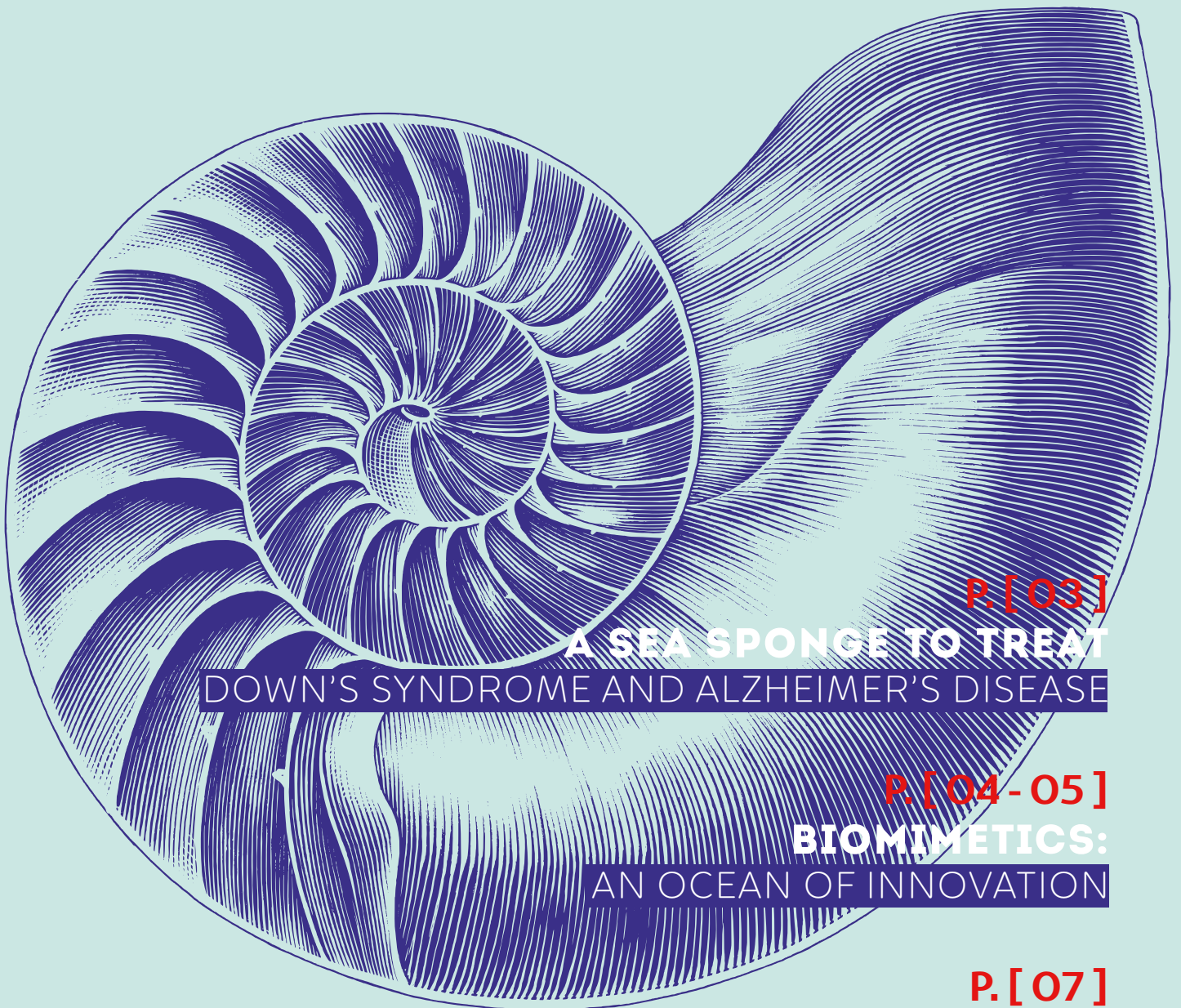


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**A SEA SPONGE TO TREAT
DOWN'S SYNDROME AND ALZHEIMER'S DISEASE**

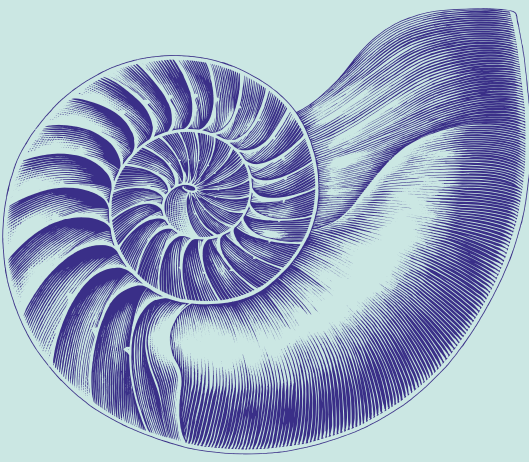
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**BIOMIMETICS:
AN OCEAN OF INNOVATION**

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**HEMARINA IS REVOLUTIONISING
ORGAN TRANSPLANTS
THANKS TO A WORM'S SUPERPOWERS**

MARINE BIOINSPIRATION



“LEARN FROM NATURE: THAT IS WHERE OUR FUTURE LIES”

Gilles Boeuf is a true specialist in biodiversity and a keen supporter of biomimetics. He has been President of the **European Centre of Excellence in Biomimetics** (Ceebios) for the last 12 years. His past roles include President of the **Muséum national d'Histoire naturelle** from 2009 to 2015, Visiting Professor at the **Collège de France** and Advisor to the French **Minister of the Environment, Energy and the Sea, Ségolène Royal**, while she was President of **COP21**.

