

Bio-material assemblages: Beyond parametrics in the design of living materials and systems.

This research engages with biotechnical architecture, and suggests alternative approaches to the parametric in designing with living systems. The last decade has seen the emergence of biotechnical architecture, a speculative discourse, inspired by recent developments in biotechnologies, and that extends the scale of architectural discourse to account for microbiological systems. Often, this involves design strategies that consider the living as parametric, effectively extending the logic of computational design. There are, however, contingencies in designing with living systems. The notion of parametrics involves a system whose behaviour can be operationalised within a range of numerical limits. However, living systems are part of assemblages in a constant process of reconfiguration which tend to express different behaviours under different circumstances, making them difficult to anticipate and model. This challenges prevalent, vertical models of design, and invites a redefinition to encompass a process of co-creation between design and living matter.

This thesis aims to highlight the challenges of designing with living systems. It begins with the core question of *what happens when design starts at the microscopic level and moves upwards to the scale relevant to architecture?* and proposes a creative practice methodology in which the author engages materially with different actants in the assemblages of living systems. There are, however, several challenges in developing a material engagement with living systems in a design context. Contemporary knowledge of the way organisms operate and how they can be modified is still insufficient to easily allow for large, architectural scale experiments. This thesis advances the notion of *biomaterial probes*, which are creative practice experiments which allow designers to engage with the intricacies and materiality of living systems. They are not design exercises in the traditional sense, as they are not guided by specific design objectives and do not result in the creation of an artefact. They are instead explorations enablers that allow designers to work with the materials, epistemologies and social contexts associated with living systems. In this, they take elements from scientific and craft-based experimentation to allow insight into the design with living systems.