



2021

1 Year in
RESEARCH

at Université
de Bretagne
Occidentale



Contents

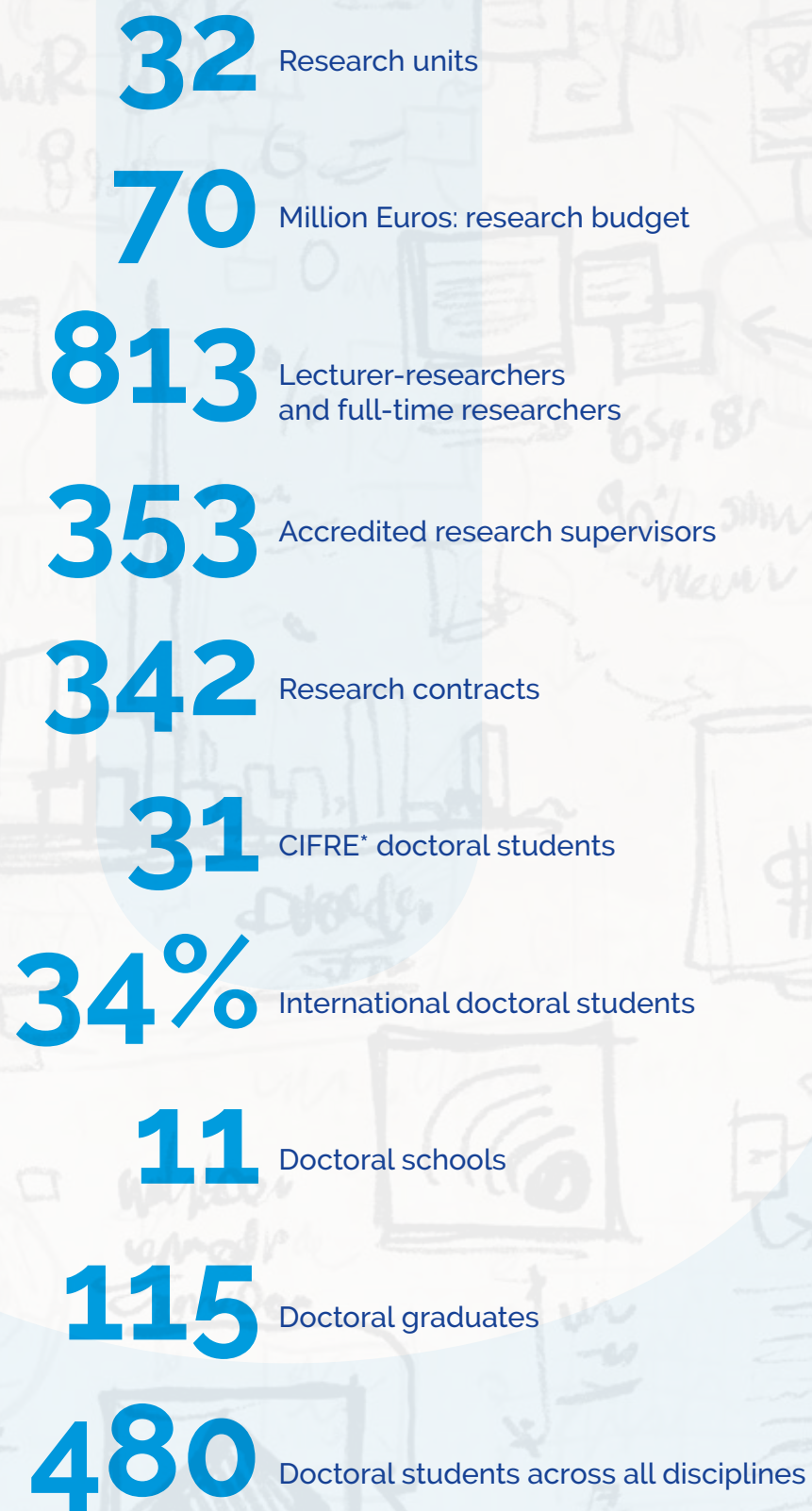


MY THESIS IN 180 SECONDS

Every year, UBO hosts the semi-final of "My Thesis in 180 Seconds" for doctoral students from Brest, Lorient and Vannes. The rules are simple. Each candidate must present and explain their research in just three minutes and with one slide. After an online event in 2021, six new candidates returned to the stage in 2022. This was a unique opportunity for them to share their passion for the sciences with a broad and diverse audience.

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RESEARCH AT UBO IN 10 FIGURES



*CIFRE: Industrial research and training agreement

priority



Christian Brosseau,
Vice President
Research and Innovation

When it comes to research and innovation, 2021 will resonate as the year of the HCERES review. The year has also seen formal continuation of around ten joint research units with the CNRS and four with INSERM, including one newcomer - GETBO. The excellence and international profile this new contract will bring us are certainly cause for celebration. Congratulations to Professor Francis Couturaud and his team for their hard work over a number of years. This high level recognition is down to their contribution and confirms our strategy of ongoing support for this unit.

Now, let's go back two years. During the Covid-19 pandemic, multi-disciplinary projects for the research component of the 2021-2027 CPER (government-regional planning contract) were collated and funding for them was negotiated through coordination between the State and the regional authorities. We have, at last, received the financial models, and the first grants, which were paid at the end of 2021, will enable us to provide our research units with heavy equipment suitable for the precision work involved in these projects.

When we take a closer look, although Covid-19 caused considerable disruption last year, our research review for 2021 has all the markers of excellence of previous years. Regionally, UBO took leading place in the call for projects for Bienvenue funding; nationally, we have created a fourth INSERM-backed joint research unit in GETBO, and our Professor Barrat has been appointed as a Senior member of IUF within its innovation research group. Additionally we are working internationally on a number of European funded projects. So at every level, this review is testament to the vision we have nurtured, since 2016, of a

powerful collective effort at UBO.

The HCERES review of our research units and the University gave us an opportunity to showcase the quality of our projects, and consider recommendations for changes and strategies to bring these changes about. There was particular praise for our new research, innovation and commercialisation service, DRiVe, which supports lecturer-researchers and researchers hosted at UBO by equipping them with new skills to meet the expectations of open science and data regulations and prepare for European projects. The review therefore recognises the pragmatic way we organise and structure research and innovation at UBO, and the dynamism and resilience of our rationale of funding through calls for projects.

The new contract for 2022-2027 begins on an optimistic note, with one imperative - excellence in research and innovation, so that we take on our full place within the international community of universities, which is becoming ever more competitive. Finally, in 2021 we have begun to implement the activities of Research-EU in a progressive and coordinated way, to strengthen the research arm of our European University, SEA-EU.

As we celebrate UBO's 50th anniversary we have one major ambition. To continue to be a multidisciplinary university that considerably enhances the value of research and innovation, so that we address the challenges associated with the environmental and energy transition.

To finish, I would like to thank the administrative services at UBO who created this Research Review.

