

LIAR Project – Living Architecture

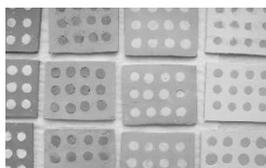
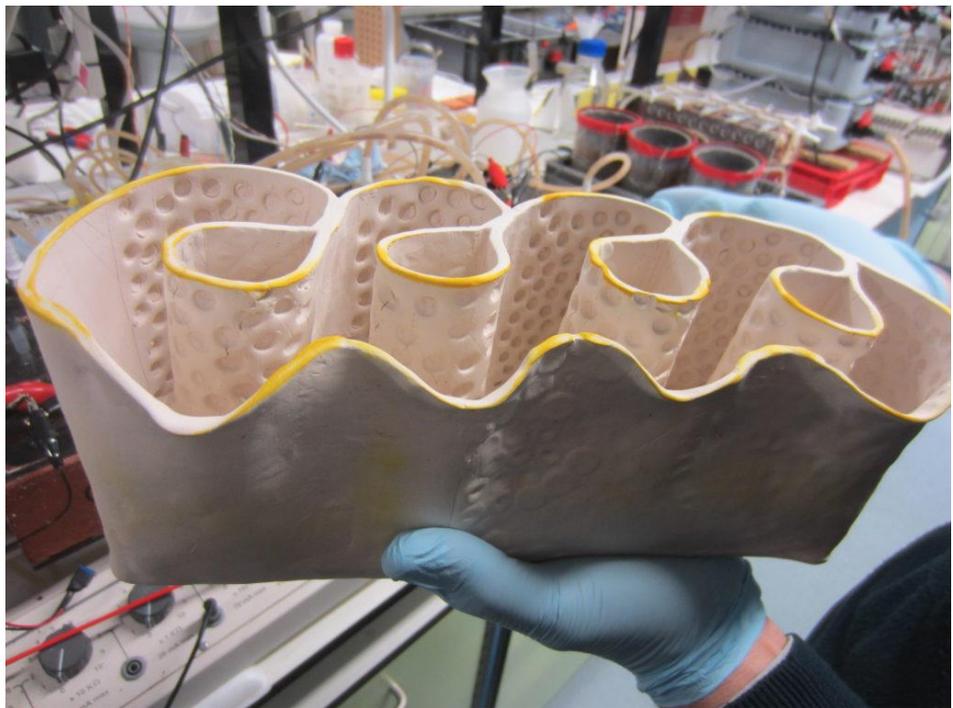
Project start: April 2016

Duration: 3 years

Living Architecture (LIAR) is a next-generation, selectively-programmable bioreactor. It is envisioned as an integral component of human dwelling, capable of extracting valuable resources from sunlight, waste water and air and in turn, generating oxygen, proteins and biomass through the manipulation of their interactions.

