Research teams involved with IM2E

**Team**

**Laboratory of Environmental Biotechnology (LBE)**

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**Aims & Objectives**

- The Laboratory of Environmental Biotechnology’s (LBE) research focuses on bioenergy production (biomethane, biohydrogen, anaerobic ecosystems, etc.), looking at ways to recover and/or treat waste from human activity – liquid effluent (especially from food processing), solid residue (farm waste, household waste and sludge from purification plants), and special types of biomass such as micro- and macro-algae.

- In its waste recovery research, LBE explicitly addresses concerns around human health (presence of drug residues, detergents and/or pathogens, etc.).

- The lab’s work is guided by the “environmental biorefinery” concept.

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**Linkage with IM2E research fields and challenging issues**

- Cooperating in areas that touch on economics and social sciences, and human sciences more generally, on the emerging cross-disciplinary topic of wastewater reuse.

- Uniting available resources and leading the way on this major issue.

- Meeting the challenges of optimised, responsible water resource use in the Mediterranean.

- Working with Montpellier’s water and environmental sciences community and raising its profile on the international scene.

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**Study areas**

- Australia
- USA
- Canada
- Mexico
- Chile
- Brazil
- Algeria, Tunisia
- Belgium
- Denmark
- Italy
- India
- China
- Spain
LBE enjoys a world-class reputation, attracting numerous PhD students, post-docs and researchers, including many from abroad (103 per year on average in the last three years – 42 from outside France, 21 different nationalities).

In the last five years, LBE has been a coordinator or partner in 48 projects (EU, ANR, national and/or private sector), one-third of which have related directly to water and reuse.

LBE has formed or been involved in setting up three companies, helping to create 63 private-sector jobs in the process. The lab is a regular winner of the Pollutec-ADEME award for innovative environmental technologies.

Each year, on average, the lab organises one international event on wastewater treatment and management, and treatment system modelling and control. Several of its researchers sit on joint advisory committees to government bodies, including a wastewater reuse risk committee for the French Agency for Food, Environmental and Occupational Health & Safety (ANSES).

To date, LBE has published 264 peer-reviewed articles in 96 journals, with co-authors from 35 different countries (10% of articles published jointly with private-sector partners) – a rate of 5.4 articles per researcher per year, and 2.8 articles.

**Thesis topic:**
Thermodynamic approach to modelling micro-organism growth in natural microbial ecosystems
Control of biological pollution treatment systems in failsafe mode to adapt water reuse to practices in the Euro-Mediterranean region.
Modelling and control of the Kenitra public landfill
Contribution to the analysis and control of anaerobic digestion systems
Thesis topic: Early detection and control of filter membrane fouling

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**Platforms and Equipments**

> Bio²E platform – from pure research through to demonstration:
  * 1,550 m² of experimental facilities.
  * A multidisciplinary professional team.
  * Technology platforms: various bioreactors (aerobic, anaerobic, free and immobilised biomass processes, micro-algae culture – 1 to 1,000 litres); experimental physical-chemical treatment pilots to optimise biological treatment; filter membrane pilots; cutting-edge analytical equipment to characterise substrates and microflora and monitor process performance.
  * Analysis equipment: HPLC, GC-MS, etc.
  * Physical-chemical processes: thermal/thermal-chemical hydrolysis, ozonation, ultrasound, etc.
  * Micro-algae production systems.
  * Information System for Experimentation (SILEX-LBE).

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**Academic and industrial partners**

**National**
- INRA
- Supagro
- INSIA
- CESB
- IRSTEA
- CIRAD
- CNRS
- IFREMER
- IRD
- INERSIS
- LGC
- ESPCI
- Paris Tech
- AgroParisTech
- École du chimie ENSC Rennes
- Université de Limoges
- Université de Nantes
- Université Paris Est
- LIPEM
- UPRDI
- UEB
- UBIO
- Estipa
- Écoles des Mines
- Institut Européen des Membranes
- Marbac
- IbisBP
- IGP
- Ladar
- INRA transfert
- Naufrage environnement
- BioEnTech
- Eeva
- Actia
- Iturg
- Olimma
- Record
- EDP
- IPF
- Énergies nouvelles
- TWI
- Chambres d’agricultures
- RITTMG
- CEVA
- Tribal
- Anivas
- Enisulite
- Aquadoc
- Vol’V
- Air liquide
- Garaud
- Distillerie Sud-Languedoc
- Velia
- Saxz
- Saur

**European**
- DU
- ICRA
- Leqia
- University of Santiago de Compostela, Spain
- Universitat de Girona, Spain
- Universitat Politècnica de València, Spain
- UNESCO

**International**
- University of Queensland
- Laboratory of Automatic Control, University of Tlemcen, Algeria
- LAMSIN (ENIT), Tunisia
- Center of Biotechnology of Sfax, Tunisia
- CNERES, Morocco
- University of Patras, Greece
- Universities of Cairo, Egypt
- Universities and Technical Centers of India
- Universities of China
- University of Oman
- University of Massachussets, Amherst, USU
- Inka University, Inchain

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**Examples of partnership projects**

**Irrì-Alt’Eau**
> A collaborative project to study an innovative solution: controlling the quality and quantity of drip irrigation in vineyards using treated wastewater from a purification plant. www.inra.fr/Entreprises-Monde-agricole/Resultats-innovation-transfert/Toutes-les-actualites/Irrì-Alt’Eau

**TREASURE**
> Euro-Mediterranean scientific network bringing together researchers from southern Europe and North Africa to work on sustainable effluent treatment and reuse in semi-arid climates. www.inra.fr/treasure.

**SICMED**
> An international programme to learn more about Mediterranean anthropo-ecosystems and how these systems are changing (sustainable agriculture, integrated water and soil management, reuse, environmental impact assessment, irrigation and treatment system performance). www.sicmed.net

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**Keywords:**

- Chemostat
- Eco-design
- Méthanisation
- Anaerobic digestion
- Eco-conception
- Modelling
- Microbial ecosystems
- Reuse
- Environmental biorefinery
- Innovation
- Micropollutants
- Bioprocesses