



Renewing Nature:

Enacting Biodesign to Restore Ecosystems

Professor Carole Collet,

Co-Director Living Systems Lab,

Director Maison/0, the Central Saint Martins -LVMH
platform for regenerative luxury

Central Saint Martins UAL

Living Systems Lab Research Group, Central Saint Martins UAL



How can living systems principles inform new approaches to creative practices?

Learning from, with and for nature, we aim to create new knowledge that nurtures a multi-species world.

@livingsystems.lab

Framing knowledge:
curation



This is Alive, new Design Frontier exhibition 2013



Symposium Series 2019-2021



Biolace 2012

Making knowledge:
biodesign

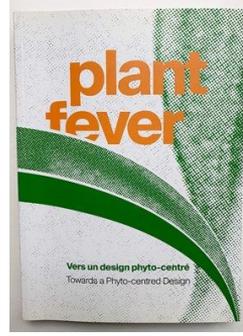
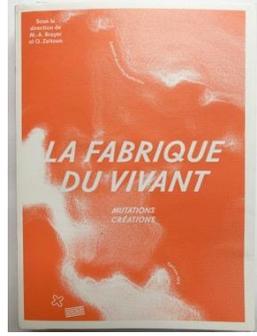
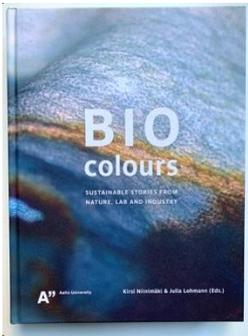


Mycelium Textiles 2016-2019



Lab Grown Fur, Fendi, LVMH,
Imperial College 2022-2024

Publishing
knowledge



Sharing
knowledge

Course Founder:
MA Textile Futures (2001)
(now Material Futures)
MA Biodesign (2019)
MA Regenerative Design
(2022)

Living Systems Lab PhD group



Living Colour: An Alternative Microbial Colour System for Textile Screen-printing
Ruth Lloyd
Funded by Colorifix and UAL



Developing carbon-capture materials through biomineralisation with cyanobacteria for future circular product design
Hyejo Shin



Olfactory Echoes: Preserving and Reimagining Rome's Climate-threatened Olfactory Heritage Through Microbial Scents.
Lucrezia Alessandroni



Detoxing flax retting wastewater with algae.
Cassie Quinn
Funded by Monsoon Accessorize and UAL

Maison/0, the Central Saint Martins-LVMH platform for regenerative luxury

@maisonzero

Scholarships



Myah Hasbany, LVMH Scholar 2025, BA Fashion

Awards



Sivia Acien Parilla
Maison/0 Green Trail
Award winner 2023

Challenge Fund



Mariia Korneeva. Holding rain
in the Headwater. MA Arts
Science & La Joya.

Research



Regenerative design in
Unesco MAB biospheres

Disruptive Curriculum

Regenerative Design

[Course overview](#) [Student work](#) [Teaching staff](#) [Fees and funding](#)



Development and validation of new MA
course, 2022

A Living Systems Approach to Design:

Cultivating matter in the context of a planetary emergency



*'All living beings
are members of
ecological
communities
bound together in
a network of
interdependencies'*

Fritjof Capra

Current world view:

Anthropocentric

Nature as a resource
Nature as a waste ground



Next world view:

Earth-centric

Nature as a set of complex
living dynamic ecosystems



*'If a maple tree is an
'it', we can take a
chain saw.*

*If a maple is a her, we
think twice'*

Robin Wall Kimmerer

A living systems approach to design

anthropocentric
extractive
degenerative
linear system
toxic
oil-based
CO2 positive
exploitative
deficient



multi-species kinship
nourishing
regenerative
circular economics
life-conductive
bio-based
CO2 negative
inclusive
holistic

