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MARINE MATERIALS

MARINE RESOURCES VALORIZATION & MARINE INSPIRED MATERIALS

Susana FERNANDES

Associate Professor at UPPA/IPREM

FARNET Seminar

November 22 Ciboure-St-Jean-de-Luz

CURRENT POSITIONS

UNIVERSITÉ DE PAU ET DES PAYS DE L'ADOUR

Associate Professor

ANR ERC-TREMPLIN Coordinator

Chair MANTA Principal Investigator

UPPSALA UNIVERSITET

Guest Researcher

FORMAS Coordinator

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OUTLINE

I. INTRODUCTION

- **Background**
- **Research Interests**

II. THE CHAIR MANTA

- **Circular Economy Opportunity**
- **Aim & Context**
- **Different Sub-Projects**
- **Valorization Marine Resources Project**
- **Impact**

QUESTIONS

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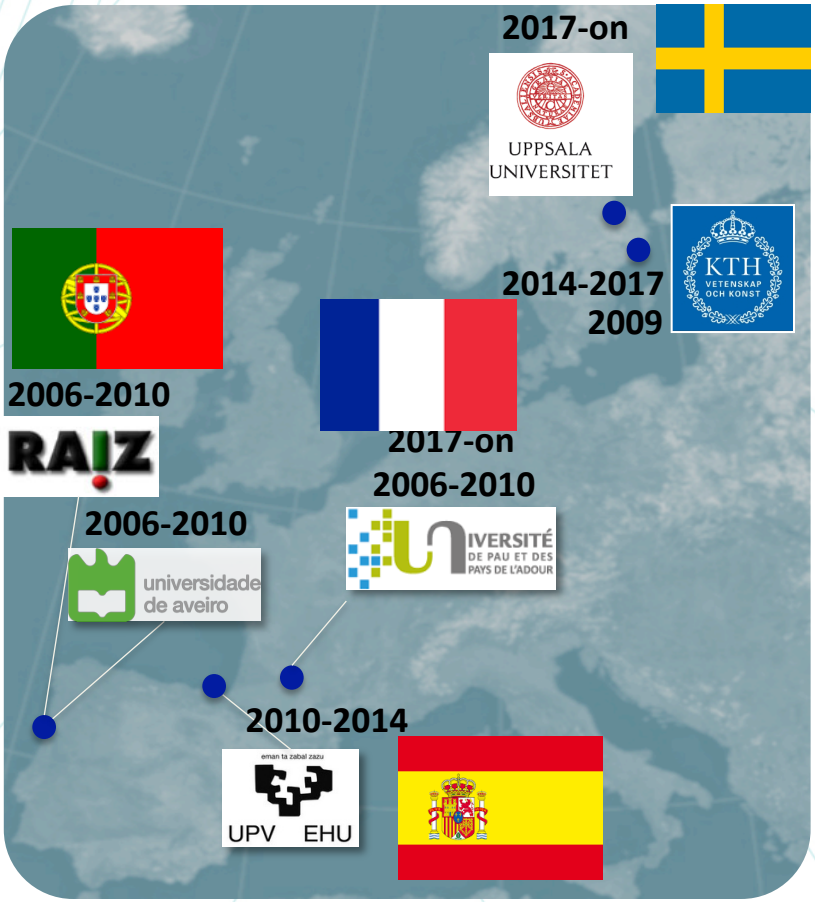
CAREER BACKGROUND

BIOMATERIALS CHEMISTRY BACKGROUND



2006-2010 PhD student — FCT

Marine-based Nanocomposites

2010-2012 Postdoc — FCT

Microbial Materials

2012-2014 Assistant Researcher — SEVENTH FRAMEWORK PROGRAMME

Blue Biotechnology

2014-2017 Associate Researcher — SEVENTH FRAMEWORK PROGRAMME — MARIE CURIE ACTIONS

Marine Bio-Inspired Materials

2017-2018 Associate Researcher — ANR

Marine Bio-Inspired Materials

Researcher — formas

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RESEARCH INTERESTS

Vision

Building as living organisms for a sustainable future

Approach

- Look at marine systems through the eyes of a Materials scientist
- Exploit marine-based polymers' & molecules' natural structure and functionalities
- Design & develop multifunctional materials following bio-inspired principles

Aim

Solve challenges in cosmetic, packaging & medical industries

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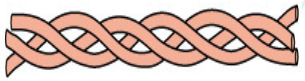
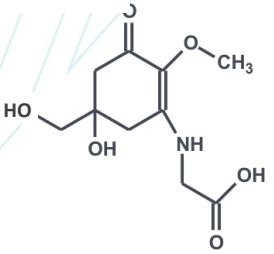
CIRCULAR ECONOMY OPPORTUNITY IN THE SOUTHWEST OF FRANCE