32 research units and 4 institutes
supporting innovation and knowledge

Health Agri-Environment Materials

IBSAM Institut Brestois Santé Agro Matière Dir: Laurent CORCOS (INSERM)		
HEALTH AGRI-ENVIRONMENT MATERIALS	Num EC*	Num HDR*
	192	108
LATIM UMR-S 1101 Laboratoire de Traitement de l'Information Médicale Dir: Eric Stindel	22	14
GGB UMR-S 1078 Génétique, Génomique Fonctionnelle et Biotechnologies Dir: Emmanuelle Genin (INSERM)	26	17
LBAI UMR-S 1227 Lymphocyte B et Auto Immunité Dir: Jacques-Olivier Pers	17	13
CEMCA UMR 6521 Laboratoire de Chimie, Électrochimie Moléculaires et Chimie Analytique Dir: Philippe Schollhammer	23	15
GETBO EA 3878 Groupe d'Étude de la Thrombose de Bretagne Occidentale Dir : Francis Couturaud	25	16
ORPHY EA 4324 Optimisation des Régulations PHYsiologiques Dir: Mickaël Theron	14	5
LUBEM EA 3882 Laboratoire Universitaire de Biodiversité et Écologie Microbienne Dir: Emmanuel Coton	22	10
LIEN EA 4685 Laboratoire des Interactions Epithelium Neurone Dir: Laurent Misery	15	9
SPURBO EA Soins Primaires, Santé Publique, Registre des Cancers de Bretagne Dir: Jean-Yves Le Reste	16	1
OPTIMAG EA 938 Laboratoire d'Optique et de Magnétisme Dir: Yann Le Grand	12	8
CIC 0502 Centre d'Investigation Clinique de Brest Dir: Christophe Leroyer		

Maths ICT

IBNM Institut Brestois Numérique Mathématiques Dir: Laurent Nana		
MATHS-ICT	Num EC*	Num HDR* HDR*
	105	48
LAB-STICC UMR 6285 Laboratoire des Sciences et Techniques de l'Information, de la Communication et de la Connaissance Dir: Christian Person (IMT Atlantique)	70	29
LMBA UMR 6205 Laboratoire de Mathématiques de Bretagne Atlantique Dir: Marc Quincampoix	35	19

Staff September 2021
EC: lecturer - researcher
HDR: higher doctors accredited to supervise research

Marine Sciences

OSU IUEM Institut Universitaire Européen de la Mer Dir: Frédéric Jean (UBO)		
MARINE SCIENCE	Num EC*	Num HDR*
	150	71
LOPS UMR 6523 Laboratoire d'Océanographie Physique et Spatiale Dir: Jérôme Paillet (CNRS)	9	5
LGO UMR 6538 Laboratoire Géosciences Océan Dir: Marc-André Gutscher (CNRS)	28	15
LEMAR UMR 6539 Laboratoire des Sciences de l'Environnement Marin Dir: Luis Tito de Morais (IRD)	38	24
LETG UMR 6554 Littoral, Environnement, Télédétection, Géomatique Dir: Françoise Gourmelon (CNRS)	11	5
LM2E UMR 6197 Laboratoire de Microbiologie des Environnements Extrêmes Dir: Mohamed Jebbar	5	2
AMURE UMR 6308 Aménagement des Usages des Ressources et des Espaces Marins et Littoraux – Centre de Droit et d'Économie de la Mer Dir: Gaëlle Gueguen-Hallouet	34	12
LBCM EA 3884 Laboratoire de Biotechnologie et Chimie Marines Dir: Isabelle Linossier (UBS)	5	1
IRDI FRE 3744 Institut de Recherche Dupuy de Lôme Dir: Philippe Le Masson	20	7

Humanities and Social Sciences

IBSHS Institut Brestois Sciences Humaines et Sociales Dir: Marie-Thérèse Cam		
HSS	Num EC*	Num HDR*
	289	102
CECJI EA 7289 Centre d'Etudes des Correspondances et Journaux Intimes. Dir: Sophie Guermes	5	4
CRBC EA 4451 Centre de Recherche Bretonne et Celtique CRBC - Documentation UMS3554 Dir: Yves Coativy	40	21
HCTI EA 4249 Héritages et Construction dans le Texte et l'Image. Dir: Alain Kerherve	49	20
LEGO EA 2652 Laboratoire d'Économie et de Gestion de l'Ouest. Dir: Patrick Gabriel	28	9
CREAD EA 3875 Centre de Recherche sur l'Education, les Apprentissages et la Didactique Dir: Patrick Marzin	43	11
GEOARCHITECTURE EA 2219 Dir: Lionel Prigent	20	7
LABERS EA 3149 Laboratoire d'Études et de Recherche en Sociologie. Dir: Nicole Roux	38	3
LAB-LEX Laboratoire de Recherche en Droit Dir: Gilles Raoul-Corneil	40	17
LP3C EA 1285 Laboratoire de Psychologie: Cognition, Comportement, Communication. Dir: Maud Besançon	11	1
CRPC-CLCS EA 4050 Composante de Recherches en Psychopathologie - Clinique du Lien et Création Subjective. Dir: Luz ZAPATA	16	1
CFV EA 1161 Centre Francois Viète Dir: Pierre Tessier (Nantes)	5	



UBO DOMINATES BIENVENÜE CALL FOR PROJECTS FUNDED BY THE REGION OF BRITTANY



The five-year postdoctoral programme, Bienvenüe, is funded by the Region of Brittany, in partnership with UBO and seven other higher education and research institutes. It has been set up to support and develop excellence in research in Brittany. In total, 75 post-doctorates will be co-funded by the EU through its Horizon 2020 research and innovation programme

In the first phase of the programme, 25 projects have been selected from more than 120 entries. Scientific relevance, potential applications, feasibility and expected results were all considered in the selection process.

Of the 25 postdoctoral projects chosen in September 2021, 11 are linked to research laboratories at UBO. The themes are diverse (e.g. immunology, chemistry, educational science, marine ecology) and come within three of UBO's four specialist research areas.

As well providing an opportunity to conduct a top-level research project, the programme is a real career booster for young researchers who will be able to take advantage of the best possible working conditions and develop their professional networks.

Another 25 post-doctorates will be selected in the second phase of the programme in 2022.



Jean-Alix Barrat, geochemist at LEMAR, has been appointed as a Senior member of the Institut Universitaire de France (Innovation), for his work on rare-earth elements, and their role in marine trophic chains.

EC002: THE OLDEST METEORITE IN THE SOLAR SYSTEM

Early small planets appeared when the solar system first formed 4.5 billion years ago. Metallic meteorites made up the visible traces of these planets' cores, but the rocky parts were totally unknown. A research team led by Jean-Alix Barrat, geochemist at LEMAR*, has acquired a piece of the EC002 meteorite which was discovered in the Sahara desert in May 2020. Through comprehensive analysis, the team has determined the make up of this rock's minerals and noble gases, its geochemistry, its physical properties, and also its date. These factors show that the rock is unique as it is the only one to present all these characteristics. In an article published in *PNAS* in March 2021, the researchers demonstrated that it was a piece of the crust from one of the first objects in the solar system. EC002 is currently recognised as the oldest meteorite. This record was entered in Guinness World Records in April 2021.