LEONARDO DA VINCI WAS MARVELLOUSLY SUCCINCT ABOUT WHAT THE ETERNAL NATURAL WORLD HAS TO OFFER US: “LEARN FROM NATURE: THAT IS WHERE OUR FUTURE LIES”. FOR 4,000 MILLION YEARS, LIFE ON EARTH HAS SURVIVED EVERYTHING THANKS TO ITS PRODIGIOUS ABILITY TO ADAPT.

Meanwhile, humans have spent their time damaging everything around them. It's time to drop the arrogance and rediscover our ability to marvel at the living world. That's what I see as the first step towards successfully changing the prevailing paradigm. Nature-based or bio-inspired solutions, biomimicry or biomimetics – call them what you will – are all predicated on a position of humility, on having a real philosophy for life on earth. This position is a far cry from fashions or idealistic fads, it comes from the desire to innovate, to seek a whole new category. Well, perhaps not completely new, if you think that our model, the living world, has been innovating since the dawn of time.

Yes, I really am saying that a whole new category of innovation is coming into flower. I'm amazed at the extent to which we researchers

are being called on by business schools – the very schools that barely knew we existed twenty years ago – to speak to their students. At **Ceebios**, we're supporting more and more companies that want to make a change. Many say – quite rightly – that they're worried about the financial viability of nature-based solutions. But don't these inventions from the ocean pay us back naturally? Creating a vessel propulsion system inspired by the fin of a whale or an eel, revolutionising organ transplants on the basis of a lugworm's superpowers, synthesising a sea sponge compound to treat Down's syndrome and Alzheimer's disease, or making building materials from marine sediment.

These solutions are exemplary in their modest resource consumption. So long as we can really monitor and evaluate their true impact, our current innovations will remain profitable by their very nature. So let's cast out arrogance and bring in humility, by drawing inspiration from other life forms. Let's marvel at it all. Naturally.





ManRoss Perha Pharmaceuticals - Laurent Meijer



Perha Pharmaceuticals ©Cécile Debitus



ManRoss Perha Pharmaceuticals - comprimés

A SEA SPONGE TO TREAT DOWN'S SYNDROME AND ALZHEIMER'S DISEASE

PERHA PHARMACEUTICALS, A BIOTECH START-UP FROM ROSCOFF IN BRITTANY, HAS BEEN OPERATING SINCE 2019. ONE OF ITS MEDICAL PRODUCTS, LEUCETTINIB-21 OR LCTB-21, DERIVES FROM A CHEMICAL FOUND IN A MARINE SPONGE, LEUCETTA MICRORAPHIS. A REQUEST FOR AUTHORISATION WAS RECENTLY LODGED WITH THE FRENCH NATIONAL **AGENCY FOR THE SAFETY OF MEDICINES AND HEALTH PRODUCTS** (ANSM).

While Perha may be a fairly new start-up, it can draw on the considerable experience of its founder and chair **Laurent Meijer**. He has 32 years at **CNRS** (French Centre for Scientific Research) under his belt, and a further 12 years running his own business. Meijer's passion is the treatment of cognitive impairments, especially those associated with Down's syndrome and Alzheimer's disease. If the firm's drug candidate is approved for clinical trials, it will be tested for tolerability in humans, and if it proves sufficiently safe, the compound's effectiveness on patients will then be assessed.

SYNTHESISING A NATURALLY OCCURRING COMPOUND

"For these pathologies, the cognitive deficits are caused by poor connections between neurones. This appears to come from an anomaly in the *DYRK1A* protein kinase, or at least that's one of our theories", **Meijer** explains. Following the herculean task of selecting and testing natural substances, mostly found in marine environments, **Perha Pharmaceuticals** opted to use Leucettamine B, the natural product of a sponge found in the South Pacific and first identified by scientists in the 1960s and 70s. "This natural compound, synthesised in the lab, is known to be an inhibitor of *DYRK1A* kinase, which causes memory problems. We synthesised and tested over 1,250 derivatives

and analogues, and this extensive work ultimately led to selecting *Leucettinib-21* as the drug candidate".

A CHEMICAL LIBRARY BENEATH THE WAVES

Is synthesising a natural compound in a laboratory in this way an example of biomimetics? "Humans have always imitated nature - and been inspired by it", **Laurent Meijer** says. "The marine environment is an amazing natural chemical library, and we can draw on its resources to find new medical ingredients".

Although product development has only just begun, the hope is that the drug will be a success, following 18 years of gradual progress - with some pleasant surprises along the way. "We started with Down's", Meijer recalls, "and then broadened our work to Alzheimer's disease, Lewy body dementia and Parkinson's disease. I wouldn't be surprised if other applications prove possible".



