Design & Living Systems
Selected Works

CAROLE COLLET
Central Saint Martins, University of the Arts London
Design & Learning Systems Key Research Questions

Can research at the intersection of design and biology enable us to create compelling sustainable design propositions for future living?

How will the intersection of design and biological fabrication open up to new ways of ‘making’ and ‘crafting’ in the future?

Aims and Outputs

The Design & Living Systems Lab explores future sustainable propositions emerging from the intersection of biological tools and design research. By combining a range of projects including practice-based design research, curation and writing, the lab explores new hierarchies for designing with living systems and investigates disruptive methodologies for designing our future materiality.

Sustainability as a Driver

Today, we can witness the effect of climate change, the rapid decline of our biodiversity, and an exponential population growth which is stretching our planet beyond its ability to regenerate. It is estimated that we, as a species, are currently using the equivalent of one and a half planets to sustain our living[i]. Based on known geological reserves, recent studies show that we could run out of some of our critical raw materials within this century.

Yet, new knowledge emerging from life sciences is beginning to offer extraordinary potential for future fabrication and manufacturing. Not only we are beginning to explore the advantage of biological systems in terms of zero waste, minimum use of energy and materials, but with synthetic biology, scientists have developed means to biofabricate like ‘Nature’ does. We can program and engineer living organisms to grow tailored materials. Such extraordinary tools can trigger a paradigm shift in terms of design and manufacture for the future.

With this emerging biological revolution and a set of extraordinary toolkit that allow us to engineer and program life from scratch, comes a need to re-evaluate the position and potential of design. Designers need to develop a critical and ethical understanding of how best to apply these new biological tools to ensure they can contribute to shaping a truly ecological age post 2050.
I began mapping the emergence of the biodesign landscape in 2007 and developed a framework to help develop a critical and ethical stance when working with living systems. This framework formed the foundation work for the curation of the exhibition ‘Alive, New Design Frontiers’ which opened in 2013 in Paris at the Espace Fondation EDF.

The framework proposes a hierarchy in four folds:

- **Nature as a model**: The most conventional of the three, this is where designers explore biomimicry principles to imitate a behavior, a function or a pattern but may rely on conventional fabrication processes which are not necessarily sustainable.

- **Nature as a co-worker**: This category combines biomimicry approaches together with husbandry techniques. Here the designer becomes a cultivator that grows and control the morphology of materials by collaborating and cooperating with natural organisms such as bacteria, fungi or algae.

- **Nature as a ‘hackable’ system**: This is the most recent approach, only possible since the advances of synthetic biology which allows for the bespoke genetic engineering of simple living organisms, redesigned
to produce tailored and tunable substances. Bacteria can be reprogrammed to produce biofuel, yeast to grow vanilla and silk. As designers embrace or rebel against this new biotechnological possibilities, a new array of design propositions can emerge.

- Nature as a ‘Conceptualized’ system. Developing the imaginary of future technologies belongs to the realm of designers. By exploiting critical and speculative design tools, designers can translate complex scientific research into tangible scenarios and act as ‘agents provocateurs’ to bring to light new disruptive possibilities, ethical concerns or alternative perspectives on future sustainability.

Design & Living Systems Selected Projects

*Alive New Design Frontiers / curation / 2013*

Espace EDF Foundation, Paris, April-September 2013. The first international design exhibition dedicated to explore how the interface of biology and design could be leading the path to new sustainable paradigms.

Curator: Carole Collet, Professor in Design For Sustainable Futures, Central Saint Martins, University of the Arts London

Objective: To reveal and question a new design landscape, where fragments of a possible programmable ‘synthetic’ future are confronted with ‘natural’ alternative design perspectives.

The seminal exhibition was commissioned and presented at the Espace EDF Foundation to cast light on the quest for different ecological design models in our increasingly bioengineered world. For the first time, it gathered under one roof the work of leading designers, architects and artists driven by nature and biological science, whose thinking ranges from potential sustainable solutions, to poetic interpretations and extreme provocations. The 34 projects, including 6 commissions, featured unraveled a future hybrid world, where our everyday products and manufacturing tools would be ‘alive’: plants would grow products, and bacteria would be genetically re-programmed to ‘biofacture’ new materials, artefacts, energy or medicine.