Further, in-depth study of this ancient rock will make it possible to build up a picture of the context in which it formed and to develop thinking about how those first primordial planets evolved over time. The EC002 meteorite is therefore a unique witness to the solar system's past.



*Laboratoire des Sciences de l'Environnement Marin (LEMAR, UMR 6539, UBO-CNRS-IRD-Ifremer)

THE SAINT-BÉLEC SLAB, THE OLDEST MAP OF EUROPE AND MAJOR DISCOVERY OF THE YEAR

In an article published in the *Bulletin de la Société préhistorique française* in April 2021, Clément Nicolas, a postdoctoral researcher at the University of Bournemouth and Yvan Pailler, researcher and chair of the ArMeRIE* programme, presented what could be the oldest known map of an area in Europe.

The Saint-Bélec slab (Finistère) is a carved, 2m long schist slab which was discovered in 1900 in a burial mound dating from the Bronze Age (2150- 1600 BC). Having rediscovered it in the cellars of the Musée d'Archéologie Nationale, the research team conducted a series of analyses using photogrammetry and 3D modelling. The results pointed to similarities between the etchings represented on the slab and maps of the area around the burial mound where it was discovered.

To validate this hypothesis statistically and mathematically, Julie Pierson, a geomatician at LETG*, carried out a concordance analysis. This showed an 80% match between the etchings on the slab and the Odet Valley. The slab is therefore thought to be a map of an area of about 30 kilometres in this region.

An English language version of the article, published in the *Oxford Journal of Archaeology* in November 2021, has given the Saint-Bélec slab an international reputation. The original nature of this discovery was also highlighted in *Archaeology Magazine*, the magazine of the American Institute of Archaeology, which ranked it in its Top 10 archaeological discoveries for 2021.



*ArMeRIE research programme (Archéologie maritime et recherche interdisciplinaire environnementale). More information on pages 25-26
*Littoral, Environnement, Géomatique, Télédétection (LETG, UMR 6554 (CNRS-École Pratique de Hautes Études-Université d'Angers-UBO-Université Caen Normandie-Université de Nantes-Université de Rennes 2)

OUR RESEARCHERS

in the Spotlight



Geneviève HÉRY-ARNAUD
PU-PH* at UMR 1078*

OUR MICROBES ARE GOOD FOR US

To respond to the growing expectations of both the general public and healthcare professionals, in April 2021, Geneviève Héry-Arnaud, PU-PH* at UMR 1078*, published a book dedicated to microbes. Featuring concrete examples and data on all the microbiota in our organs, this book "explains what the bacteria in our bodies do, links them to the illnesses we know about and dread, explains their workings and data obtained through research, and offers viewpoints to spark curiosity".

Through her writing, Geneviève Héry-Arnaud takes the role of an advocate for our microbes and sets out to show us that they are good for us - a stance she takes every day in her research laboratory and with her students.



To find out more:

Ces microbes qui nous veulent du bien
Published by Humen Sciences



*PU-PH: Professeur des Universités et Praticien Hospitalier/Prof of Universities and Hospital Practitioner

*Génétique, génomique fonctionnelle et biotechnologies (GGB, UMR 1078, Inserm-UBO-Établissement Français du Sang-CHRU de Brest)



François LUCIA
winner of the Fondation de France
Lucien Mallet Prize

IMPROVING RADIOTHERAPY THROUGH MEDICAL IMAGING

François Lucia, oncologist and radiotherapist at Brest CHU received the Fondation de France Lucien Mallet Prize last March. The award recognises his research on functional imaging as a way to improve brachytherapy, which he carried out for his thesis at LaTIM* under the supervision of Professor Ulrike Schick and Mathieu Hatt. This radiotherapy technique targets the tumour directly.

His thesis focused on cancer of the cervix, which affects some 3000 women in France every year, and on using medical imaging, including MRI* and PET*, to improve treatment. The images obtained could be used to personalise and adapt treatment to the specific needs of each patient, thus optimizing efficacy and minimizing toxicity.

*Laboratoire de traitement de l'information médicale (LaTIM, UMR 1101, UBO- IMTA-Inserm)

* Magnetic Resonance Imaging

* Positron Emission Tomography



Géraldine LE ROUX
2021 prix du livre engagé
for the planet

ETHNOGRAPHY OF MICRO PLASTICS

Published in June, *Sea Sisters* received the 2021 prix du livre engagé at the Mouans-Sartoux literary festival. In her book, Géraldine Le Roux describes the story of eXXpedition, a citizen science project documenting the presence of plastic in oceans and carried out on a round the world sailing expedition with a 100% female crew.

While sailing between Rapa Nui (Easter Island) and Tahiti in 2020, eXXpedition was interrupted, by the pandemic. The crew had to "self isolate" at sea but this did not deter them! The experience motivated Géraldine, a senior lecturer in anthropology at the CRBC*, to include a social analysis of the lockdown experience in her book.

As well as recounting the adventure, she offers in-depth ethnographical insights into a citizen science project. She also draws a link between cultural perceptions of plastic waste in Oceanian societies, her main sphere of research.



Learn more about eXXpedition:
Sea sisters - Indigène éditions

Learn more about
the work of Géraldine
Le Roux



*Centre de Recherche Bretonne et Celtique (EA 4451)



Matthieu TALAGAS
Charles Grupper prize 2021

THE RELATIONSHIP BETWEEN THE SKIN AND THE NERVOUS SYSTEM

At last year's Dermatology Days in Paris, Matthieu Talagas, professor of universities and hospital practitioner, received the Charles Grupper prize for 2021. This prize, from the Leo Pharma pharmaceutical laboratory, is awarded to young researchers who have published at a high level in the field of dermatology. "For me and the laboratory, this is important recognition of our research, from our peers" said Matthieu.

His work, conducted with the team from LIEN*, focuses on identifying the relationship between keratinocytes, the main cells in the epidermis, and the sensory neurones. In the long-term, this advance could pave the way for new targeted treatments for cutaneous pain and itching.



To find out more

*Laboratoire des Interactions Epithelium-Neurone (EA 4685)

OUR DOCTORAL STUDENTS

have got talent



Axel AYET
Best thesis for
Meteorology,
Atmospheric sciences and
Climate

A NEW PERSPECTIVE ON THE AIR-SEA INTERFACE

Axel Ayet has received the 2021 André Prudhomme prize for best thesis in the field of Meteorology, Atmospheric Sciences and Climate. His thesis, "Air-sea momentum fluxes in the vicinity of the sea surface: a theoretical study of the coupling between turbulence and wind-waves", was prepared at LOPS* and defended at UBO in 2020.