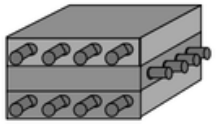
Raw Materials

Extraction/Purification

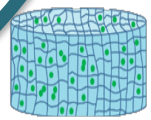




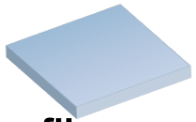
Make (Bio)materials



composites



Hydrogels



films

Human Use

contact lens

sprays

Nature Reuse

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OBJECTIVE OF MANTA

To mimic remarkable phenomena and hierarchical structures observed in the aquatic environment, to design functional and environmentally sustainable (bio)materials based on marine molecules and assess their impact on human health and marine ecosystems

CROSSTALK BLUE & RED BIOTECHNOLOGIES

DIFFERENT SUB-PROJECTS

- **VALORIZATION OF MARINE BIOMASS**

(Extraction & Purification biopolymers & bioactive molecules)

- **DESIGN & DEVELOPMENT OF MARINE BIO-INSPIRED MATERIALS**

(mimic the functionality & structure of marine organisms)

- **STUDY OF THE IMPACT ON HUMAN HEALTH**

(tissue protection & regeneration)

- **EVALUATION OF THE IMPACT ON MARINE ENVIRONMENT**

(on water & marine organisms)

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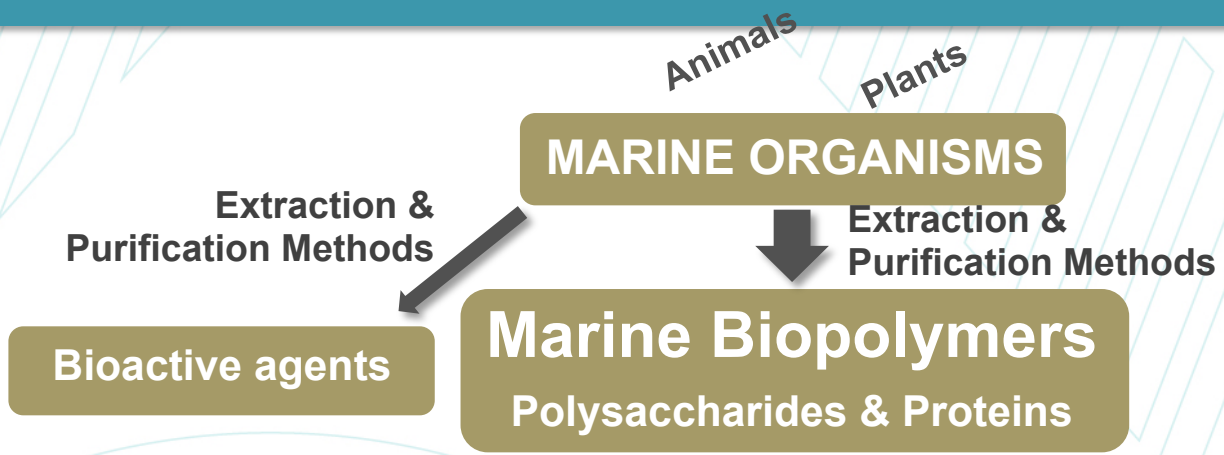
VALORIZATION OF MARINE BIOMASS PROJECT



- Chemical Hydrolysis
- Enzymatic Hydrolysis
- Ultrasound
- Electric discharge

VALORIZATION OF MARINE BIOMASS PROJECT

Animals

Plants

MARINE ORGANISMS

Extraction & Purification Methods

Extraction & Purification Methods

Bioactive agents

Marine Biopolymers

Polysaccharides & Proteins

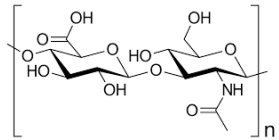
- Chemical Hydrolysis
- Enzymatic Hydrolysis
- Ultrasound
- Electric discharge

Hyaluronic Acid

Vitreous humor

tuna eyeballs

Polyanionic

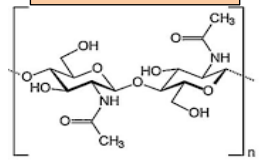


(Nano)Chitin

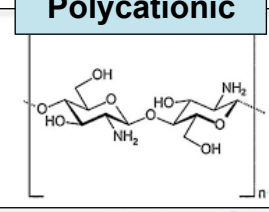
Crab & shrimp

Chitosan

Neutral

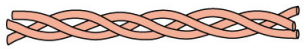


Polycationic



Collagen

Fish skin



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VALORIZATION OF MARINE BIOMASS PROJECT

