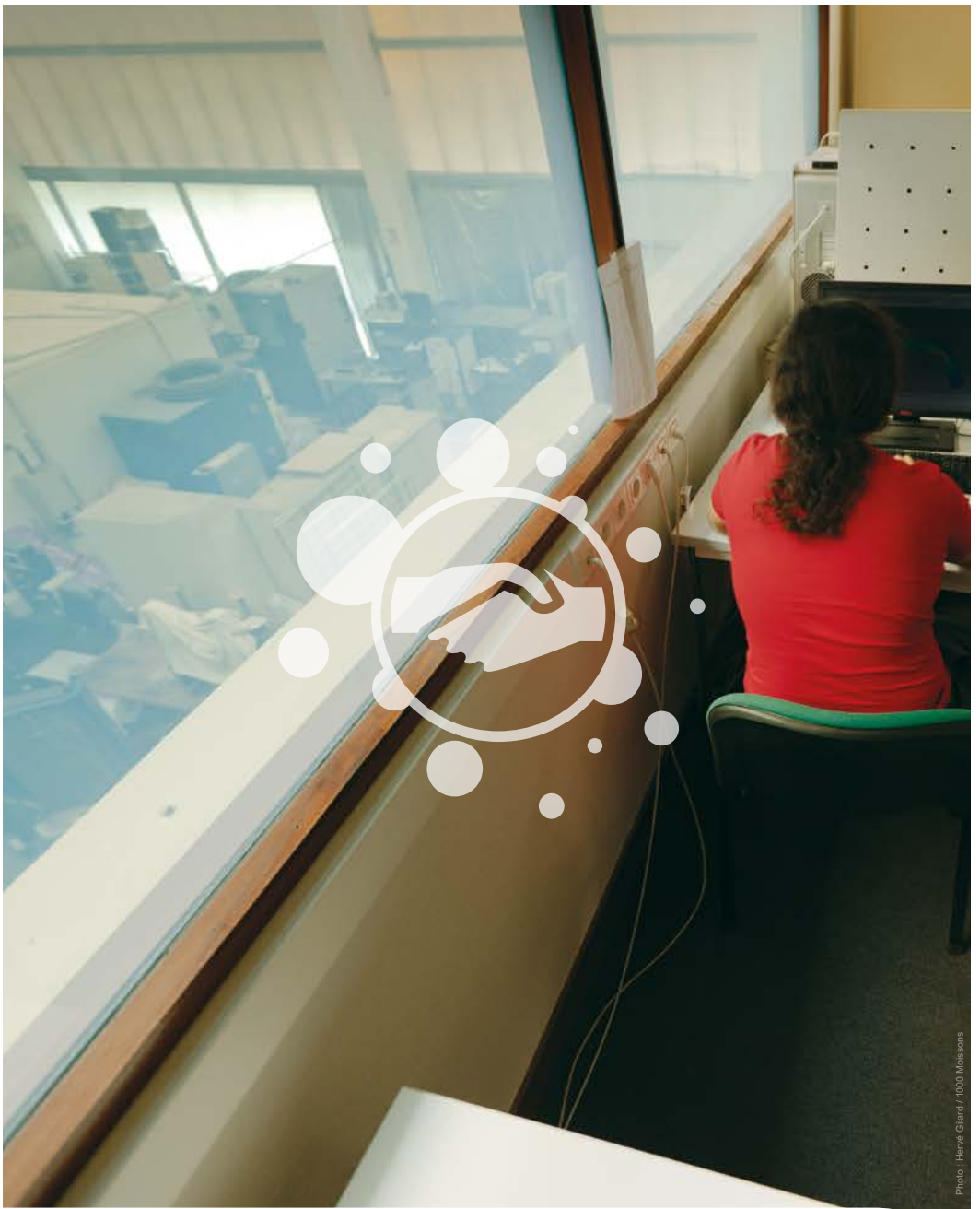


Photo : Hervé Glard / 1000 Mobbans



*[YouTube link Film in English](#)  
[About Research at UBS](#)*

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