His work reconsiders ways of describing wind-wave coupling. This new theoretical framework has led to significant advances in atmosphere and ocean modelling and the definition of parameters for air-sea fluxes.

*Laboratoire d'Océanographie Physique et Spatiale (LOPS, UMR 6523, CNRS-Ifremer-IRD-UBO)



Élyne DUGÉNY
Finalist,
"My Thesis in 180 seconds"

OYSTER MICROBIOTA EXPLAINED IN THREE MINUTES

In April 2021, Élyne Dugény, a former doctoral student at LEMAR*, was finally able to take part in the national semi finals of "My Thesis in 180 Seconds", having won the Brittany/Loire regional finals twice (in March 2020, before the rest of the competition was cancelled due to Covid, and again in March 2021).

She delivered her clear explanation of the influence that neighbouring species have on the microbiota of oysters with enthusiasm and a touch of humour, winning over the regional judges. On 11 June 2021, she joined 15 more candidates for the national finals in Paris. Although she did not make it into the top three, this is an impressive achievement for the young researcher who defended her thesis at IUEM on 7 September 2021.

*Laboratoire des Sciences de l'Environnement Marin (LEMAR, UMR 6539, UBO-CNRS-IRD-Ifremer)

ALGORITHMS QUICKER THAN DOCTORS



Andrei IANTSEN
HECKTO 2020

Andrei Iantsen, a doctoral student at LaTIM*, has won a first algorithm competition for developing a model to detect and autocontour tumours using artificial intelligence, HECKTO 2020.

The LaTIM team, led by Andrei Iantsen, beat 17 other international teams with its deep learning-based approach which at times is more effective than doctors. The algorithms developed during the competition could have real-life applications, such as assisting doctors with assessing the development of tumours during treatment, or facilitating large-scale studies on precision medicine.

*LaTIM: Laboratoire de traitement de l'information médicale (LaTIM, UMR 1101, UBO- IMTA- Inserm)



Laura CORSI
Thesis in social geography



To view all the
documentaries
produced for this
thesis

A VIDEO MAGAZINE FOR A THESIS AT TÉBÉO

Laura Corsi has completed a doctoral programme in social geography at local television station TÉBÉO in Finistère. After finishing her studies in January 2020, she is now pursuing postdoctoral research at Labex Dynamite.

"I conducted my studies at TÉBÉO and the LETG* laboratory at IUEM* under a CIFRE* agreement as part of programme called ID-îles (Initiatives and Development on the Îles du Ponant).

I contributed to research on new arrivals settling on the islands and the impact of this phenomenon on local dynamics. Based on our research, I then co-wrote a screenplay and went on to film, present, edit and screen this on the islands. In all I produced 19 programmes, each lasting 26 minutes, and featuring 179 people. Afterwards, I analysed this experience through the concept of mediation between the spheres of research, local areas and television. My thesis received the second honourable mention in the Comité National Français de Géographie's thesis prize."

*Convention Industrielle de Formation par la Recherche (Industrial research and training agreement)

*Littoral, Environnement, Géomatique, Télédétection (LETG, UMR 6554, CNRS-École Pratique de Hautes Études-Université d'Angers-UBO-Université Caen Normandie-Université de Nantes-Université de Rennes 2)

*Institut Universitaire Européen de la Mer



José-Luis GARCIA CORONA
Maureen Kellerman Prize

ALGAE THAT ARE TOXIC TO SCALLOPS

José-Luis Garcia Corona is a doctoral student in eco-toxicology at LEMAR*. His thesis was about the detection of an algae that contains an amnesic toxin, domoic acid, in the tissue of a marine bivalve. Through an approach that used integrative physiology and functional genomics, he discovered the mechanisms involved in the accumulation and retention of this toxin in scallops.

At the 19th International Conference on Harmful Algae, last October in Mexico, José-Luis received the Maureen Kellerman prize for best oral presentation. His talk was selected from the 77 presentations given by doctoral students from 13 different countries.

*Laboratoire des Sciences de l'Environnement Marin (LEMAR, UMR 6539, UBO-CNRS-IRD-Ifremer)



Dominique ABGRALL
Winner of the SCOR prize 2021

CHANGE DETECTION APPLIED TO INSURANCE

Dominique Abgrall, an actuary at AXA and Doctor of applied mathematics, has won the 2021 SCOR prize for young doctors. The prize recognises his work on a thesis which he prepared at the Brest Mathematics Laboratory (LMBA*) with backing from UBO's school for actuaries, EURIA.

"My thesis was based on two studies to detect change. We looked at random phenomena with underlying characteristics that are thought to be constant but can change in a moment. This is what we mean by change here." Dominique explained. The initial study established a rapid way to estimate the average number of deaths following a change. Dominique then went on to develop a technique to help actuaries detect changes in a population made up of several sub-populations.

*Laboratoire de Mathématiques de Bretagne Atlantique (LMBA, UMR 6205, CNRS-UBO-UBS)

KEY ISSUES + IN RESEARCH



Focus: the AUB and CERNI

The Brittany Alliance of Universities (AUB) has had an ethics committee for non-interventional research (CERNI) since 2021. Its role is to ensure that the rules of ethics are observed in research projects conducted by members of UBO, UBS, and ENIB. Approval from CERNI shows that a project is considered to follow the ethical principles of research.

CERNI also monitors legal and regulatory developments concerning research on humans and data protection.

To find out more:
<https://aub.bzh/recherche/cerni/>

“A review of the Day of Research 2021 in figures”

”

14 October 2021

- **1 central theme :**
ethics and scientific integrity
- **5 expert speakers**
on these issues, including 1 from the University of Split, a member of the SEA-EU Alliance
- **200 attendees**
including 96 doctoral students

500 views
of recordings on Youtube

ETHICS AND SCIENTIFIC INTEGRITY AT THE CENTRE OF OUR RESEARCH ACTIVITIES

UBO's annual day of research was dedicated to ethics and scientific integrity. As these two notions are integral to research, they have been a consideration within universities since they were founded. However, over the last 15 years various related issues have developed and changed in significance. Three main reasons are attributed to this: the ever increasing amounts of funding needed to complete research and difficulty securing budgets; the phenomenal increase in the volume of information in circulation and ease of access to it; and the emphasis placed on quantitative criteria (bibliometrics, order of signatures, etc) in career development. In response to growing awareness of these developments, in 2007, an initial world conference was organised in Lisbon to discuss scientific integrity, defined as "all the rules governing research practices to guarantee honesty and scientific rigour in research".