BIOMIMETICS: AN OCEAN OF INNOVATION

IT'S ONE THING DRAWING INSPIRATION FROM THE LIVING WORLD. IT'S A MUCH MORE AMBITIOUS CHALLENGE TO DRAW INSPIRATION FROM THE LIVING WORLD AND THEN INNOVATE SUSTAINABLY. AND WHAT IF YOU WERE TO USE THE OCEAN AS A MODEL IN WHICH RESILIENCE OCCURS QUITE NATURALLY? WE INTERVIEWED **JULIETTE VERSEUX**, PROJECT MANAGER FOR MARINE BIOMIMETICS AT THE **EUROPEAN CENTRE OF EXCELLENCE IN BIOMIMETICS** (CEEBIOS), AND **TARIK CHEKCHAK**, DIRECTOR OF THE HUB FOR STRATEGIES INSPIRED BY THE LIVING WORLD AT THE **INSTITUTE FOR DESIRABLE FUTURES** (INSTITUT DES FUTURS SOUHAITABLES, IFS).

COULD YOU TELL US SOMETHING ABOUT YOUR ORGANISATIONS?

Juliette Verseux | Ceebios: Our cooperative aims to boost the environmental and societal transition using biomimetics, based on a simple observation: nature is an adaptive model which has selected the most robust, least energy-consuming and least resource-intensive solutions. We offer public and private sector stakeholders tools with which they can rethink innovation, modelling it on the living world in general and the marine environment in particular.

Tarik Chekchak | IFS: Our organisation is non-profit and is dedicated to amplifying what at present are weak signals, which will then resonate to help meet our future requirements. This can only be achieved by people who are keen to take action. We are living through a paradigm shift that provides the ideal opportunity to revisit what innovation can mean for us. The Institute is a member of **Ceebios**; we offer training, conferences and workshops dedicated to biomimetics. We don't claim that drawing inspiration from outside the human sphere is new, but we do adopt a new environmental design perspective - as also seen in agroecology and permaculture.

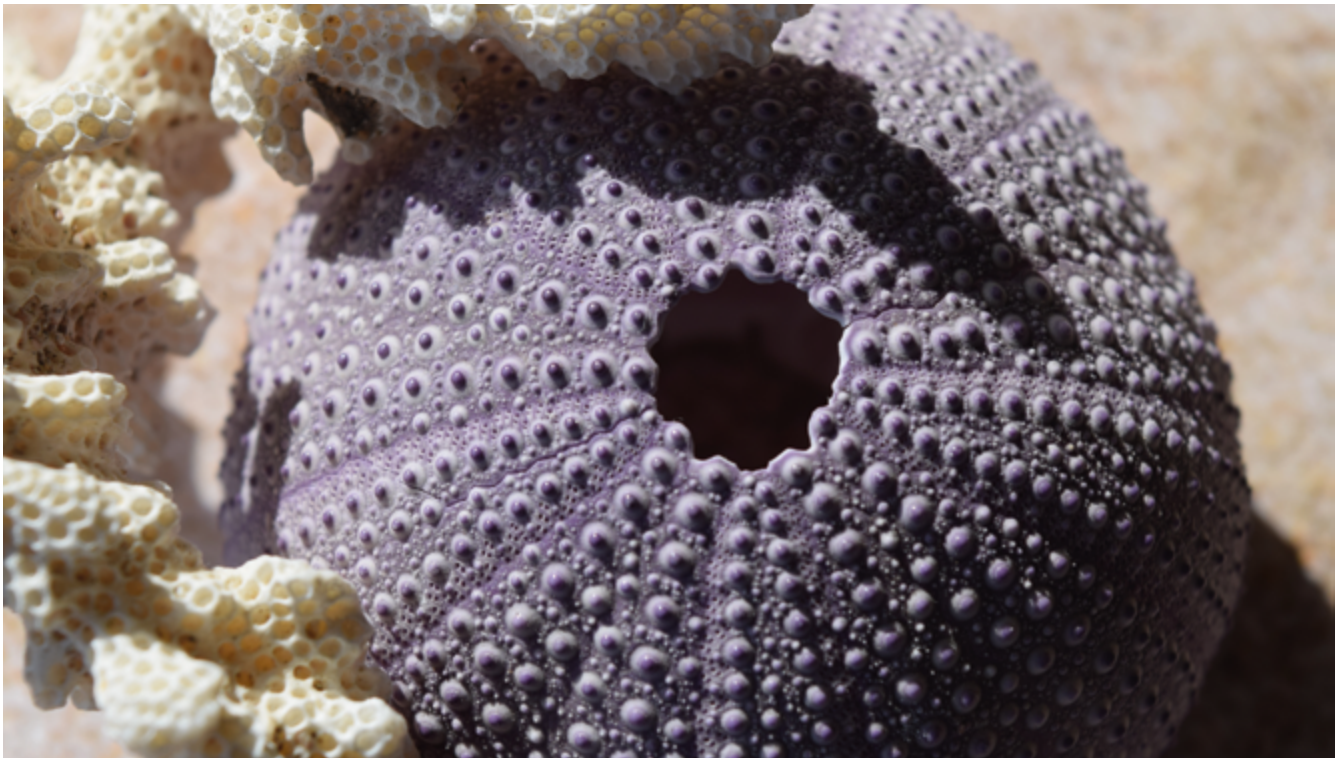
WHICH AREAS DOES MARINE BIOMIMETICS OPERATE IN?

Juliette Verseux: In contrast with land-based ecosystems, the marine ecosystem subjects organisms to very specific constraints. Equipment used in a marine environment is also affected: vessels are subject to the effects of current and the highly saline environment, just as fish are. Conversely, studying sharks - for example - can be a real mine of information. **Sharklet** is a US company that has designed an antibacterial coating for use in hospitals, while **EEL Energy** from Paris has copied the way sharks swim to design its undulating tidal turbine. Work is also underway to make a ship's hull that imitates the properties of shark skin. Other marine organisms such as sea urchins have inspired a self-cleaning surface to prevent biofouling, which in turn removes the need for chemicals to scour vessels' hulls.