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Extraction & Purification Methods

Extraction & Purification Methods

- Chemical Hydrolysis
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Bioactive agents

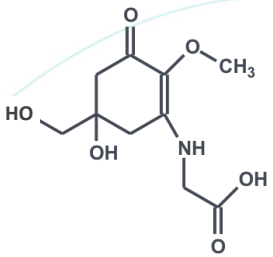
Marine Biopolymers

Polysaccharides & Proteins

Mycosporines

Red algae

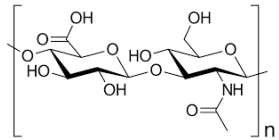
Cyclohexenone or Cyclohexenimine ring



Hyaluronic Acid

Vitreous humor tuna eyeballs

Polyanionic



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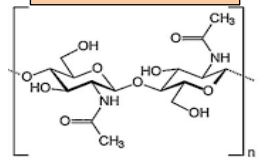

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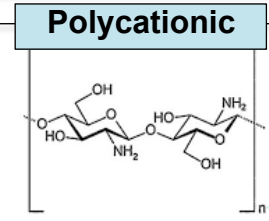

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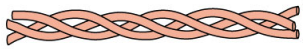

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Polysaccharides & Proteins

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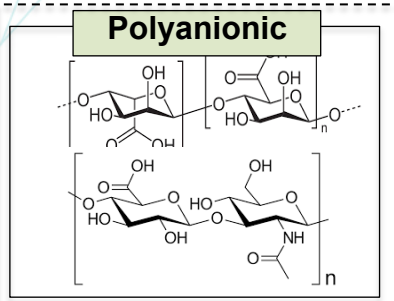
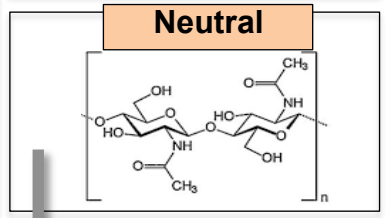
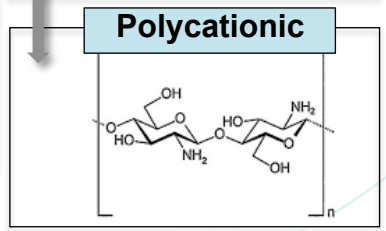
PROPERTIES

- BIODEGRADABLE
- NON-TOXIC
- BIOCOMPATIBLE
- CHEMICAL FUNCTIONALITY
- BIOLOGICAL ACTIVITY (ANTIMICROBIAL, ETC)
- MECHANICAL PROPERTIES
- OPTICAL PROPERTIES (UV-ABSORPTION, TRANSPARENCY)







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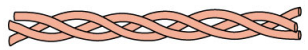
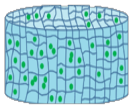
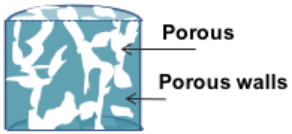


