# Smart bricks will transform how buildings work

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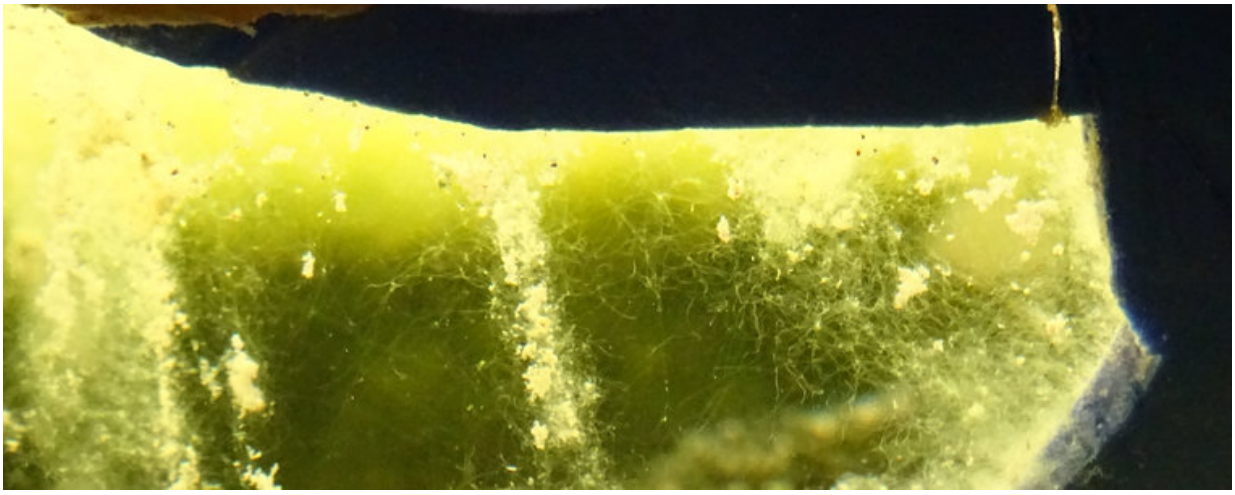

Credit: University of the West of England

Smart bricks capable of recycling wastewater and generating electricity from sunlight are being developed by a team of scientists from the University of the West of England (UWE Bristol). The bricks will be able to fit together and create 'bioreactor walls' which could then be incorporated in housing, public building and office spaces

The UWE Bristol team is working on the smart technologies that will be integrated into the bricks in this pan European 'Living Architecture' (LIAR) project led by Newcastle University. The LIAR project brings together living architecture, computing and engineering to find a new

way to tackle global sustainability issues.

The smart living bricks will be made from bio-reactors filled with microbial cells and algae. Designed to self-adapt to changing environmental conditions the smart bricks will monitor and modify air in the building and recognise occupants.

Each brick will contain Microbial Fuel Cells (MFCs) containing a variety of micro-organisms specifically chosen to clean water, reclaim phosphate, generate electricity and facilitate the production of new detergents, as part of the same process.

The MFCs that will make up the living engine of the wall of smart bricks will be able to sense their surroundings and respond to them through a series of digitally coordinated mechanisms.

Professor Andrew Adamatzky, LIAR Project Director for UWE Bristol, is leading the UWE Bristol team, he said, "The technologies we are developing aim to transform the places where we live and work enabling us co-live with the building.

"A building made from bio-reactors will become a large-scale living organism that addresses all environmental and energy needs of the occupants. Walls in buildings comprised of smart bricks containing bioreactors will integrate massive-parallel computing processors where millions of living creatures sense the occupants in the building and the internal and external environmental conditions.

"Each smart brick is an electrical analogous computer. A building made of such bricks will be a massive-parallel computing processor."

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), carbon dioxide from the atmosphere, and different types of nutrient to generate outputs.

These outputs include 'polished' water, fertiliser, extractable products (recoverable phosphate), oxygen, next generation biodegradable detergents, electricity, recoverable biomass, bio-fluorescence and to a certain extent, heat.

Professor Ioannis Ieropoulos, Director of the Bristol Bioenergy Centre (BBiC), at the Bristol Robotics Laboratory at UWE Bristol, said, "Microbial Fuel Cells are energy transducers that exploit the metabolic activity of the constituent microbes to break down organic waste and generate electricity. This is a novel application for MFC modules to be made into actuating building blocks as part of wall structures. This will allow us to explore the possibility of treating household waste, generating useful levels of electricity, and have 'active programmable' walls within our living environments."

Rachel Armstrong, Professor of Experimental Architecture at Newcastle University, UK, who is co-ordinating the project, said, "The LIAR project is incredibly exciting – it is bringing together living architecture, computing and engineering to find a new way to tackle global issues, like sustainability."

Provided by University of the West of England