Biodegradable Soft Robots for Ocean Monitoring

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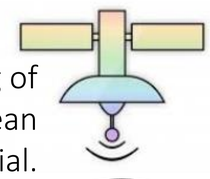
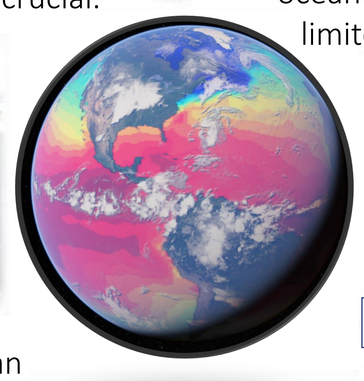
1. Climate Change & Ocean Monitoring

With the unfolding of Climate Change, Ocean Monitoring is crucial.



Satellites, moorings, autonomous vehicles and oceanographic vessels have limited capabilities.

Rosette



Mooring Deployment

More than 90% of our ocean is unexplored. Our data are limited to the first 2 Km of the water column.

We need more data in the abyssal ocean to understand better the role of the ocean in climate change.

Glider

2. Polymers & E-waste

Bio-degradation: decaying process that any material undergoes before being completely absorbed by the environment.

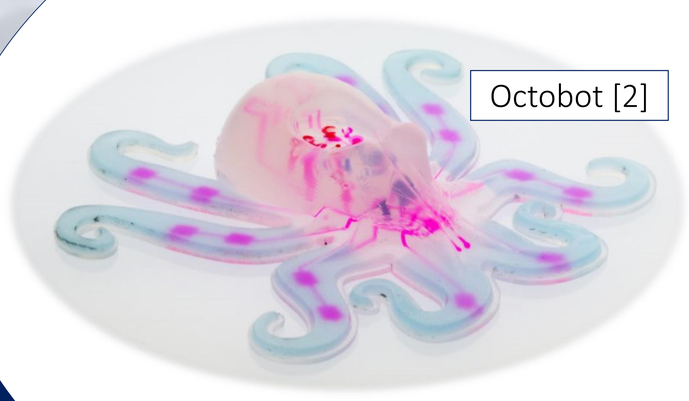
Ubiquitous polymers pollution requires prompt action.

Where did my mobile phone go?

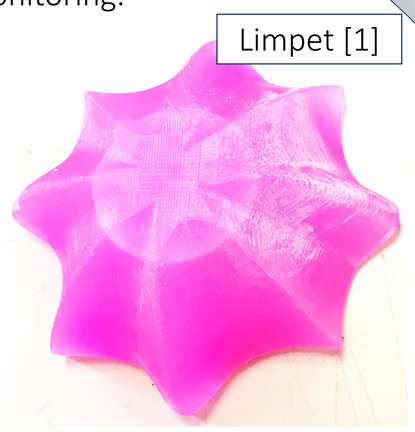
Electronic waste (e-waste) is hardly recyclable. When electronics starts to degrade, it spreads toxic substances, such as lead, beryllium, mercury. This substances are well known to cause brain damage, cancer, kidneys failure.

3. Soft Robots & Biomimesis

Soft robotics is a relatively new branch of robotics and it has a huge, yet unexplored, potential including deep sea exploration and monitoring.



Octobot [2]



Limpet [1]

Soft robots are the ideal candidate for exploration. Due to their compliant nature, they can inspect unknown spaces and adapt to varying environmental conditions.

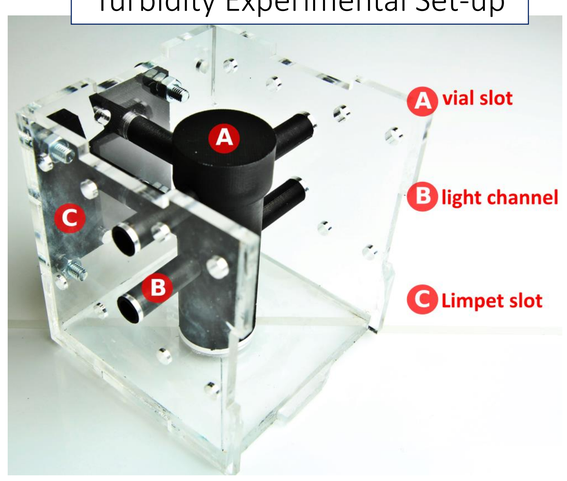
4. The Limpet & the ORCA Hub

The Limpet: bioinspired robot (Patella Vulgata). It is capable of 9 sensing modalities and 5 communication modes.

Limpet soldering

ORCA Hub aims to remove personnel from hazardous offshore environments.

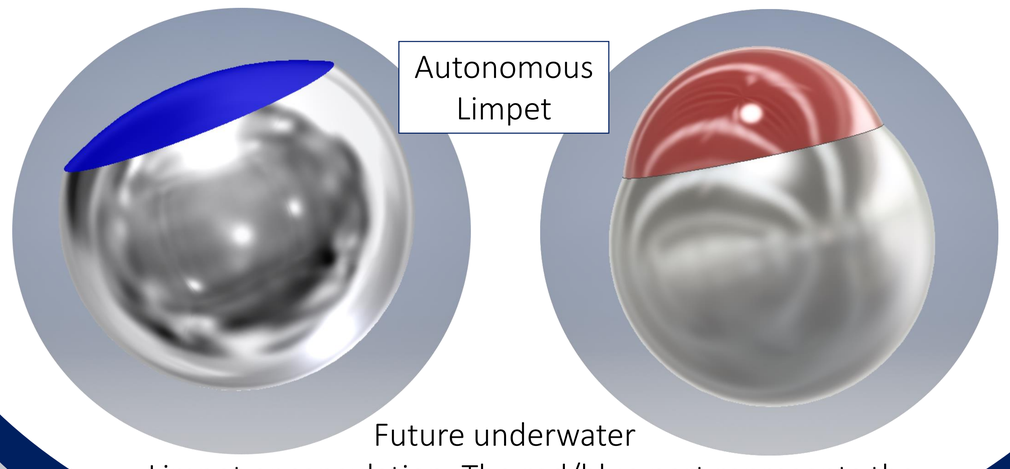
Turbidity Experimental Set-up



We demonstrated the capabilities of the Limpet to perform offshore wind turbine monitoring, turbidity measurements [3] and underwater acoustic communication [4].

5. The Limpet & Ocean

A new underwater development of the Limpet envisages an autonomous device capable of moving across isopycnals. The materials employed can convey the latest technological advances [5] and, therefore, be mindful of the environment.



Future underwater Limpet encapsulation. The red/blue part represents the soft bladder in the upcast/downcast status.

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