Transdisciplinary knowledge sharing platform for biologically augmented materials for the building industry

Elise ELSACKER[abc]*, Winnie PONCELET[c], Eveline PEETERS[b], Lars DE LAET[a]

[a]*Architectural Engineering Research Group, Department of Architectural Engineering, Vrije Universiteit Brussel, Pleinlaan 2, B-1050 Brussels, Belgium.
Tel.: +32 2 629 28 30 - E-mail address: elise.vanden.elsacker@vub.be
[b] Research Group of Microbiology, Department of Bioengineering Sciences, Vrije Universiteit Brussel
[c] Glimps cvba, Wispelbergbergstraat 2, 9000 Gent, Belgium

Abstract

The paper discusses how open-platform research is deployed as a tool to scale-up the manufacturing of biologically augmented materials in the building industry. A broad potential exists in the production of biomolecular self-assembling living materials, such as mycelial composites [1], with properties that are beneficial for all organisms (humans and non-human). Unfortunately, several risks have been attributed to the recent (potentially myopic) developments in engineered biological systems under highly controlled conditions to produce lightweight living composites [2]. One of the risks is related to the exponential industrialisation and technological growth leading to exponential competition for scared resources. As a result, harm is exponentially externalised to the biosphere and the commons to a level that is no longer viable [3]. In meanwhile, grassroot biohacking communities composed of students, self-builders, product designers, architects, researchers, educators, are producing abundant knowledge about sustainable biomaterials on a transdisciplinary platform [4]. To scale the self-replicating manufacturing systems developed by those commons, all stakeholders (such as waste management facilities, mycelium producers, mushroom farmers, material manufactures, engineers, constructors, governments, scientists…) should be identified, connected and willing to reinvent the industrial processes of living biomaterials in the building industry.

First of all, we establish a set of principles uncovered from the avant-garde biohacking movement, as well as a series of material and design experiments evaluating those methods in the architectural practice. Two pilots are elaborated. The first is an education project of architectural engineering students on the topic of living materials. The second is a large-scale manufacturing project of mycelium building materials. We analyse the opportunities and challenges when different fields come together in a symbiotic relation. What if mushroom farmers become mycelium-material producers in a circular model, "bio-artisans" working with wild-types in local autonomy, similar to craftsmen and brewers? How to give architectural engineers new toolsets to become bio-engineers? What does it mean to engineer living biological materials into designed objects?

The research approach for both pilots is community-based and uses an online forum for knowledge sharing. It includes action-oriented and material-based research which is probabilistic, explorative and shaped by its local context. While most experiments on the open-platform are not always scientifically reproducible, they embody a valuable set of psychogeography possibilities for the re-appropriation of matter. The stakeholders are assisted to deal with non-linear, complex and iterative processes. The collaborative engagements regularly form new 'out-of-control' information, which creates fertile and fluctuating spaces between disciplines, the people, and their relationships. This approach leads to non-competitive dynamics and closed-loop dynamics.

References

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