Tarik Chekchak: At the **IFS**, we find areas of innovation with strong potential to transform industrial processes. We have made varying levels of progress with these, depending on the professionals and technologies we have available. One thing's for sure: many applications are looking very promising. There is great scope for green chemistry to be applied, as it converges with biochemistry. We could use water as a



Tidal turbine ©eel energy



solvent, turn all waste into a resource, and prioritise using elements that are plentiful and lightweight, as nature does - rather than using scarce, heavy elements we don't know how to dispose of. If we understand how living organisms work and grant ourselves the opportunity to draw inspiration from other systems, rather than just ourselves as human beings, we have the potential to speed up our transition. This could be very powerful and it would be a shame not to harness it.

DO YOU THINK IT'S IMPORTANT TO STANDARDISE THE CONCEPT OF BIOMIMETICS?

Juliette Verseux: Biomimetics, or biomimicry, describes an approach that takes living beings as a model for environmental design in response to the ecological and societal challenges we face. Biomimetics is not geared towards performance for performance's sake. The ISO standard

and the Technical Committee that define it underline this aim by making a clear distinction between biomimetics and other ideas such as 'bio-inspired'.

Tarik Chekchak: We now realise that our previous idea of performance no longer holds water. Officially, performance must now take the environmental aspect into account, which means public health: the health of people, society and the ecosystem.

INFO + ceebios.com

INFO + www.futurs-souhaitables.org



Fourth year of masters programme, January 2023. Participants (from left to right): Guillaume Masse, Jean-Pierre Nicolas, Bernard Bourles, Nadia Améziane, Daniel Rodary and Guillian Graves. ©SMC ENSCI

CONCARNEAU MARINE STATION: HOME PORT FOR AN ENSCI-LES ATELIERS MASTERS DEGREE

AS ONE OF THE 13 SITES OF THE FRENCH NATIONAL MUSEUM OF NATURAL HISTORY, CONCARNEAU MARINE STATION IS THE OLDEST FUNCTIONING FACILITY OF ITS TYPE IN THE WORLD, AND IT IS HERE WHERE THE FRENCH NATIONAL INSTITUTE FOR ADVANCED STUDIES IN INDUSTRIAL DESIGN (ENSCI, KNOWN INFORMALLY AS "LES ATELIERS" OR THE "WORKSHOPS") BRINGS STUDENTS FOR AN IMMERSION WEEK AT THE START OF THEIR MSc IN NATURE-INSPIRED DESIGN.

This is an excellent example of a constructive partnership between a renowned institution and a committed training establishment. **Guilliam Graves**, who established and still leads this unique masters course, has held a teaching post at ENSCI for 10 years and has a passion for biomimetics. He also heads up the **Big Bang Project** design agency. The **National Museum of Natural History** is not the only partner organisation for the course: there are also roles for the European Centre of Excellence in Biomimetics (**Ceebios**) and the Paris-based **Institute of Desirable Futures (Institut des Futurs souhaitables)**. In January 2024, the masters course will get underway for the fifth time.

INNOVATION - AS TAUGHT BY NATURE

Each year, 10 to 12 students from different backgrounds are selected to take the ENSCI masters course on design inspired by nature. "Engineers, designers, architects, chemists and biologists are all motivated by the integration of living systems into their work: they are all keen to innovate for, and from, nature," **Guilliam Graves** says. Hence the importance of immersion into the world of marine flora and fauna right from the start of the course. **Concarneau Marine Station** was an obvious choice. As Guilliam Graves puts it, "The marine station is a major asset for learning, allowing us access to a whole world of fundamental science." Concarneau makes for important synergies, too. **Nadia Améziane**, the station's manager, explains, "We encourage an exchange of ideas and insights during the immersion week by involving a number of students from the museum, including anthropology and palaeontology students. The week is an excellent incubator for what our students might go on to achieve in their future careers."

FROM FUNDAMENTAL RESEARCH TO SPECIFIC APPLICATIONS

It is very much in the spirit of the MSc to pursue, above all, a vocation of multidisciplinary - even interdisciplinary. "When tackling complex issues," **Guilliam Graves** says, "we mustn't rely on a simplistic approach.



©SMC ENSCI

We teach our students to work together, each with their respective specialism. This is how innovative projects fully take shape, especially when we draw inspiration from nature."

It's a matter of learning together through project work, moving from basic research to concrete applications on the ground. In the course of their immersion week, the students are challenged to rethink urban planning in the context of rising sea levels and to picture the aquaculture industry of the future. Creativity, skills and a sense of responsibility are very much the order of the day!

CONCARNEAU MARINE STATION IS A SPECIALIST CENTRE FOR MARITIME RESEARCH, EDUCATION, EXPERTISE AND KNOWLEDGE DISSEMINATION, AND IT ALSO HOUSES COLLECTIONS. IT IS ONE OF THE 13 SITES OF THE FRENCH NATIONAL MUSEUM OF NATURAL HISTORY.