The concept is more pragmatic than ethics, which places the emphasis on the major questions arising from advances in science and their societal repercussions. At that level, France has had a national advisory committee since 1983 whereas scientific integrity has remained the poor relation. After the second world conference, in Singapore in 2010, things changed. In 2015, a national ethics charter for research was enacted and a conference of its signatories - which include UBO - was introduced. The following year, Pierre Corvol, a doctor, biologist and chair of the Académie des Sciences, was tasked with a report which would open up a new field. Entitled "Review and Suggestions for Implementing the National Charter for Scientific Integrity", the report made 16 recommendations, including the creation of a national office for scientific integrity (OFIS) which was established in March 2017. This office is a department of HCERES and its activities are supervised by the French Council for Scientific Integrity (COFIS). OFIS immediately suggested that an ad-

viser for scientific integrity was appointed in every higher education establishment. UBO appointed one in March 2018. Today, there are 170 such advisers. They have their own network (RESINT) and have published a guide in order to standardise the records compiled when failings are reported or suspected. It goes without saying that we should prioritise prevention. To this end, ad hoc training for doctoral students has been expanded and the guarantee of good practice is a standard requirement in the majority of calls for tender in research, which stipulate specific conditions and request authorised approval on the protocols proposed. This requirement, introduced by the Jardé law in 2012, to cover interventional contexts, was extended to the humanities and social sciences by decree on June 16, 2016.

To satisfy this requirement, UBO established an ethics committee for non-interventional research (CERNI) in conjunction with UBS and ENIB through the AUB. The 2021 Day of Research was an opportunity to place issues in context, to explain current and future arrangements, and to make UBO's staff and service users aware of these matters.

Daniel Le Couedic,
Ethics and scientific integrity adviser at UBO
2018 - 2021





©Mathieu Le Gall

CONTEMPORARY CHALLENGES IN RESEARCH

Two disciplines one objective: ending food waste

The FoodRest project was motivated by the unignorable observation that 53% of food waste in Europe comes from households. What's more, most of this waste is preventable.

To understand the causes and find solutions to limit fresh fruit and vegetable waste, two of UBO's laboratories have joined forces: LEGO* to consider the behavioural and communicational issues and LUBEM* to investigate the microbiological aspects.

FoodRest was launched in early 2021 with funding from the ANR* and will run for four years. To reflect real life conditions as closely as possible, the project has recruited 50 volunteer families in the Brest region for its research. Each home has been given a smart bin to weigh the volume of fruit and vegetables thrown away accurately. Additionally, participants have been interviewed and samples taken from blemished fruit and vegetables, in

the bins and storage areas. With this approach, it is possible to study the entire process of waste generation in households including attitudes to blemished fruit and vegetables, steps taken to preserve fruit and vegetables, and microbial contamination.

FoodRest's end goal is to produce a guide to good hygiene practices to inform consumers and help them limit fresh fruit and vegetable waste.

*Laboratoire d'Économie et de Gestion de l'Ouest (LEGO, UR 2652, UBO-IMTA-UBS)

*Laboratoire Universitaire de Biodiversité et d'Écologie Microbienne (LUBEM, UR 3882, UBO)

*Agence Nationale de la Recherche



©Entre-vue

Individual treatment for each rare autoimmune condition

Today, 5-8% of the world's population is estimated to be affected by a rare autoimmune condition. Knowing about and understanding the origins of these pathologies is essential for developing personalised medicine strategies. The European project IMI PRECISESADS has been working towards this very objective for five years through the input of 28 partners in 12 different countries, including the research team from UBO's immunology laboratory, LBAI*.

In an article published in *Nature Communications* in June 2021, LBAI put the spotlight on Gougerot-Sjögren Syndrome (GSS). This autoimmune disease manifests by destroying the tear and saliva glands. Because of the varied nature of symptoms, there are currently no effective treatments for GSS. LBAI are particularly interested in this heterogeneity and its causes.

So far, through a series of molecular analyses, it

has been possible to classify GSS patients into 4 groups, or clusters, according to their immune profile. These clusters have then been characterised specifically using an algorithm derived from machine learning. By determining the molecular biomarkers responsible for GSS, LBAI's study has helped to clarify understanding of the heterogeneous nature of the condition, and therefore its causes, opening up possibilities for targeted treatments for affected patients.

*Lymphocytes B et Autoimmunité (LBAI, UMR 1227, UBO-Inserm-CHRU de Brest)



©NASA

Small-scale currents influence climate

The surface of the ocean is swept by multiple currents of different forms and scales, contributing to the circulation of physical elements. The Agulhas current, off the coast of South Africa, facilitates the transfer of warm salty water from the Indian Ocean to the Atlantic. These water masses feed thermohaline circulation which plays an important role in climate regulation.

In a study published in *Nature Communications* in September 2021, Jonathan Gula, a researcher at LOPS* and his colleagues from the GEOMAR Helmholtz for ocean regulation in Kiel, Germany, showed, for the first time, that small-scale currents have a significant impact on ocean circulation in the region of the Agulhas current. To demonstrate this, researchers used very high-resolution simulations to model dynamic structures (currents, eddies, etc) over areas of approximately 1 km. Their findings showed that these small-scale structures modify exchanges between oceans and can increase the leakage of warm salty water into the Atlantic by 40%.

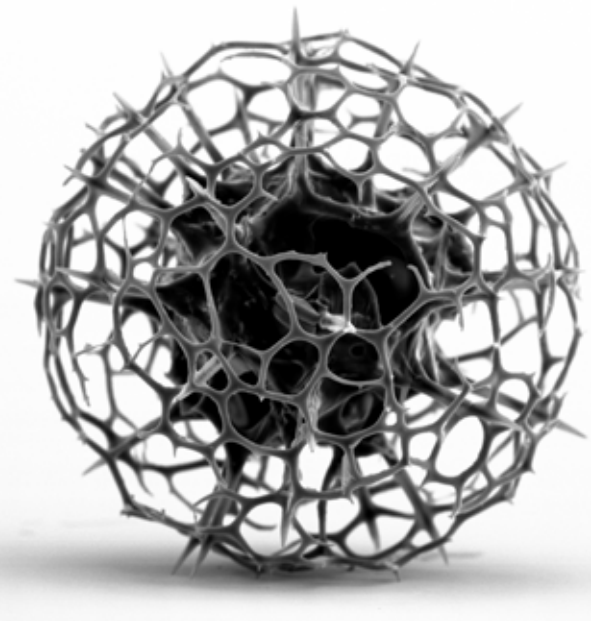
These changes to the Agulhas current, even on a small scale, can therefore lead to an imbalance and have a major impact on climate, for example, by increasing the frequency and intensity of cyclones.



Jonathan Gula, an oceanographer and physicist at LOPS, was appointed as a Junior member of the Institut Universitaire de France in 2020 for his research on ocean turbulence and dynamic processes. Membership is for a five-year term, and will enable him to concentrate solely on his research projects with the goal of creating and innovating.