Learning from Nature: Life-conducive and cyclic material systems



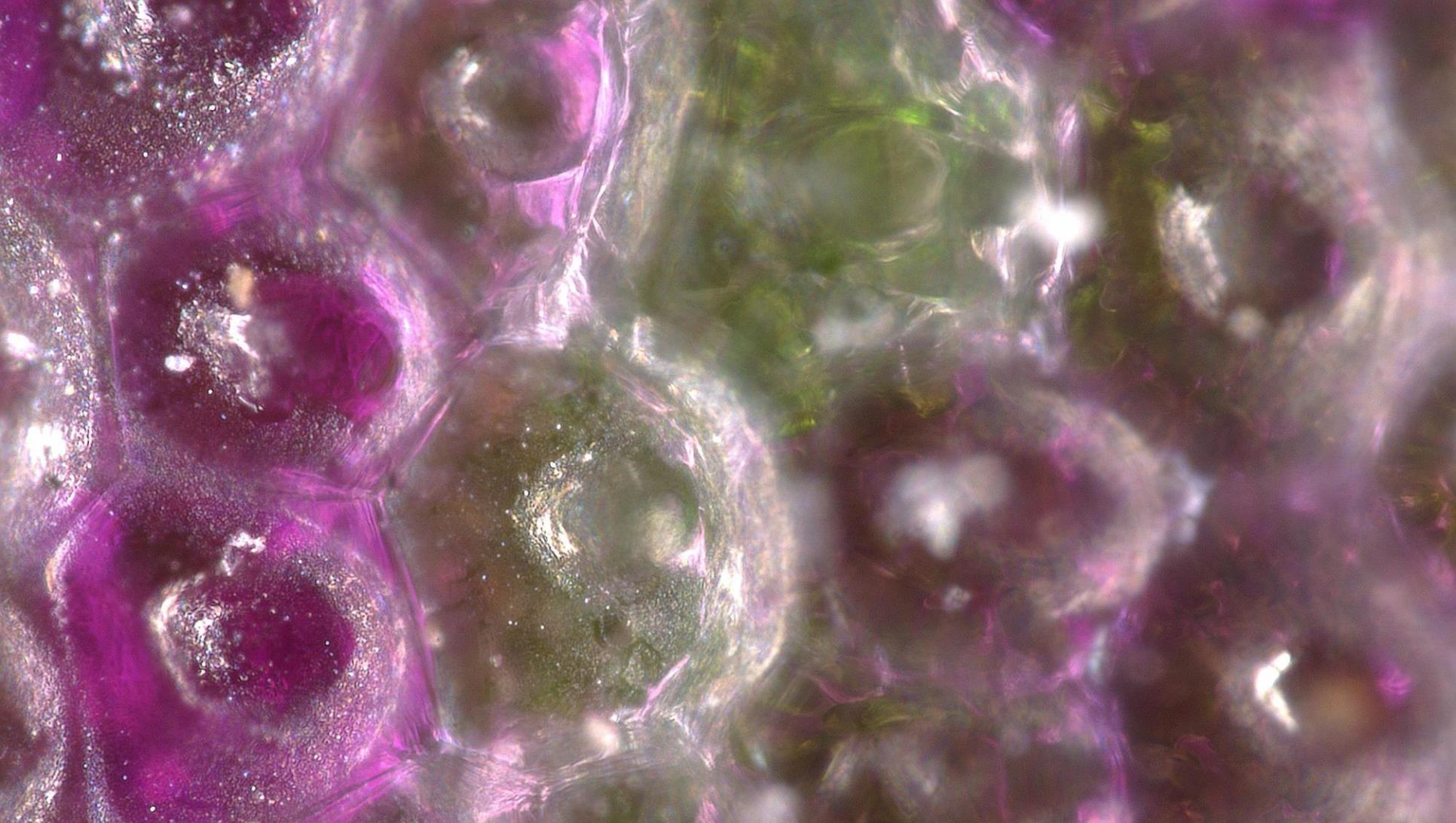
A leaf: grown ('biofabricated') at ambient temperature using local resources, solar energy in a cyclic system which is life-conducive to other living beings.



Learning from Nature: Self-assembly

A leaf: a biodegradable carbon capture technology
fit for purpose and context

Precision bio-engineering using self-assembly principles to biofabricate sensing
matter, colours and finishes.



'Life can't put its factory on the edge of town;
it has to live where it works.'

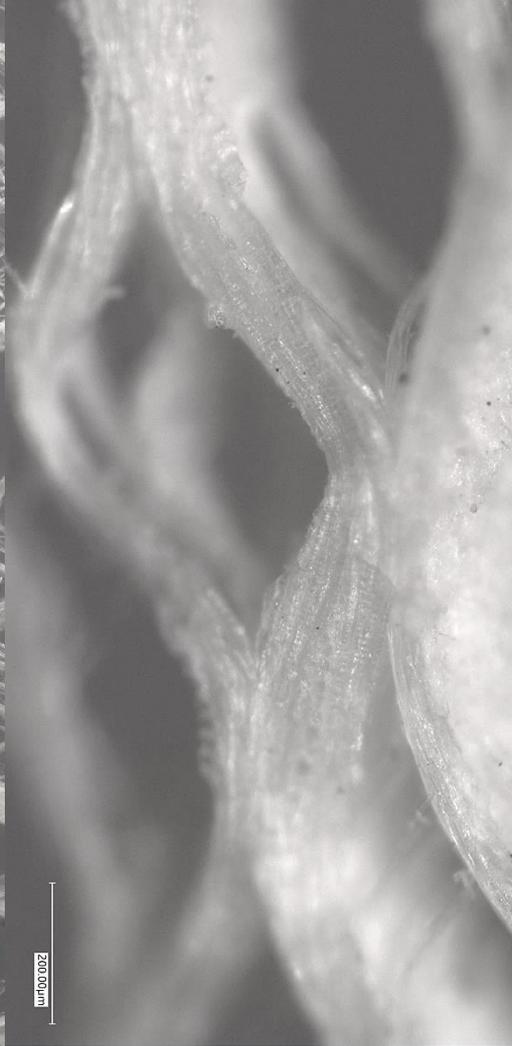
As a result, nature's first trick of the trade is that
nature manufactures its materials under life
friendly conditions, in water, at room temperature,
without harsh chemicals or high pressures'

Janine Benyus

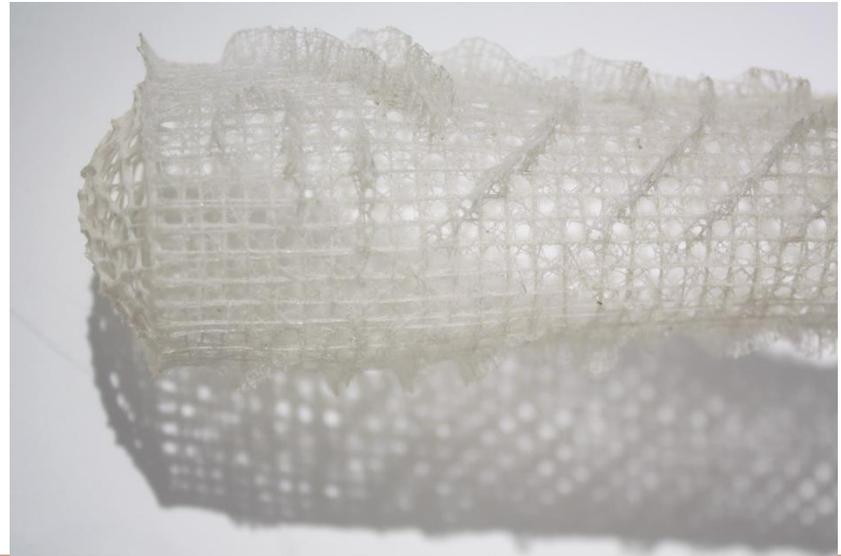


How does Nature make a textile?