Franck Zal ©Matthieu Le Gall



Lugworm ©Matthieu Le Gall

HEMARINA IS REVOLUTIONISING ORGAN TRANSPLANTS THANKS TO A WORM'S SUPERPOWERS

"I'VE TRAVELLED AROUND THE WORLD, BUT IT WAS WHEN I WAS LOOKING DOWN AT MY FEET ON A BEACH IN FINISTÈRE THAT I FOUND MY HOLY GRAIL" THIS IS THE STORY TOLD BY **FRANCK ZAL**, CO-FOUNDER AND CEO OF THE BIOTECH FIRM **HEMARINA** - ZAL'S "GRAIL" BEING A SANDWORM WITH SUPERPOWERS THAT INSPIRED A REMARKABLE INNOVATION.

Hemarina specialises in therapeutic oxygen carriers made from the lugworm (*Arenicola marina*), whose haemoglobin is similar to the human variety. It differs, however, in that it is the only type capable of holding a large amount of oxygen while being compatible with all human blood types.

100% INSPIRED BY NATURE

During his time as a **CNRS** (French Centre for Scientific Research) researcher at **Roscoff Marine Station**, **Franck Zal** wanted to understand how a worm could survive at low tide despite only being able to breathe in water. Once convinced of the potential of his lugworm, **Zal**

founded **Hemarina** in 2007. Everything had to be done from scratch. "Having raised just €40 million, we managed to develop an industrial extraction process for our molecule." There was no suggestion of taking worms from the wild, so **Zal** bought up an aquaculture farm on the island of Noirmoutier in the Vendée, which became the world's first sandworm farm.

EXPONENTIAL DEVELOPMENT

After 15 years of R&D and 63 patent applications, **Hemarina's** organ transplant products will be on sale soon. **HEMO2life®**, an additive that extends the preservation of harvested organs by optimising their oxygenation, is set to revolutionise organ transplants. Further applications related to blood circulation are also being developed, focusing on wound healing, gum disease and cancer treatment.



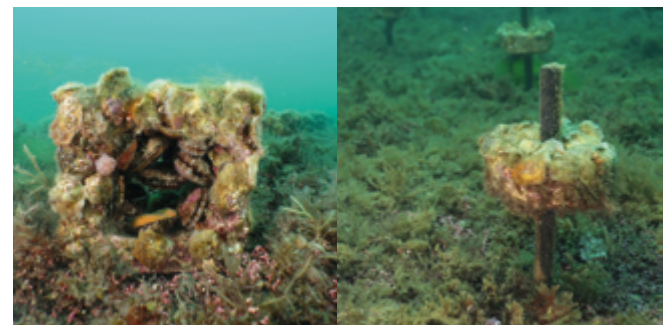
BAY OF BREST IFREMER HELPS ECOSYSTEM SELF-REPAIR

FOR TEN YEARS NOW THE FRENCH **NATIONAL INSTITUTE FOR OCEAN SCIENCE (IFREMER)** HAS BEEN WORKING TO RESTORE FLAT OYSTER REEFS IN THE BAY OF BREST. AS WELL AS THE ANTICIPATED ENVIRONMENTAL BENEFITS, THE ENTIRE LOCAL ECONOMIC ECOSYSTEM COULD SEE A POSITIVE IMPACT WITH THE RETURN OF BRITANNY'S CELEBRATED BIVALVE.

Three centuries ago, the seabed in the Bay of Brest was carpeted with 20,000 tonnes of flat oysters, but by the early 20th century over-exploitation had driven the oysters to the brink of extinction. Their disappearance caused the eradication of the habitat the oyster shells provided for oyster larvae and a host of other species, dealing a disastrous blow to the whole marine ecosystem.

OBSERVATIONS AND EXPERIMENTS

"We're initiating a bio-inspired virtuous circle to help the ecosystem repair itself", explains **Stéphane Pouvreau**, a marine biology researcher who is managing the restoration work at **Ifremer**. He goes on to say that the aim is to create "a simple mechanism that's easy to replicate, both technically and financially". Since 2015 an underwater laboratory has been in place at the heart of the Bay of Daoulas (within the Bay of Brest) to observe one of the bay's last remaining small oyster beds. A 60m² restoration site has been established which will be expanded to



©Matthias Huber - Ifremer

300m² in 2024 and will eventually cover an area of several hectares. Here the **Ifremer** team is studying oyster behaviour and experimenting with nature-based solutions*. To this end, work with materials experts has led to the development of a rough substrate that 'mimics' the shell of the flat oyster. "It's organic, biodegradable and part of the circular economy, and will disappear beneath the oysters as they attach themselves to it to form reefs." The intention is to show by example that it's possible to exploit a species commercially in a way that is respectful of nature.

*Nature-based solutions are "actions to address societal challenges through the protection, sustainable management and restoration of ecosystems, benefiting both biodiversity and human well-being." (IUCN definition).



GWILEN REINVENTS DESIGN AND CONSTRUCTION - NATURALLY

GWILEN, A COMPANY ESTABLISHED IN 2020, HAS DEVELOPED A WAY OF PROCESSING MARINE SEDIMENT TO MAKE SUSTAINABLE BUILDING MATERIALS - WITH SUPPORT FROM **TECHNOPÔLE BREST-IROISE** THE FIRM'S APPROACH WAS INSPIRED BY **DIAGENESIS**, THE AGE-OLD NATURAL PROCESS UNDERLYING SEDIMENTARY ROCK FORMATION.

The starting point was silt. All ports and estuaries silt up naturally; the process seems inevitable. **Yann Santerre** is the architect and engineer who founded **Gwilen**, and for him it all began with the idea of using this encroaching sediment to make sustainable materials.