The commissions included: Radiant Soil by Philip Beesley, The Rise by
Biolace / Speculative design / 2012

Biolace is a speculative design project which explores the potential of synthetic biology for future textile fabrication. In a future located in 2050, when natural resources have become scarce, and global population has reached 9 Billion, food grows in urban hydroponic greenhouses that host new species of plants genetically engineered to ‘manufacture’ multi-products to save energy, space and time. Biolace aims at questionning the validity and ethics of an emerging synthetic nature and its pertinence for future sustainable textiles.

Biolace has been showcased in 26 international exhibitions since 2012 and includes a set of 4 photographs, a short animation, and a lace doily.
‘Future Hybrids’ continues to explore fictional alternative grown biomaterialities for future textiles. Here I question the ethics of fur production and whether synthetic biology could enable us to grow fur without exploiting farmed animals or threatening endangered species. Future Hybrids considers a synthetic topology where the digital genetic code of the animal, mineral and vegetal worlds converge towards a new hybrid animate entity. Here a mushroom and a plant are reprogrammed to express the fur of an endangered raccoon.

*From Earth: Mycelium textiles / Co-designing with Mycelium / 2016 – on going*

‘From Earth: Mycelium Textiles’ is an experimental collection of materials and artefacts that explores the potential of mycelium growth as a new sustainable
surface treatment for textiles. The aims of this design-led material research are (i) to achieve to produce both soft and structural textile qualities by experimenting with the environment of growth of the mycelium (ii) to develop new biodegradable, compostable coatings for textiles that can replace current oil-based finishing processes. (iii) to develop protocols that encourage self expression and self patterning techniques in mycelium materials.

Design & Living Systems Input
Into the Curriculum/Example

![Left]: Self-patterned mycelium rubber, part of the Mycelium textiles project © Carole Collet 2016. This sample is as flexible as rubber and exhibits floral patterns which are not the result of a moulding technique, but the evidence of a self-organised pattern behaviour which developed as the mycelium colonised a waste coffee-based substrate during its growth.

![Right]: Self-patterned mycelium rubber/details, part of the Mycelium textiles project © Carole Collet 2016.

*Fabrics of Life: Big Data / 2014*

What can designers learn from interacting with scientists? Can the study of biological systems generate new perspectives on design? These key questions encapsulate the premise of our on-going collaboration with the MRC Clinical Sciences Centre. Fabrics of Life 2014, was a live project with designers from MA Textile Futures (Central Saint Martins, UAL) and architects from the Interactive Architecture Lab (RC3, the Bartlett School of Architecture, UCL). Groups of students have dedicated three weeks to transform ideas from big data biology into blueprints for design futures.
Cultivating Bio-Intelligent Conversations

*Biosalon / 2015-2016*

Biosalon is a joint initiative organised by the Crafts Council and the Design & Living Systems Lab at Central Saint Martins, University of the Arts London.

Designers and scientists are exploring the future uses and applications of living matter, and ways to cultivate and grow new materials. Coupled with the evolution of technologies, our understanding of materiality is changing, and new perspectives on what defines a material and its critical context are emerging. Biosalon was set up to provide a critical space for designers and scientists engaged with this debate to come together and discuss the implications of biofabrications for their respective practices.

**Carole Collet** is a Research Professor and Director of the Design & Living Systems Lab at Central Saint Martins, University of the Arts, London. Collet originally set up the Textile Futures discipline at Central Saint Martins before to focus her research and practice on exploring the intersection of design and biology to develop new sustainable propositions for future living. Collet operates within the field of textile futures and biodesign and has contributed to the production of new knowledge as a designer and curator at international level since 2008. An indicative example is the project ‘Biolace’ which has been featured in more than 25 international exhibitions. Her recent cura- tion of ‘Alive, New Design Frontiers’ at the EDF Foundation in Paris has also been critically acclaimed and clearly establishes a new original framework for designing with the living. One of her characteristics is that she operates different research roles, from designer, to curator and educator. This enables her to develop an informed critique of both the output and the context, from making knowledge to framing knowledge. Her design work has been exhibited at the Science Museum, the ICA and the V&A and she has contributed to conferences worldwide on the subject of design-science collaborations, textile futures, biodesign, biomimicry, synthetic biology, future manufacturing, sustainable design and climate change.