How does Nature fabricate and cultivate matter?



Lace Bark, Lagetta Lagetto tree



Venus' flower basket (*Euplectella aspergillum*).

My practice is centered on living systems thinking and ranges from fundamental/curiosity-driven inquiries to applied research.

Curiosity Driven Research

Applied Research



Speculative design



Biodesign



Regenerative design

Working across species and ecosystems

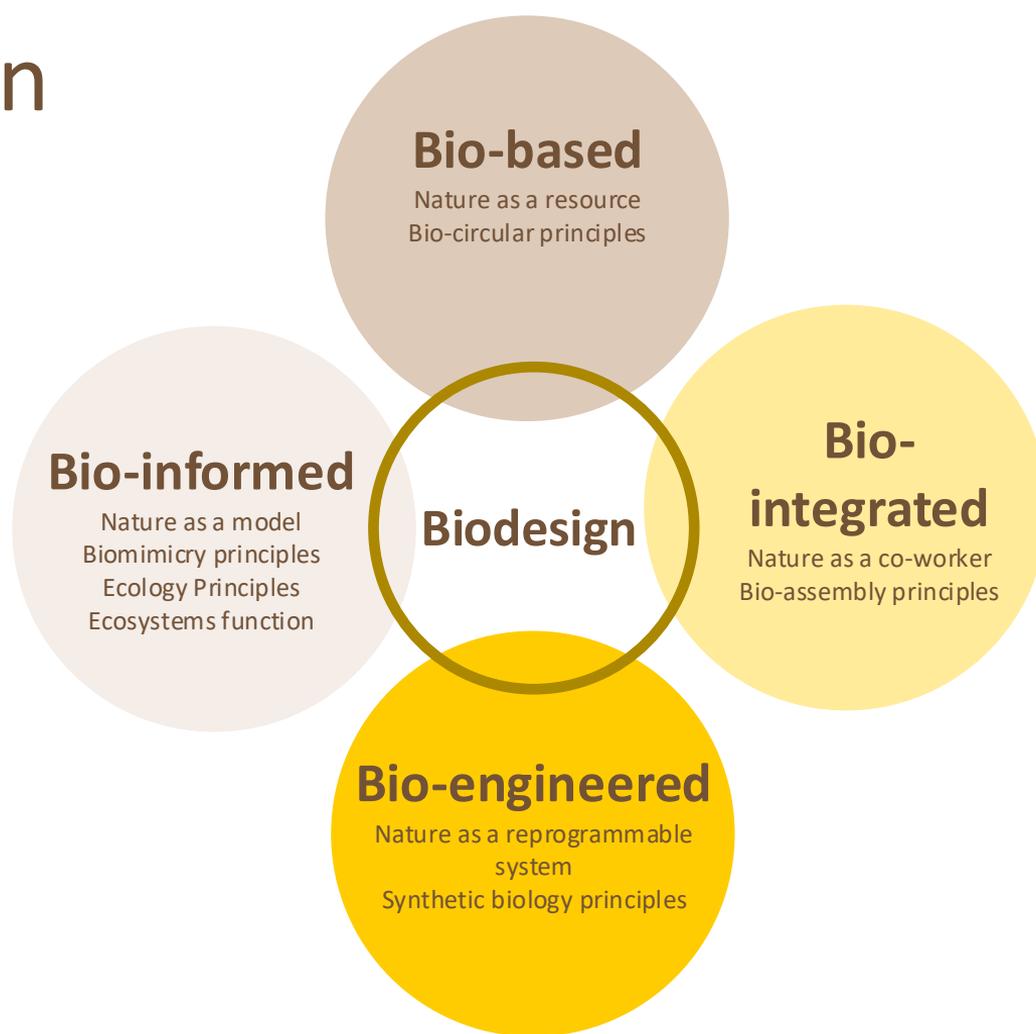
Species- specific

Ecosystem specific

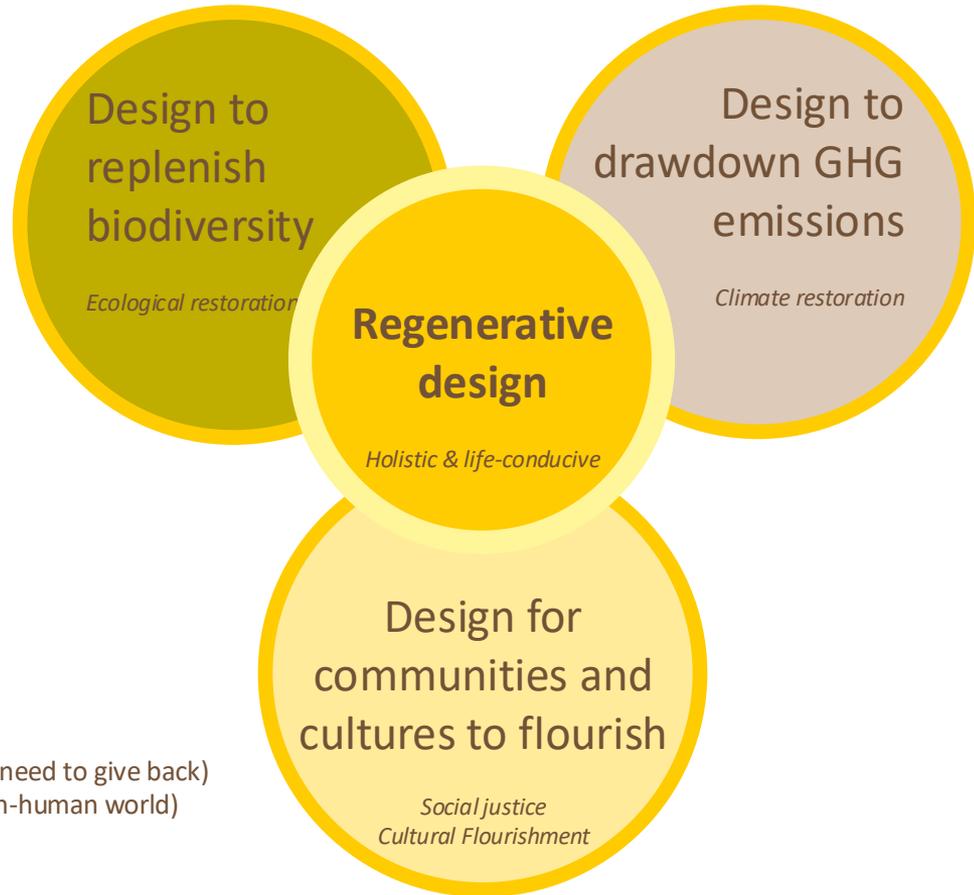
Biodesign

Regenerative design

Biodesign



Regenerative design



Active regeneration

A place-based and life-conductive approach to creative practice.

3 levels of actions:

- Design to restore biodiversity
- Design to restore climate
- Design for communities and cultures to flourish

3 core principles:

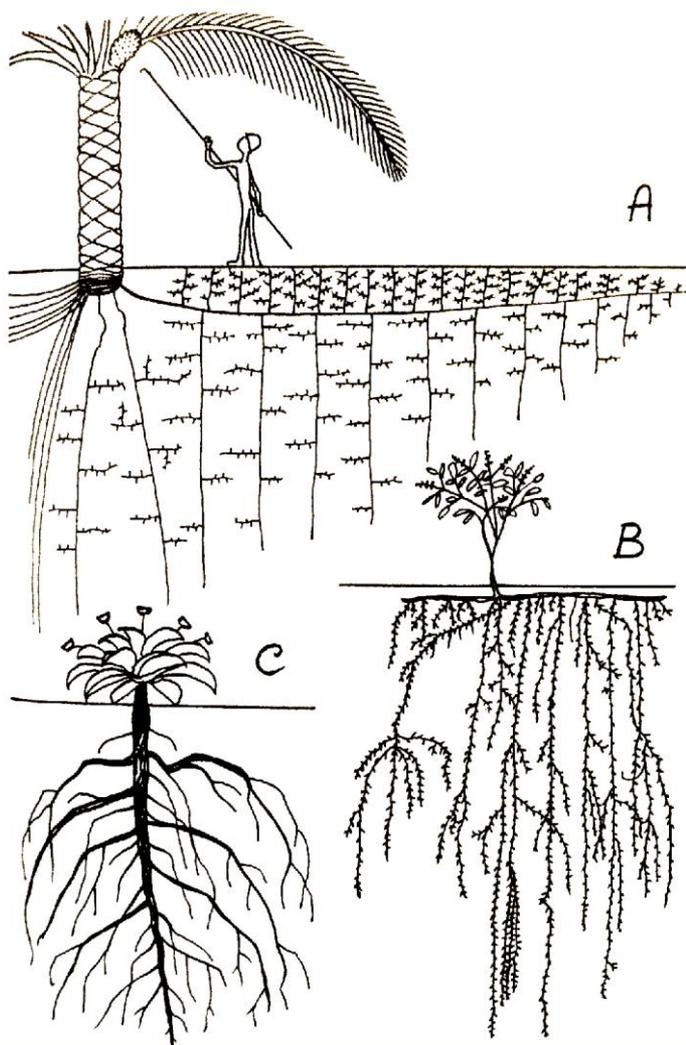
- Design for ecological and socio-cultural abundance
- Design for reciprocity (when we take from Nature, we need to give back)
- Design for the benefit of multi-species (for a more-than-human world)

Plant roots

The surface of a rye plant reaches 639 m².

The surface of its underground root systems is estimated to be 130 times greater than its aerial surface, put one after the other, its roots would represent 622 km with a daily growth rate of 5 km.

Francis Halle, *Eloge de la plante*, referencing King.J



A: palm oil
4-8000 horizontal roots

B: *Symphoricarpos occidentalis*:
the aerial part is < 50 cm, whilst the root
system
is 150 cm deep

C: *Balsamorhiza sagittata*:
the aerial part is 5 cm, the root system
reaches 2 metres.

(Francis Halle, *Eloge de la plante*, p.43)

Plant roots

Biolace (2010-2012)

Exploring plant architecture, biological morphogenesis and synthetic biology to program a new responsive materiality for textiles

Biolace is a speculative design project which explores the potential of synthetic biology for future fabrication. In a future located in 2050, when natural resources have become scarce, and global population has reached beyond 9 Billion, food grows in urban hydroponic greenhouses that host new species of plants genetically engineered to 'biofacture' multi-products to save energy, space and time. Biolace aims at debating the future impact of ignoring the planetary emergency as well as the ethics of biotechnology.