KEEPING CLOSE TO NATURAL PROCESSES

Santerre explains the approach he and his business partner **Mathieu Cabannes** take: *"These days, we need to consider performance as a whole, how sustainable it is, getting as close as possible to what we observe in nature."* They have devised and perfected *"simple, low-energy processes with the right properties, in the right amounts, for their intended use in design, architecture and building."* With this in mind, **Gwilen** has succeeded where many previous projects using sediment have failed to achieve the results expected.



Green fault tiles ©Gwilen

CIRCULAR AND LOCAL

Gwilen has really thought through its circular economy model. The company exploits a local resource (which the local authority would otherwise need to remove at its own expense), makes use of local infrastructure, and sells tiles, furniture and design objects locally. The company is currently raising capital so it can develop a range of products aimed at the construction industry.



BLUEFINS: ACCELERATING DECARBONISATION WITH A HYDROFOIL INSPIRED BY WHALES

A MECHANICAL TAIL FIN WHICH HARNESSES SWELL TO ENHANCE SHIP PROPULSION - THIS IS THE ZERO FUEL SOLUTION DEVELOPED BY START-UP COMPANY **BLUEFINS**, IN PARTNERSHIP WITH **IFREMER**, **TOTALENERGIES** AND **ZEBOX**.



©Bluefins SAS

In 2017, **Olivier Giusti** was struck by the realisation that *"for an inventor, the most useful renewable energy to explore is wave energy"*. The engineer is keen to use his skills to advance the energy transition and is developing a technology that can be used for electricity generation and propulsion. His project is the first to have been incubated by the **French National Institute for Ocean Science (Ifremer)** through the **Octo'pousse** challenge.

GREEN PROPULSION

Giusti set up **Bluefins** in late 2020 to focus on propulsion. The hydrofoil mechanism he designed was inspired by the way a whale's tail fin propels the animal through the water. The hydrofoil doesn't mimic the movement of the tail fin; instead, as **Giusti** explains, *"Our auxiliary propulsion system is fixed to the ship's stern and is activated when there's swell and lifted out of the water when the sea is calm."* The engineer's invention has been patented and the mechanism can be adapted to suit a wide range of vessels, from cargo and container ships to LNG carriers and more.

PROMISING PERFORMANCE

The project is currently receiving support from **ZEBOX**, an incubator founded by **CMA CGM Group**. Following the first successful trials on a 7-metre model ship in 2023, a prototype is set to be tested at sea on a 25-metre **Ifremer** ship in late 2024. The launch of the first commercial pilot is scheduled for early 2026. It's estimated that the **Bluefins** hydrofoil could offer fuel savings of 20%. Quite an achievement!



WE EXPLORE: COURSE SET FOR BIO-INSPIRATION WITH A POSITIVE IMPACT

ROLAND JOURDAIN IS MORE THAN A SAILOR, HE IS AN EXPLORER IN ACTION. ADVENTURES ACROSS THE WORLD'S SEAS AND OCEANS HAVE FUELLED HIS DESIRE TO HELP CREATE A VIRTUOUS CIRCLE: A WORLD IN TUNE WITH NATURE. HIS BOAT **WE EXPLORE** IS AN AMBASSADOR FOR BIOCOMPOSITES AND HE PLANS TO PUSH US STILL FURTHER BY ENCOURAGING US TO RETHINK OUR BEHAVIOUR.



Navigation - We Explore ©Martin Viezzer



Roland Jourdain ©PuraVida Images

Initially, **Roland Jourdain** and **Sophie Vercelletto** set up **Kairos**, an entreprise à mission with an environmental and social purpose. This was followed by the endowment fund **Explore**, and with **We Explore** the committed pair continue their commitment to support "explorers and builders of a world in harmony with nature".

CLEANING UP OUR ACT

When talking about his boat made from biocomposites derived from Normandy flax, **Roland Jourdain** prefers the term 'bio-inspired' to 'biomimetic': *"Biomimetics isn't an end in itself. What's the point of drawing inspiration from animal morphology to make a boat fly if we don't also think more broadly about what we're doing? Just because a material is clean doesn't mean we should treat it like a disposable hankie."* In other words, to develop technologies that have a positive impact on the planet, we must also be ready to clean up our act and change how we behave.

This is the thinking behind **We Explore's** dual mission: not only does it offer the virtue of being used for scientific programmes, it will also demonstrate that simplicity and restraint are no barrier to performance, quite the opposite in fact. The intention is to set their teams of explorers on a new course: towards different, bio-inspired innovation that's environmentally responsible and doesn't place a burden on the environment.

INFO + www.we-explore.org

POLYMARIS FINDS A SOURCE OF INDUSTRIAL INNOVATION ON THE FORESHORE

THE RIGHT MOLECULE AT THE RIGHT TIME - THAT'S HOW HEAD OF **POLYMARIS**, **BERTRAND THOLLAS**, EXPLAINS HIS COMPANY'S ACHIEVEMENTS. ADD TO THAT A DASH OF TALENT AND PLENTY OF INTUITION AND YOU HAVE A REAL BRETON SUCCESS STORY. **POLYMARIS** IS NOW A GLOBAL LEADER IN THE PRODUCTION OF MARINE POLYMERS FOR COSMETICS.