*Laboratory of Physical and Space Oceanography (LOPS, UMR 6523, CNRS-Ifremer-IRD-UBO)

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IUEM leads research on silicium

Living organisms are made of carbon. It is often overlooked that many of these organisms use silicium to form external and internal envelopes. This is certainly the case with diatoms, microscopic algae which supply 25% of the oxygen we breathe. A comprehensive study, led by Paul Tréguer and Jill Sutton from LEMAR*, shows that deposits of silicium in the ocean (from rivers, dissolving siliceous rocks, winds, etc) are currently balanced by organic deposits in sediments. However, like the carbon cycle, the silicium cycle is under intense pressure from human activity such as agricultural practices that cause soil erosion, dams that divert rivers and climate change. These activities change the composition of sediments and the elements available for organisms. Over the course of the 21st century, this disruption could have a major impact on siliceous organisms and destabilise the global silicium cycle, with far-reaching consequences.

This is the third study on the silicium cycle that researchers at IUEM* have led over the past 25 years, confirming the unit's standing as a world leader on this topic.

*Marine Environmental Sciences Laboratory (LEMAR, UMR 6539, UBO-CNRS-IRD-Ifremer)

*European University Institute of the Sea



LUBEM strengthens its links with INRAE

At present, LUBEM* is UBO's only specialist agriculture and food laboratory. It studies these fields from a microbiological perspective and has a particular interest in spore forming bacteria and fungi (yeasts and moulds). The laboratory's teams frequently work with other local laboratories such as LEGO* and BEEP*, but it also has long-standing, regular collaborations with INRAE, and more specifically the MICA department which specialises in microorganisms in the food chain.

The two units have now signed an agreement to formalise these historic and productive links. This means that as of 1 January 2022, LUBEM will work officially under an INRAE contract (USC). Although INRAE has not yet become a supervisory affiliate to LUBEM, this agreement strengthens links, facilitates project development and opens access to the Institute's doctoral contracts for joint theses.

As part of this agreement, LUBEM has had to sign up to the INRAE 2030 plan, a roadmap that defines the Institute's major scientific goals for the next decade. In this context, LUBEM will pursue two lines of research: "Understanding the function of alimentary microbiota to support ecological transition" and "Studying and optimising microbial systems for biotechnology", particularly in the fields of agri-food, the environment, and health. These are all subjects of the future which we should follow closely!

* University Laboratory of Biodiversity and Microbial Ecology (LUBEM, UR 3882, UBO)

*Western Economics and Management Laboratory (LEGO, UR 2652, UBO-IMTA-UBS)

*Laboratory Biology and Ecology of Deep Marine Environments (BEEP, UMR 6197, Ifremer-UBO-CNRS)

*National Research Institute for Agriculture, Food and the Environment



AN ECOSYSTEM CONDUCTIVE TO COMMERCIALISATION



Two technological platforms at UBO in the BiogenOuest network

University-industry collaborations: in pursuit of excellence

Three new and promising projects recognised by the Fondation Grand Ouest

The **Fondation Grand Ouest** supports innovative projects in the region. As part of its remit, every year, it awards some 20 prizes throughout the Grand Ouest region.

For the third consecutive year, a female researcher from Brest has been awarded the prix du Grand Ouest. **Souha Nazir** has received a €20,000 grant for her project "Dynamic Monitoring of the Patient's Surface" which she is working on with LATIM* and Brest CHU. Her goal is to develop a simple and non-invasive technological device, based on artificial intelligence, that can adapt oxygen flows for patients in resuscitation.

Two prizes for "Encouragement", worth €5000 each, were also awarded to young researchers from Brest.

Pascal Trouvé is head of the research group for "Proteic Function and Pharmacological Modulation" at the GGB* laboratory. The group has discovered five new molecules that counter cystic fibrosis and COPD, which could lead to new treatments and improve care of these patients.

After completing a thesis at LM2E*, Jordan Hartunians has founded the GRYHN project, for which he successfully won funding through IFREMER's Octo'Pousse competition. GRHYN's goal is to find a totally carbon free source of energy by producing hydrogen on an industrial scale from a marine microorganism.

* Laboratoire de traitement de l'information médicale (LaTIM, UMR 1101, UBO- IMTA-Inserm)

* Génétique, génomique fonctionnelle et biotechnologies (GGB, UMR 1078, Inserm-UBO-Établissement Français du Sang-CHRU de Brest)

* Laboratoire de Microbiologie des Environnements Extrêmes (LM2E, UMR 6197, Ifremer-UBO-CNRS)

Commercialisation trophies: Olivier Mignen receives the Transfer prize

This year, for the first time, Ouest Valorisation and the Brest-Lorient-Vannes innovation campus held an awards ceremony for commercialisation. The event was organised to promote research activities in the Brest-Lorient-Vannes region by recognising joint, innovative scientific projects between the public and private sectors. For this opening year, the Brittany regional authorities awarded prizes for Partnership, Transfer, and Transition at a ceremony at UBO on 23 November 2021.

Olivier Mignen, senior lecturer at UBO, researcher at LBAI* and co-founder of the start-up Kalsiom, received the Transfer prize. This start-up's research team is developing new, "top-class" immunomodulatory antibodies to regulate calcium signalling in order to treat some autoimmune conditions. The ultimate goal is to produce a medicine to treat rare autoimmune illnesses such as Disseminated Lupus Erythematosus and Myasthenia gravis. These research activities received the Transfer prize for their focus on developing a commercially available solution to address a societal challenge.



To find out more: about Kalsiom's activities

* Lymphocytes B et Autoimmunité (LBAI, UMR 1227, UBO-Inserm-CHRU de Brest)

BiogenOuest is an interregional network of 36 technological platforms for life sciences and the environment in the Grand Ouest region. These platforms are open to all of the scientific community, public and private, and some meet the needs of manufacturers and economic stakeholders.

In addition to pooling resources and driving technological development, BiogenOuest has the remit of disseminating knowledge through training and playing a part in scientific outreach and economic development in the region.

In 2021, two new platforms at UBO joined this network: Hyperion and PLaTIMed.

The PLaTIMed platform was developed by LaTIM* to support and facilitate research, development and approval of innovative medical devices and procedures by making available cutting-edge equipment and unique expertise. It comprises two technical platforms designed to respond fully to the needs of research laboratories and manufacturers. Its preclinical platform has an anatomy lab and an adjoining preclinical operating room so that preclinical tests can be performed in a realistic environment. And its clinical platform provides privileged access to an imaging system and a scanner to support trials and initiate clinical studies.

The Hyperion platform offers a package of techniques focused on flow cytometry, cell sorting, and both standard and imaging mass cytometry. The platform's staff have the technical and scientific skills and knowledge for projects on all types of cells and tissues. Hyperion is open to all stakeholders in the scientific community, public and private.

Research collaborations are built on the principle of partnership between the University and one or more research institutes or private sponsors. Through these research groups, and by merit of

the additional resources they bring, UBO is able to conduct research activities at the highest levels of excellence and share knowledge with students and members of the public.

Cyberlot: "building secure communications for the future"



This ambitious research programme will strengthen cooperation between the Laboratoire des Sciences et Techniques de l'Information, de la Communication et de la Connaissance (Lab-STICC) and the Laboratoire de Mathématique de Bretagne Atlantique (LMBA).