**Strawberry Noir
(Fragaria Fusca Tenebris)**

Black strawberry with enhanced levels of Vitamin C
and Antioxydants,
Black Lace for fashion trimmings



Basil n° 5 (*Ocimum Basilicum Rosa*)

Perfumed lace for luxury fashion trimmings, culinary herb and anti viral medicine.



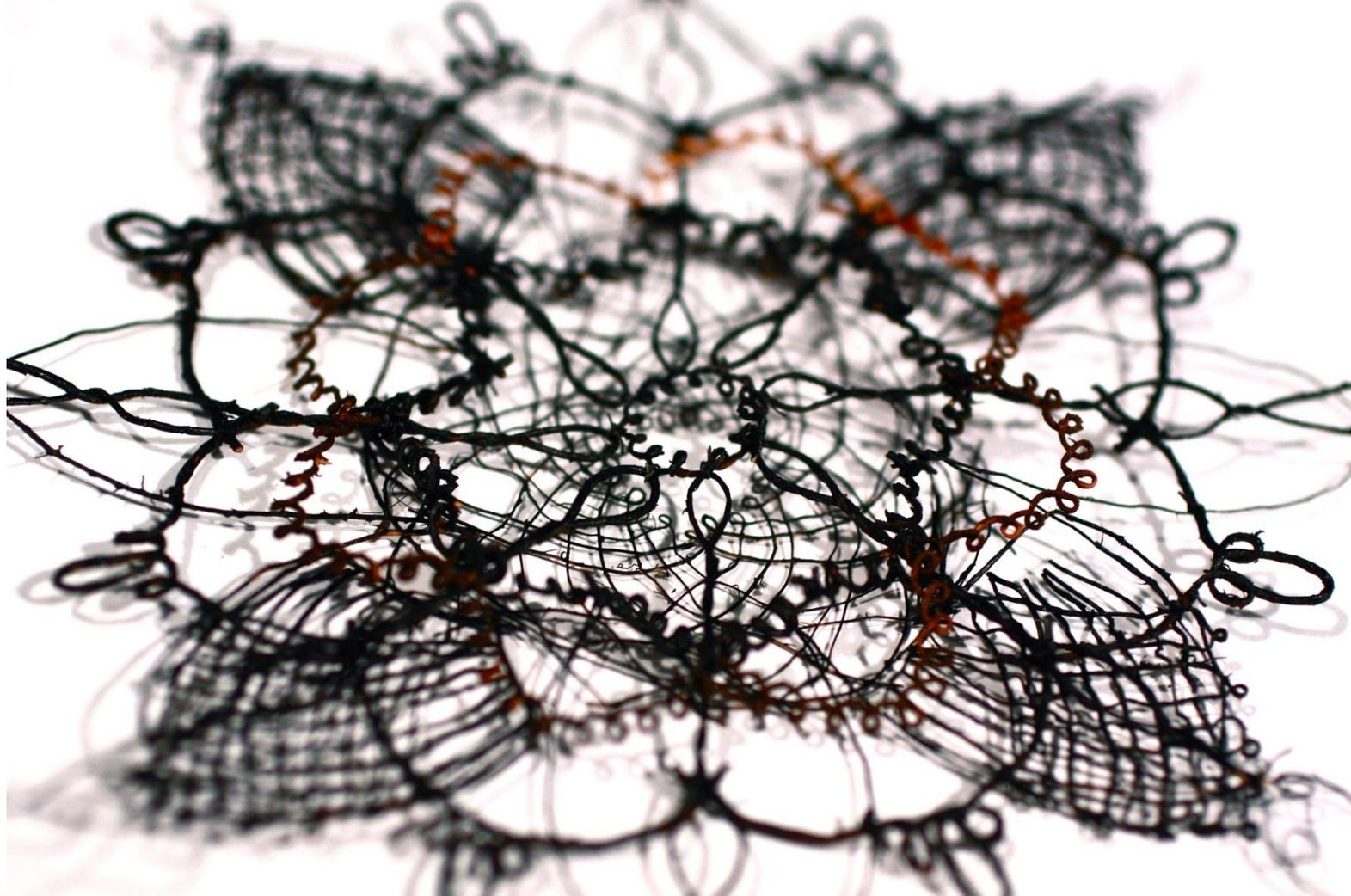
Factor 60 Tomato
(*Solanum Lycopersicon*)

Produces high levels of Lycopene for UV skin protection Factor 60, and protein rich -bacon flavoured edible tomato lace for haute cuisine.



Gold Nano Spinach
(*Spinacia Aurea Electrica*)

Produces bio nano transistors for the electronic sector, and multi-mineral food supplements



Lace Doily.

Material: fresh
strawberry roots.
Dimension:
D; 12 cm.