Biosealite & biosealite en poudre ©Polymaris

What if the foreshore, washed by the waves, were to be home to polysaccharides as valuable as those found in the ocean depths? When they asked themselves this question 15 years ago, **Bertrand Thollas** and his associate **Anthony Courtois** could hardly have imagined how their company, **Polymaris**, would go on to develop a unique library of microorganisms that would be highly sought after by the cosmetics industry.

REMARKABLE MOLECULES FOR NATURAL COSMETICS

Produced through a process of microorganism fermentation, the **Polymaris** biomolecules are natural, biosourced and biodegradable and boast remarkable properties. For a decade now the cosmetics industry has recognised the quality of their family of exopolysaccharides (EPS) for applications such as natural glues and films or water and nutrient capture.

More recently, **Polymaris** has launched a new family of molecules on to the market. These are polyhydroxyalcanoates (PHA) which are used to make natural, 100% biodegradable biomaterials with properties similar to those of plastic. A PHA production plant is currently under construction. As with EPS ten years ago, this pioneer market can surely look forward to a bright future.

INFO + polymaris.com



Oceane Marcone ©Lancelot Six



Serious game - Marine Management Organisation ©Ana M Queiros

OCÉANE MARCONE, A FRENCH RESEARCHER WORKING IN THE UK

OCÉANE MARCONE IS A SOCIAL SCIENCE RESEARCHER WHO ANALYSES THE INTERACTIONS BETWEEN HUMANS AND MARINE ECOSYSTEMS. THIS IS HOW SHE CONTRIBUTES TO SUSTAINABLE DEVELOPMENT FROM **PLYMOUTH MARINE LABORATORY** WHERE SHE HAS BEEN BASED FOR THE PAST FIVE YEARS.

ONE OCEAN, MANY PEOPLE

WHAT BROUGHT YOU FROM SAVOIE IN FRANCE TO THE SOUTH COAST OF THE UK?

Despite what my name suggests, I wasn't always destined to focus on the marine ecosystem! My first degree was in psychology, then I branched out into economics and sociology. After a Masters in Environmental Science, the issue of water management came to the fore. During a second masters year focusing on the Economics of Sustainable Development, Energy and the Environment, I conducted an interesting case study on coastal zone management in Croatia. Next I worked for **UNESCO's Intergovernmental Oceanographic Commission** on a short-term contract in the run-up to COP 21 in Rio.

THEN YOU DID A PHD WITH THE FRENCH NATIONAL INSTITUTE FOR OCEAN SCIENCE (IFREMER). WHAT DID YOU RESEARCH?

Regulations and guidelines increasingly require environmental measures to be cost-effective. But how can we assess improvements to the environment in economic terms? My work aims to understand how economic analysis has been deployed and implemented in the context of these rules. My PhD viva was in January 2017, after I had worked with **Ifremer** for four years.

WHAT'S HAPPENED SINCE THEN?

I worked at the **University of Brest** for several months on a project that aimed to gather and map socio-economic data as a way of

understanding the pressures placed on benthic habitats by human activity. Then I was recruited as an applied social science researcher in marine studies at **Plymouth Marine Laboratory**. Since 2018 I have been studying interactions between people and the marine environment

CAN YOU TELL US MORE ABOUT WHAT YOU'RE WORKING ON?

I'm currently taking the lead on two sustainable marine resource management projects. For one of these projects, I'm working alongside biologists and modelling experts to draw up strategies for managing the marine environment. The other project focuses on resilience in coastal communities: I aim to identify how these communities are responding to climate change, so we can help them to build resilience. A third project is investigating night-time light pollution from onshore and its impact on the coastal environment. And finally, I am working with an applied environmental psychologist to develop rating scales that assess the level of connection an individual has to the ocean. This is already being done in relation to nature. These tools will provide us with a more detailed understanding of the parameters that positively influence our behaviours.

They're all subjects I'm passionate about. This is how I hope my work can have an impact on real life, although I know that research timescales don't mesh perfectly with political timetables.





Aurélie Dubois ©Respect Ocean

RESPECTOCEAN PROMOTES INNOVATIVE SOLUTIONS WITH REAL-WORLD IMPACT

RESPECTOCEAN HAD ALREADY LINKED UP WITH **CAMPUS MONDIAL DE LA MER** BEFORE IT OFFICIALLY JOINED THE NETWORK. BOTH ORGANISATIONS ARE GUIDED BY THE SAME CORE VALUES: JOINT WORKING AND A FOCUSED COMMITMENT TO MARITIME DYNAMICS, ALL SET WITHIN AN OCEAN-FACING REGION.

The **RespectOcean** network started to expand in 2013. It receives support from Brittany Region and was instigated by **Raphaëla Le Gouvello**, a famous windsurfer-turned-sailor and scientist from **Brittany**. The network aims to forge a collective that will elicit and promote innovative, sustainable solutions for the blue economy. It was registered as a non-profit association in 2018 to consolidate its professionalism and continued growth. **RespectOcean** now has some 85 members, both in France and abroad, including many actors in the ecosystem who are experts in a particular area.

existing solutions. The organisation has held several public webinars, for example about biomimetics and bio-inspired solutions. And last but not least there is the **Ocean Pitch Challenge**[®] - an international quest for solutions with a special prize reserved for biomimetics - and the organisation's **Marine and Economic Biodiversity** programme. **RespectOcean** also attends the **Biomim'expo** trade fair each year, as one of its special partners. This is yet another way in which the network's collaborative work bears fruit and helps raise awareness of innovative, sustainable solutions.