The Cyberlot research group was formed within IBNM* at the end of 2018 to study the highly topical question of making smart objects secure. Its specialist focus is on securing data in the physical layer, the first link in the information transmission chain.

Despite a challenging public health context, which has limited opportunities for international mobility and to attend conferences, and also hindered access to the equipment needed for experiments, Cyberlot's profile has strengthened this year. "Numerous partners have contacted us about collaborating on projects and joint publications" reports Roland Gautier, a lecturer-researcher at Lab-STICC, and the group's coordinator. As well as the seven papers Cyberlot already had under its belt, four more articles have been published, including one in the highly regarded *IEEE*



The dig at Beniguet on the Molène archipelago (Finistère).
The wooden frames stop sand from covering the site - and people!

© Pierre Stéphan, LETG.



Explore the site by video

Internet of Things Journal. The programme has also been recognised by the Cyber excellence hub. "Our activities and knowledge are respected, making us all the more attractive to our high calibre students, Roland explains. "We are also attracting top class international doctoral students through our international collaborations."

In 2022, the six thesis projects in progress will continue and will be promoted and developed through publications, patents and collaborations. And last, but not least, Cyberlot plans to respond to a new and highly selective call for original projects under the ERC* Advanced Grant 2022 scheme which recognises and funds scientific excellence.

* Institut Brestois du Numérique et des Mathématiques.
* European Research Council.

ArMeRIE: an interdisciplinary approach to maritime archaeology

The ArMeRIE* research group was set up jointly by UBO and INRAP* to provide a true meeting point between disciplines. Historians, ethnohistorians, geneticists, geologists, geographers, biologists, archaeologists and palynologists are all working together on a common research area: understanding coastal societies of the past.

"Our approach is firmly interdisciplinary" confirms Yvan Pailler, an archaeologist at INRAP and the group's coordinator.

There were several standout highlights for ArMeRIE in 2021. First of all, the group published an article about the Saint-Bélec slab (Leuhan), interpreted to be one of the oldest maps of Europe**. Beg ar Loued (Molène), the site of the vestiges of two dry stone houses from the early Bronze Age, was also in the spotlight. A virtual tour of one of the houses was reconstructed in video* and previewed at the Shoreline Archaeology symposium*. The summer, also saw the start of an educational dig on the île de Béniguet. It is hoped that this excavation will develop understanding about life and the environment for island societies in the past. The next dig will be in August 2022.

* INational Institute of Preventive Archaeological Research.

* The research group is formed from 3 departments at UBO (IBSHS, IB-SAM, IUEM) and five research units (LEMAR, LETG, LGO, GGB, CRBC). The Centre Européen de Réalité Virtuelle (CERV) also joined recently. It receives additional funding from the EUR Isblue SeaLex project and the ANR's GEOPRAS project.

* With the support of CERV (Centre Européen de Réalité Virtuelle), ENIB.

* Organised by INRAP and the Musée du Quai Branly.

** See "The Saint-Bélec slab, the oldest map of Europe and major discovery of the year", p. 11



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RESEARCH WITH AN INTERNATIONAL REACH

UBO still in the Top 15 for Oceanography research

The Shanghai "by subject" ranking 2021, which lists the best universities in each disciplinary field, was published in Summer 2021. Again, and for the 3rd year running, UBO has performed particularly well in oceanography, occupying 13th place in the world - which translates to 5th place in Europe and 2nd place in France. As well as this high level of distinction internationally for oceanography, UBO has been recognised in another 5 disciplines:

- **Earth sciences:** 101 – 150
- **Atmospheric sciences:** 301 – 400
- **Ecology:** 401 – 500
- **Environmental science and engineering:** 401-500
- **Biology:** 401 – 500

Although these rankings are not an objective in themselves within the University's strategy, they prove, once again, that UBO is at the cutting edge of research in life, earth and marine sciences.

The Shanghai ranking is based primarily on research output, and specifically, contributions from researchers to international scientific reviews. The evaluation criteria focus on both the number of articles published and their impact on a global scale. They offer an external and independent view, based on public and reproducible indicators.

Research on the polar environment : a priority for IUEM

Global climate change impacts the whole planet. But its effects are being observed more rapidly and with more intensity in the polar and sub- polar regions at both a biological and an economic level. The vast majority of research units at IUEM* are working on research programmes on these regions in conjunction with their national (IFREMER, MNHN, IPEV) and international partners. Their input reflects UBO's long tradition in polar research which began in the 1970s with studies on the geomorphology of Spitzbergen and chemical oceanography in the Indian section of the Southern Ocean.

On 1 April 2021, IUEM members working on the topic met for a "polar day". The event formalised their cross-disciplinary strategy for research on polar environments.

Through this strategy, it will be possible to structure and foster an interdisciplinary approach to research projects both within IUEM and with its partners. Researchers at IUEM will also be able to take part in major national and international programmes.

From an international perspective, having an official strategy for cross-disciplinary polar research means that IUEM will play a leading role in interdisciplinary research on these regions.

SEA-EU was formed in October 2019 to create a European alliance of multidisciplinary universities with coastal locations. In 2022, three new universities brought its membership to nine. All universities share the same goals: creating a truly international campus, embedding a European identity and responding to the societal challenges of sustainable development. SEA-EU facilitates European mobility for students, lecturers, researchers and other staff at member universities, to strengthen links and foster exchange.

Encouraging international research

One of SEA-EU's priorities is to break down barriers and facilitate cooperation between members, especially when it comes to research.

To this end, universities in the alliance, predominantly through research vice presidents, will be developing a shared strategy that will be set out in a long-term, research plan.

The ambition is to make it easier to organise research projects across SEA-EU. Researchers can also draw on the expertise of every member university, which will be invaluable for responding jointly to calls for projects.

While this research plan will formalise joint approaches and methods, universities in the alliance are already pursuing projects together. Two projects were launched in 2021:

► **The Zone Atelier Brest Iroise (ZABrI) will be presented at a workshop in April 2022 and developed with the alliance's member universities.**

Located in the Bay of Brest, ZABrI works to improve understanding of the functioning and evolution of the coastal environment. Its objective within SEA-EU is to create a sustainable future for coastal ecosystems. This theme is central to the concerns of the universities in SEA-EU given their geographical locations by the sea.

► **Rolling out UBO's Labo 1 point 5 initiative to all universities in the SEA-EU Alliance.**

Labo 1 point 5 is a collective for research and sustainable innovation which supports research laboratories with reducing their carbon footprint. SEA-EU members have started to develop on a position paper so they can work together to reduce greenhouse gases produced in the course of their research projects.

Broadening professional horizons for doctoral students

Today, positions in the public research sector are hard to come by and many new doctoral graduates are unprepared for the range of careers possible outside of academia. This is the finding of a survey of doctoral students and young researchers at universities in the SEA-EU Alliance.