APPLICATIONS

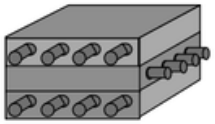
MARINE-BASED POLYMERIC MATERIALS



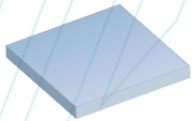
Hydrogels



3D porous scaffolds



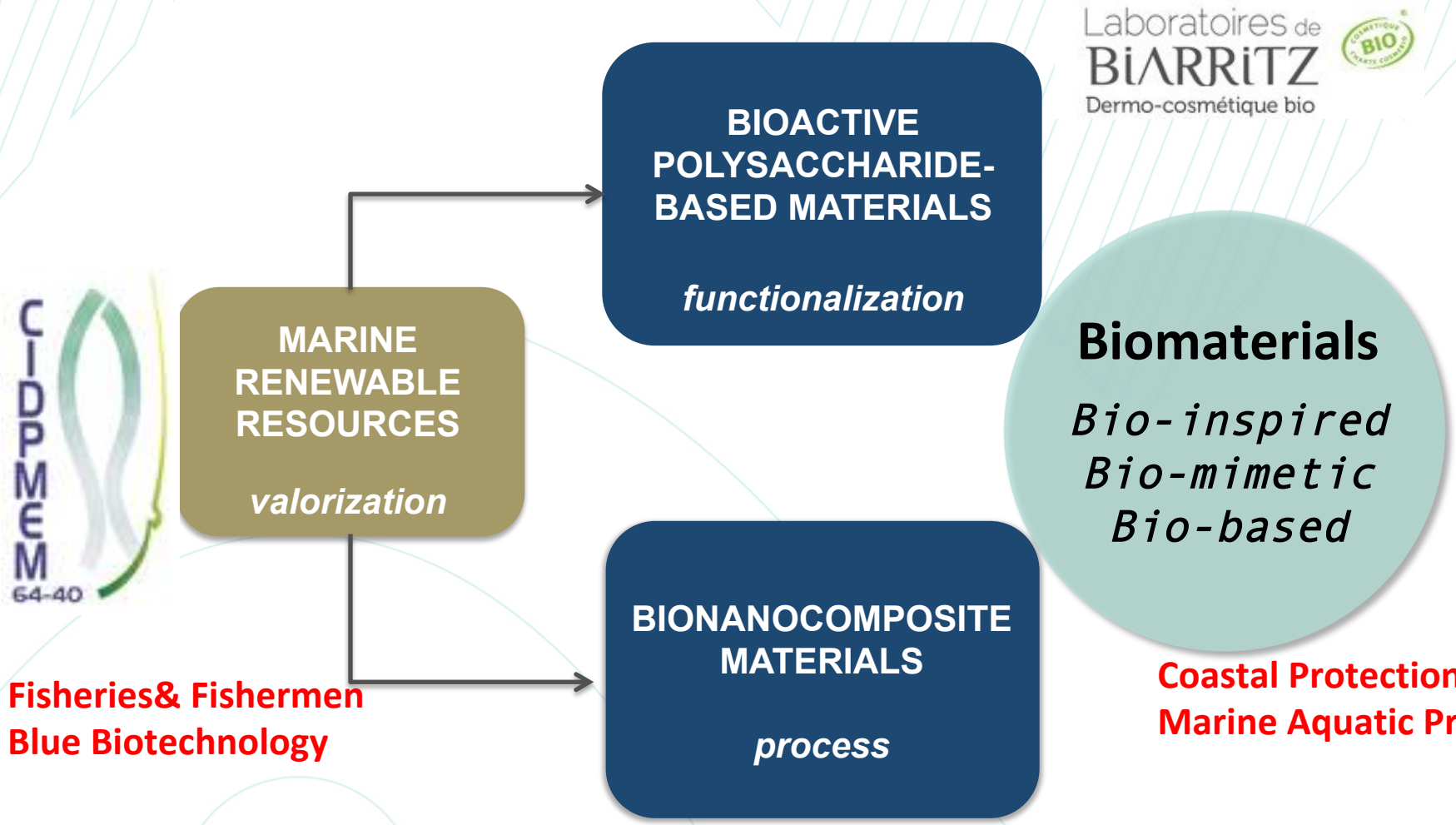
(Nano)Composites



Films

- Cosmetic
- Biomedical
- Packaging
- Coatings
- Water treatment

IMPACT ON 4 BLUE ECONOMY SECTORS



EXPECTED RESULTS & POTENTIAL IMPACT

- ✓ **The Chair** will open new opportunities in 4 individual sectors of the Local, National and International Blue Economy:
  - Coastal Protection (novel biodegradable and eco-friendly sunscreens)
  - Blue Biotechnology (exploration and exploitation of marine resources)
  - Fisheries (valorization of by-products)
  - Marine Aquatic Products (new commercially attractive products)

- ✓ **The Chair** will create opportunities for new jobs, small companies and start-ups, and development of Networks (national, European)

- ✓ **The Chair** will lead to a new generation of sunscreens and UV-protective biomaterials which overcomes their current performance limitations in terms of Human and Environment Protection

- ✓ **The Chair** will bring new scientific knowledge on the effect of emergent marine-based products on human health and environment

PARTNERS & FUNDING

e2s UPPA
energy environment solutions

UNIVERSITÉ DE PAU ET DES PAYS DE L'ADOUR

Communauté D'AGGLOMERATION PAYS BASQUE
EUSKAL HIRIGUNE Elkargoa

RÉGION Nouvelle-Aquitaine

INVESTIR L'AVENIR

Laboratoires de BIARRITZ
Dermo-cosmétique bio

MAKE OUR PLANET GREAT AGAIN

Winereef Lab

CIDPMEM 64-40

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FRAMEWORK OF THE PROJECT

DLAL (Développement Local mené par les Acteurs Locaux) program of the European Maritime and Fisheries Fund, led by the CIDPMEM 64-40

MERCI!

in The Sydney Morning Herald

Susana FERNANDES
susana.fernandes@univ-pau.fr