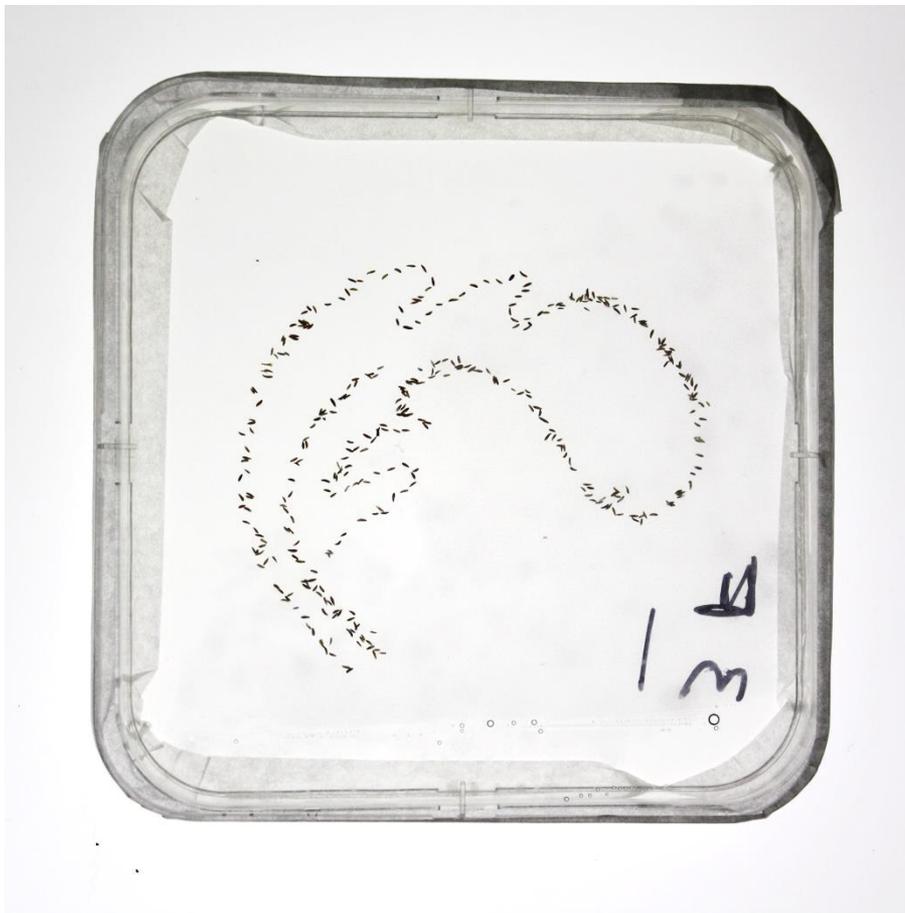


Geotropic Textiles (2019)

Geotropic Textiles intersects plant tissue engineering techniques with textile patterning methods to grow textile-like root assemblies in vitro.

By using phototropic response, we can influence the direction of growths of plant roots. A series of lab experiments across a range of plant species was designed to explore how light can guide the development of roots to create structures akin to knitted or woven processes.





Botanical Fur - Carole Collet

Date (seeding):	03/12/18	N°	7
Agar:		Seed:	Mustard bleaching tray
From: microscience:		From:	(half coin seed)
Mix:	Sg 11L	Bleaching:	1 sec - d.
Date: (Harvesting):		Design Grid:	F

Comments/description:

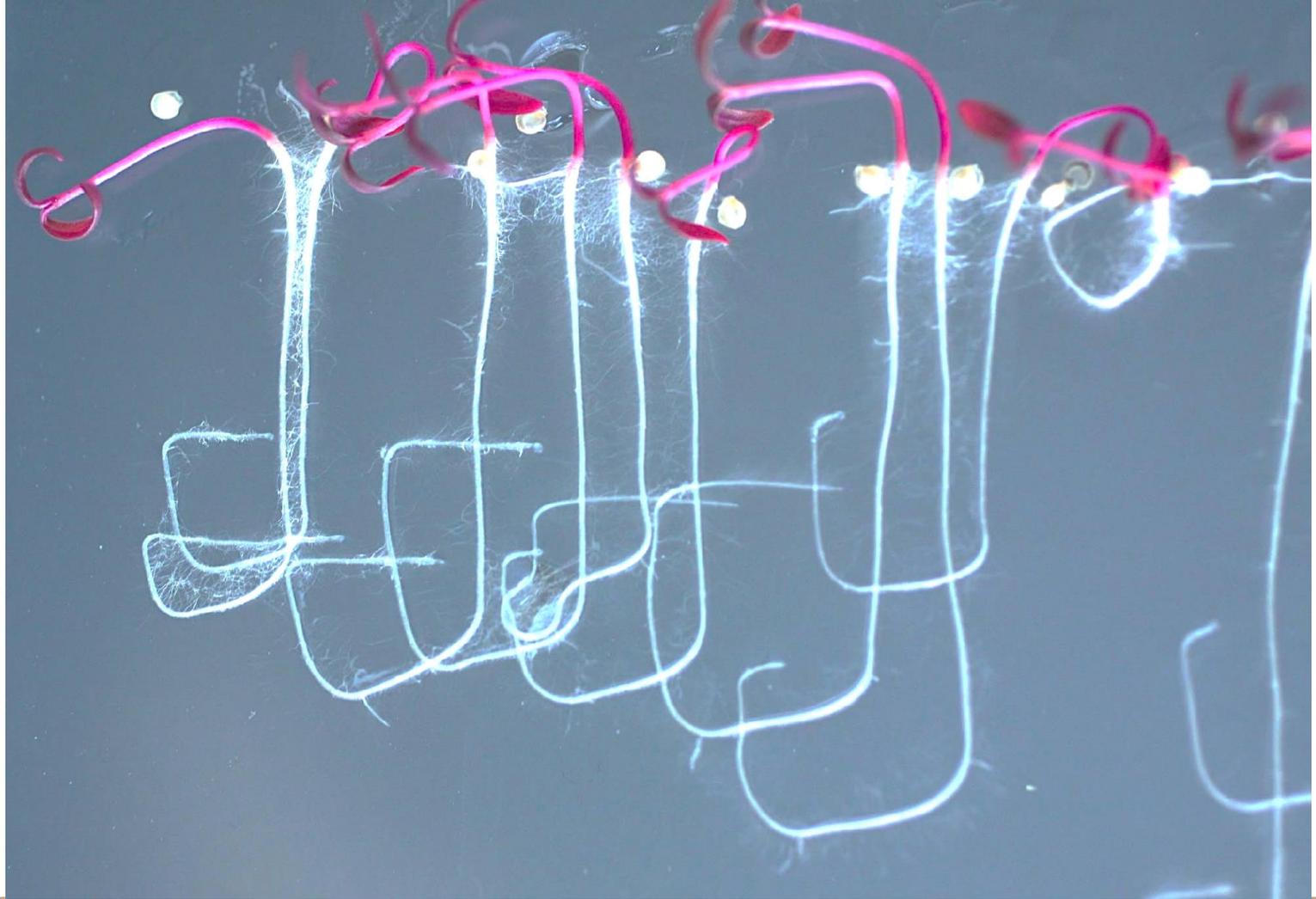
Botanical Fur - Carole Collet

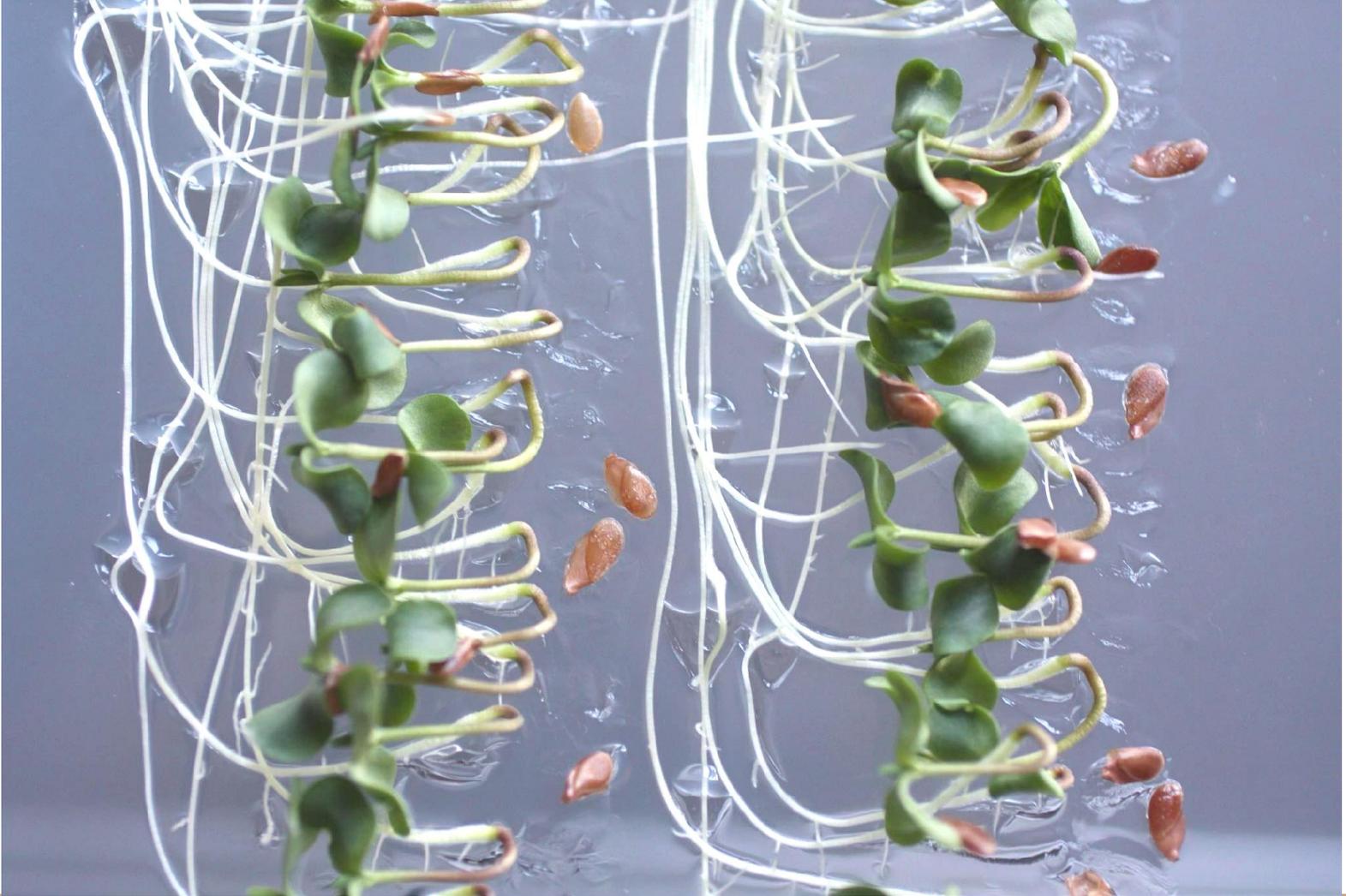
Date (seeding):	03/12/18	N°	5
Agar:		Seed:	Alfalfa (Lucerne) + Agrostis Mehadia sativa + Agrostis (half coin seed)
From: microscience:		From:	(half coin seed)
Mix:	Sg 11L	Bleaching:	1.0
Date: (Harvesting):		Design Grid:	J

Comments/description:

→ alfalfa
 → Agrostis Nebulosa
 Cloud grass / Faba sp







Plant fur



Plant fur

Future Hybrid (2014)

'By reading and rewriting the gene codes of bacteria, plants, and animals . . . We start to turn cells, seeds, and animal embryos into the equivalent of floppy disks . . . Data sets that can be changed and rewritten to fulfill specific tasks. We start deliberately mixing and matching apples and oranges . . . Species . . . Plants and animals.'

