# RESEARCH PORTFOLIO

Membrane technologies for water treatment and resource recovery

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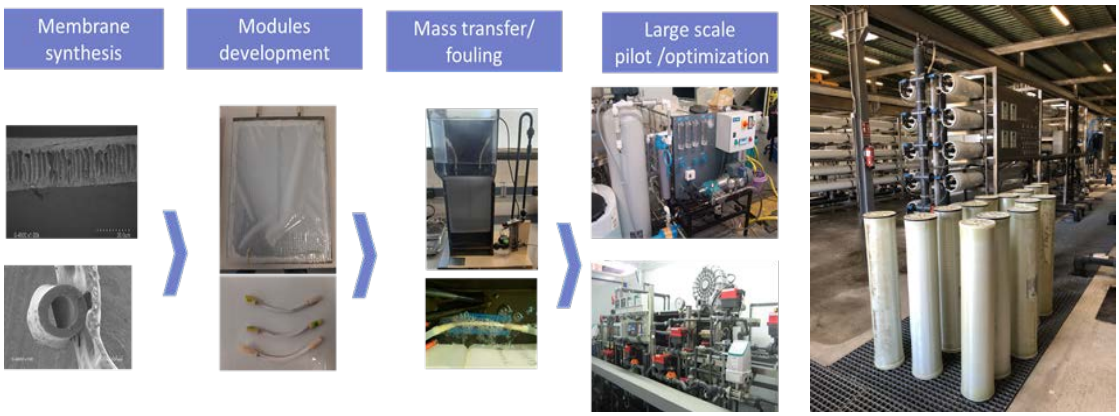
## Name of scientists in charge


> **Dr Gaëtan Blandin,** "Ramón y Cajal" fellow, gaetan.blandin@udg.edu
> **Dr Ignasi Rodríguez-Roda**, Full Professor, ignasi.rodriguezroda@udg.edu
> **Dr Joaquim Comas**, Full Professor, joaquim.comas@udg.edu
> **Dr Hèctor Monclús**, "Ramón y Cajal" fellow, hector.monclus@udg.edu


## Technology description

> Basic/applied research for a better understanding of membrane-based processes and their application for wastewater treatment/reuse and desalination. Improvement of design, operation and control of membranes.




## Research expertise

Expertise:

- Membrane fouling and clogging: from basic research of the responsible parameters to practical aspects for cleaning and monitoring.
- Membrane and modules fabrication
- Membrane characterization (bench scale filtration tests, physical characterization).
- Modelling and simulation.
- Fate of micropollutants.
- Development and validation of decision support systems.

Membrane technologies:

- Membrane bioreactors (MBR): for wastewater treatment /grey water treatment and reuse, and integrated systems (with NF/RO)
- Coupling of membrane technologies with biological reactors (fermenter, photobioreactor, BES systems)
- Pressure driven system for separation and concentration of nutrients (MF, UF, NF, RO)
- Forward osmosis: as concentration and purification steps for water reuse and desalination (from bench scale to pilot scale, cross flow and submerged systems)
- Reverse osmosis membranes (RO): recycling of RO membranes for water treatment and validation in full-scale facilities.
- Decentralized membrane purification systems for remote area and emergencies.


INSTITUTE OF THE ENVIRONMENT
Universitat de Girona – Campus Montilivi s/n – 17003 Girona – Catalonia, Spain
Tel. +34 972 419 859 – Fax +34 972 418 150 – info.lequia@udg.edu – www.lequia-udg.com

## Projects

> **CONCENTRA -** Giving four lives to osmotic membranes with innovative recycling processes – ACCIÓ – Nuclis R+D – New membrane concentration systems within high VOC concentration ranges to produce PHAs – 2022-2024.

> **OSMO4LIVES -** Giving four lives to osmotic membranes with innovative recycling processes – AEI - Proyectos de Generación de Conocimiento – 2022-2024.

> **FORWARD-FACTORY -** Implementation of forward osmosis to transform urban wastewater treatment in resource recovery factory. La Caixa Foundation- Postdoctoral junior retaining leader program- 2021-2024.

> International cooperation for development – UdG: **AMAZOMEM –** Improvement of availability and access to potable water in Colombian Amazon communities (2021-2024). Cooperation with Universidad Nacional de Colombia; **ULTRA-SEN** – UF gravity-driven membranes for water disinfection (2023). Cooperation with Université Assane Seck

## Publications


> Sabio, B. Z.; Pacheco, R. G.; Pàrraga, P. V.; Bernades, I. A.; Sales, H. M.; Blandin, G. Gravity-Driven Ultrafiltration and Nanofiltration Recycled Membranes for Tertiary Treatment of Urban Wastewater, *Journal of Water Process Engineering*, 2024, 63, 105545.

> Yalamanchili, R.; Rodriguez-Roda, I.; Galizia, A.; Blandin, G. Can a Forward Osmosis-Reverse Osmosis Hybrid System Achieve 90 % Wastewater Recovery and Desalination Energy below 1 kWh/M3? A Design and Simulation Study. Desalination 2024, 585, 117767.

> Galizia, A., Comas, J., Pino, A., Rodero, A., Rodríguez-Roda, I., Blandin, G., Monclús, H., Optimizing full-scale MBR performance: A dual-phase approach for real-time air-scouring and permeate flow modifications, *Journal of Water Process Engineering,* 66, 2024, 105992.

> Olives, P.; Sanchez, L.; Lesage, G.; Héran, M.; Rodriguez-Roda, I.; Impact of Integration of FO Membranes into a Granular Biomass AnMBR for Water Reuse, *Membranes*, 2023, 13, 3, 265.

> Mendoza, E.; Magrí, A.; Blandin, G.; Bayo, À.; Vosse, J.; Buttiglieri, G.; Colprim, J.; Comas, J. Second-Generation Magnesium Phosphates as Water Extractant Agents in Forward Osmosis and Subsequent Use in Hydroponics. *Membranes*, 2023, 13 (2), 226.

> Mendoza, E.; Blandin, G.; Castaño-Trias, M.; Alonso, L. L.; Comas, J.; Buttiglieri, G. Rejection of Organic Micropollutants from Greywater with Forward Osmosis: A Matter of Time. *Journal of Environmental Chemical Engineering*, 2023, 11 (5), 110931.

> García-Pacheco R., Li Q., Comas J., Taylor R.A., Le-Clech P., Novel housing designs for nanofiltration and ultrafiltration gravity-driven recycled membrane-based systems, *Science of the Total Environment*, 2021, 7671, 144181.


## Patents

> **Real time control of MBRs** (Spanish Patent ES2333837), 50% UdG 50% GS INIMA.

## Awards

> **Prize to Young Talent in Sustainable Water Management 2021** from the Botín Foundation to Raquel García Pacheco for her work on recycling of RO membranes.

## Spinoff

> Ecomemb is a spinoff company of University of Girona (UdG) and the Catalan Institute for Water Research (ICRA) founded in 2022 that collects discarded filters from large seawater desalination plants, treats them, and sells them to other types of smaller facilities, which treat water for irrigation and industrial processes, among others.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