COMMITTED TO REDUCING IMPACTS AT ALL LEVELS

Aurélie Dubois, Managing Director of **RespectOcean**, explains: "Our mission is to bring together stakeholders who are fundamentally committed to both economic development and limiting their own negative impact on the ocean". These stakeholders stand firm in their action to reduce this impact, be they cosmetics or household appliance firms, maritime transport operators or artificial intelligence companies. As a member of **Campus mondial de la mer**, **RespectOcean** builds and nurtures many partnerships with other similarly engaged actors at all levels. Brittany remains the source of most **RespectOcean** members "because our region has a historic, policy and economic focus on the ocean."

FROM FELLOW FEELING TO SUSTAINABLE SOLUTIONS

RespectOcean seeks to exercise both national and international influence, as a way of supporting the economy as it takes into account the impact of human activity, as well as fostering an understanding of



www.respectocean.com



©Brest métropole

BLUE BOX: A BLUE INNOVATION TOOLBOX

IN JULY THE BLUE BOX PROJECT SPONSORED BY THE UNIVERSITY OF BREST (UBO) WON THE CALL FOR PROPOSALS TO ESTABLISH A PÔLE UNIVERSITAIRE D'INNOVATION (PUI). THIS INITIATIVE WAS LAUNCHED BY THE FRENCH MINISTRY OF HIGHER EDUCATION AND RESEARCH TOGETHER WITH THE NATIONAL RESEARCH AGENCY (ANR). WINNING THE CALL HAS UNLOCKED €4 MILLION TO HELP THE TIP OF BRITTANY BECOME A CENTRE OF EXCELLENCE FOR OCEAN TECH AND TO CREATE RELATED START-UPS.

This is a great example of collaboration with UBO, which contributed a great degree of dynamism. The Blue Box project was initiated by Technopôle Brest-Iroise. In the words of its President Michel Gourtay, it aims "to help drive innovation in our region and grow the Campus mondial de la mer community." The project has certainly benefited from constructive cooperation with UBO.

UNRIVALLED ENGAGEMENT

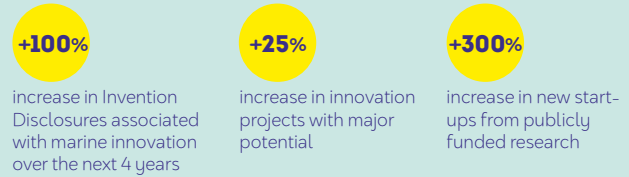
The project promoters state "Our first success was to get so many major players around the table with UBO". With UBO taking the lead, Blue Box thus brings together several entities. Four of these are French engineering research institutions: the French Naval Academy (Ecole Navale), the Brest National School of Engineering (ENIB), ENSTA Bretagne and IMT Atlantique. Three national research bodies are also involved: the French Centre for Scientific Research (CNRS), the French National Institute for Ocean Science (Ifremer), and the French National Research Institute for Sustainable Development (IRD). Other players include the Naval Hydrographic and Oceanographic Service (SHOM), the regional incubator Emergys represented by Technopôle Brest-Iroise and the Ouest Valorisation Technology Transfer Office. Blue Box also partners with Brest University Hospital Centre, INSERM, the

b>>com institute for research and technology, the Energy transition institute France Énergies Marines, and the Pôle Mer Bretagne Atlantique competitiveness hub. This unrivalled engagement in the sector undoubtedly informed the PUI selection committee's decision in favour of Blue Box.

GENERATING SYNERGIES BETWEEN RESEARCH AND THE ECONOMY

Françoise Duprat, Executive Manager of Technopôle Brest-Iroise, explains how the Finistère campus distinguishes itself from France's other PUIs by deploying its acknowledged expertise in marine science and technology. "Our PUI draws out synergies between research and the economy, thus taking us to a higher level." Meanwhile Raphaël Tripier, Vice-President in charge of Research Promotion at UBO, stresses, "We're currently seeing much greater awareness about the need to help transfer breakthrough innovations from laboratories into companies." This means public-sector research should be helped to add even greater economic value. By combining public and private-sector models, a new paradigm can be created.

AMBITIOUS BUT REALISTIC AIMS



BLUE BOX IN ACTION

- Official launch planned for 26 March 2024
- Regular interaction with the Campus mondial de la mer community

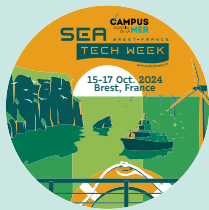


Brest International Maritime Festival

12-17 July 2024 in Brest, France

For the 8th edition, the Brest Maritime Festival will be bringing together more than a thousand boats from all over the world, bearing witness to the many ways in which mankind had, has and will continue to take to the water. It's the extraordinary wealth of maritime cultural heritage and know-how that will be on show.

More information on www.fetesmaritimesdebrest.fr



Sea Tech Week® 2024 - Maritime safety and security

15-17 October 2024 in Brest

La Sea Tech Week® is the Campus mondial de la mer flagship event dedicated to marine science and technology. Every two years, it brings together 1,200 leading national and international participants in Brest. Sea Tech Week® includes 3 plenary sessions, numerous workshops, a trade fair, BtoB meetings, a gala evening, etc. In 2024, Ireland will be the country of honour.

More information on www.seatechweek.eu

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