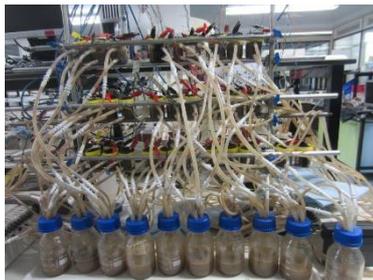
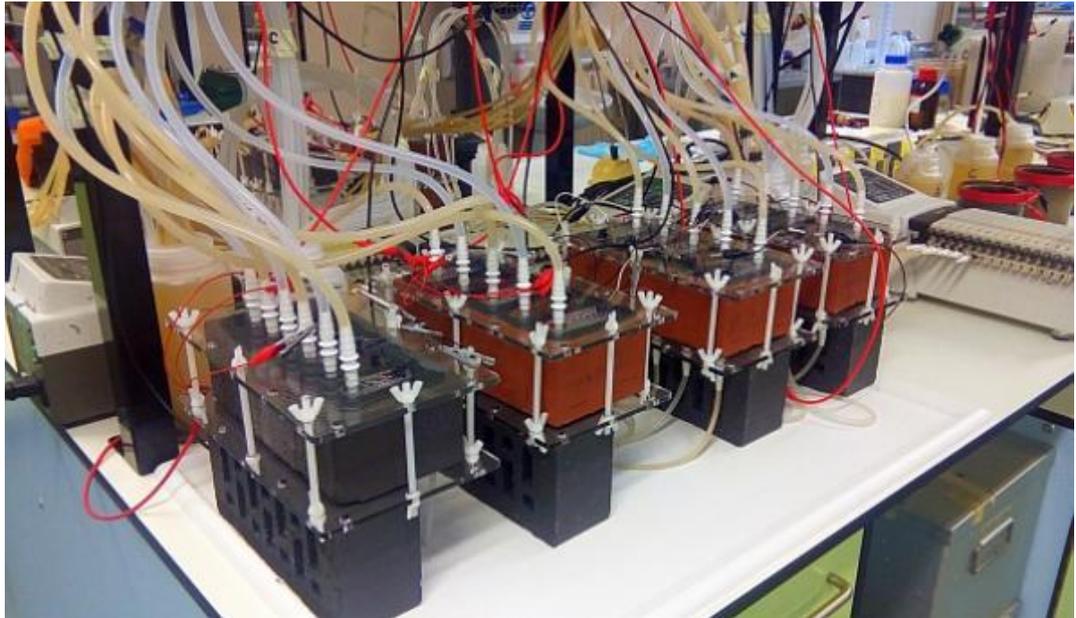
The goal of project LIAR is to design and build a proof-of-concept 'living architecture' whose targeted breakthrough is to transform our habitats from inert spaces into programmable sites. LIAR will be developed as a modular bioreactor-wall, based on the operational principles of microbial fuel cell technology and synthetic 'consortia' of microbes.

A freestanding partition composed of bioreactor 'building blocks' will be prototyped. The 'building blocks' are conceived as standardized building segments and can be incorporated into common building construction methods.



Top: Ceramic 'building block' during testing at Bristol lab
Left: Material samples for conductivity tests at Bristol lab
Photo credits: Living Architecture consortium 2017

Each bioreactor 'building block' has a programmed and configured Microbial Fuel Cell (MFC), which typically converts chemical energy of an organic feedstock into electricity, via the metabolic processes of microorganisms, which act as biocatalysts.



All photos of Microbial Fuel Cell tests at lab in Bristol

Photo credits:
Living Architecture consortium
2017

A photo-bioreactor is a device that can be programmed to utilize a variety of inputs such as; grey water, microbial consortia (algae and bacteria), nitrous oxide and carbon dioxide, visible light, temperature, different types of nutrients (nitrogen and phosphate as macronutrients, trace metals and vitamins as micronutrients), to generate outputs such as; “polished” water, fertiliser, extractable products (recoverable phosphate), oxygen, next generation biodegradable detergents, electricity, recoverable biomass, bio-fluorescence and to a certain extent, heat.

The economic value models used to justify this approach are based in both notions of ‘circular economy’ and also the World Wildlife Fund’s initiative to set new benchmarks and protocols in establishing the ‘real’ cost of natural resources in industrial processes.

LIAR develops a foundational platform for addressing the existing disparity between the waste produced by a building and the resources that lack in its surrounding ‘natural’ environment. Applications within urban systems are a form of customizable, programmable micro-agriculture for installation in domestic, public (schools, hospitals) and office environments. The technology developed could potentially address global scale challenges of urban sustainability and resource management (if implemented at a large scale).



The project has received funding from the European Union’s Horizon 2020 Research a Innovation Programme under Grant Agreement no 686585.

The LIAR Interdisciplinary team includes experts from:



University of Newcastle Upon Tyne (UNEW) www.newcastle.ac.uk



University of the West of England, Bristol (UWE, Bristol) www.uwe.ac.uk



Spanish National Research Council / Agencia Estatal Consejo Superior Investigaciones Cientificas (CSIC) <http://www.csic.es>



LIQUIFER Systems Group (LSG) www.liquifer.at



EXPLORA BIOTECH S.r.l. (EXP) www.explora-biotech.com



University of Trento / University Degli Studi di Trento (UNITN) www.unitn.it