To respond to the growing need to broaden the professional horizons of young doctoral students, an Erasmus+ programme, SEA-EU DOC, has been set up across all universities in the SEA-EU alliance. Its purpose is to establish a network of young European researchers, promote good practices and facilitate mobility between partner universities' doctoral schools. At UBO the programme is managed by EDSML*.

An initial study week on career development was organised in Brest in May 2021. Over the course of the week, 10 doctoral students from each university took part in online training on topics such as making a pitch, creating a LinkedIn profile, and identifying professional skills that can be transferred to the world of work. There were also opportunities to meet and talk with business leaders. *"This week of training has helped students to identify skills they have which are relevant to their areas of expertise and the kinds of transferable skills businesses are looking for. As an outcome they have become more confident both in themselves and in their competencies"* explained Catherine Meur-Ferec, who is head of EDSML and joint coordinator of SEA-EU DOC with Philippe Pondaven.

The week was a great success with the students who had particular praise for the positive group dynamics and connections they made with each other. It has also achieved its objectives as one doctoral student had received an offer of employment before the end of the week.



To find out more:



SCIENTIFIC, TECHNICAL, AND INDUSTRIAL CULTURE AT UBO

A University open to all



One of the University's roles is to educate and train students. But this isn't its only purpose. To transfer scientific knowledge and understanding to all parts of society, UBO coordinates and organises summer schools for teachers and journalists. The Sea & Education summer school has been running since 2013 and is currently organised through a partnership between UBO, the interdisciplinary graduate school ISblue, IFREMER, Océanopolis and the Académie de Rennes.

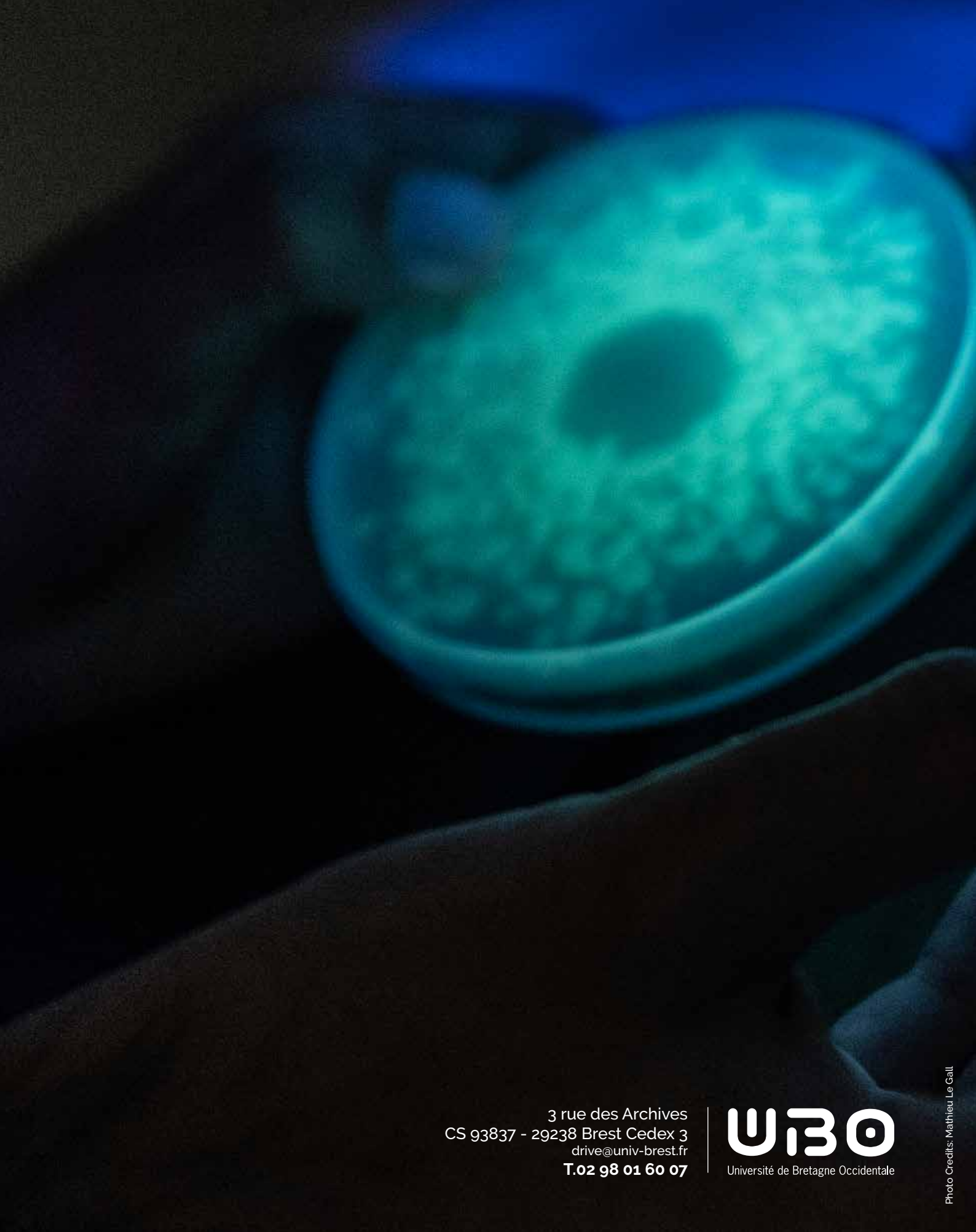
The 2021 school was held at IUEM between 23 and 26 August 2021. Some 30 teachers from all areas of France and Belgium attended these multidisciplinary training sessions on ocean sciences and technologies. This year, the main focus was on the scientific issues and technological challenges involved in ocean exploration, particularly in more remote areas such as the poles, the abyssal plains and the tropics. Over the four days, attendees could take part in 26 scientific sessions. There were also opportunities for specific visits and to join follow-up workshops, enabling teachers to co-develop educational projects using the knowledge they had gained at the summer school. In addition to training teachers, the purpose of these summer schools is to transfer knowledge and educate pupils, strengthening the links between schools and universities.



The 3rd session of the "Sea and Journalism" summer school took place at IUEM and online on 24 and 25 August 2021. It was aimed at French-speaking journalists of all specialisms and all media formats and was organised jointly by the ISblue interdisciplinary graduate school, the Ecole Supérieure de Journalisme de Lille (ESJL), the Institut France Québec Maritime (IFQM), the Club de la Presse de Bretagne (CPB), and Océanopolis. The 23 participants attended lectures from experts who put the spotlight on a general theme: "From oceans of extremes and crises to sustainable development"

The lectures were followed by workshops during which the journalists worked with the scientists to develop outlines for future articles or interviews on four topics related to the theme: anthropic pressure on coastal habitats, the impact of climate change on the Antarctic Ocean, human migration, and an ecosystem approach to fishing. The workshops were also an opportunity to inform journalists about scientific approaches and for networking.

*École doctorale science de la mer et du littoral



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