Juan Enriquez, As the future catches you. (2001)

This speculative design projects explores the imaginary of future genetic engineering which could help tackle critical environmental issues. The 'Fungi Fur' and the 'Phyto Fur' collections addresses the urgent need to protect the planet's biodiversity and in particular wild endangered animals killed for their fur. By creating new species of fast-growing fungi reprogrammed to produce fur caps, or plant leaves engineered to grow fur, we could provide luxury furs that imitate the skins of wild animals, or create new furs.





Botanical Fur (2019)

A study to observe and decode the material characteristics and plasticity of plant fur through making. This research inquiry explores biological time and functions in plants systems to prototype new textile conceptual constructs and new material assembly techniques.



Carole Collet 2019, photography Immatters



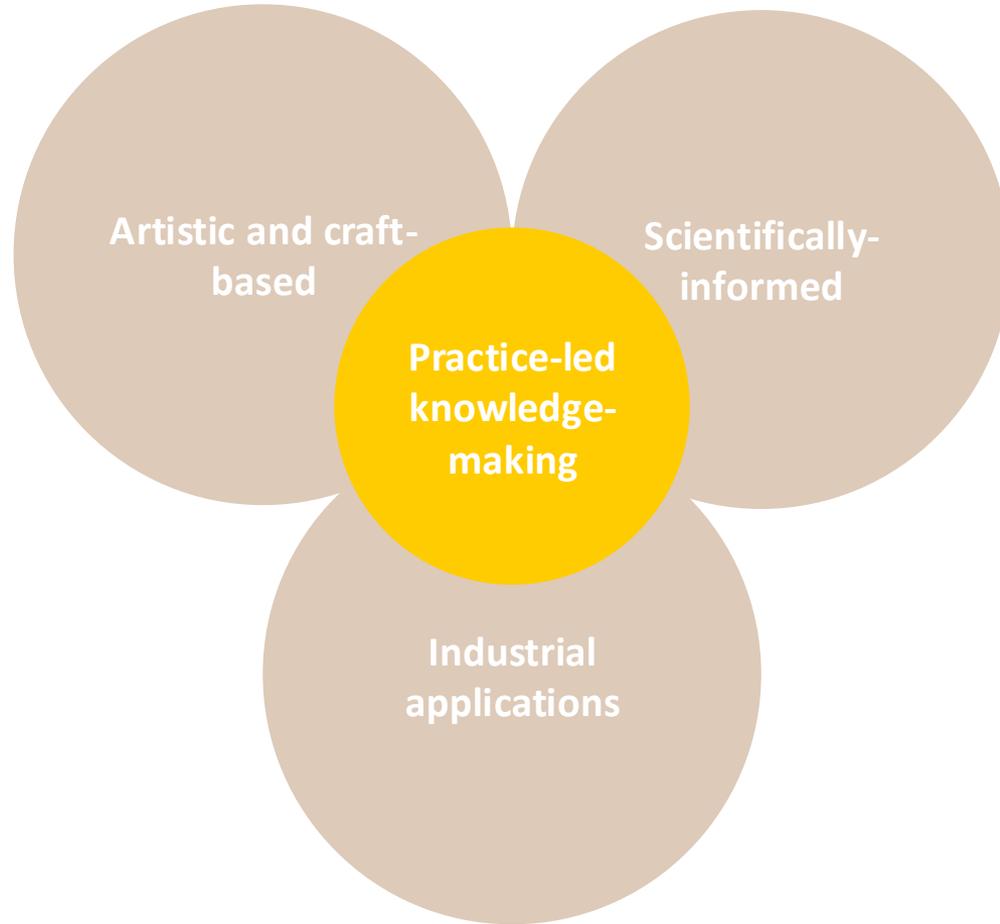
0.28 grammes:
9 years



Carole Collet 2019, photography Immatters



Intersecting hypothesis and curiosity-driven practice with biocraft and biotechnology for industrial development



Biotechnology for textiles

Lab Grown Fur
FENDI, LVMH, Imperial college



Epoch's biorecycling platform unlocks circularity for the toughest to recycle materials. Our AI-designed enzymes enable infinite recycling for mixed plastics and textiles at low temperatures. We produce sustainable outputs for use in apparel, automotive, packaging and more.



Nylon

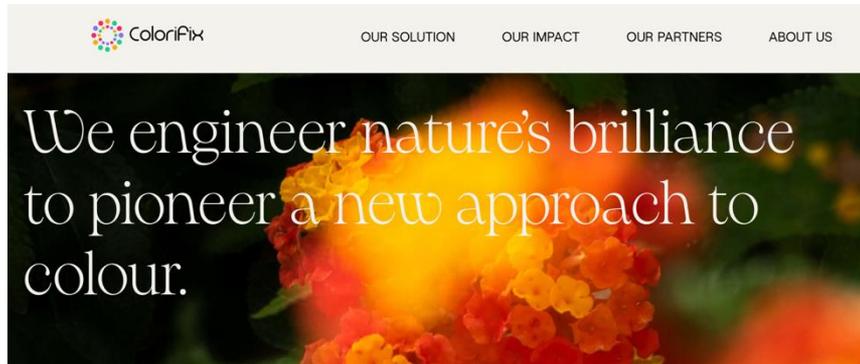
From automotive to fashion, blended Nylons are notoriously difficult to recycle. Our process changes that.

Living Colour: An Alternative Microbial Colour System for Textile Screen-printing

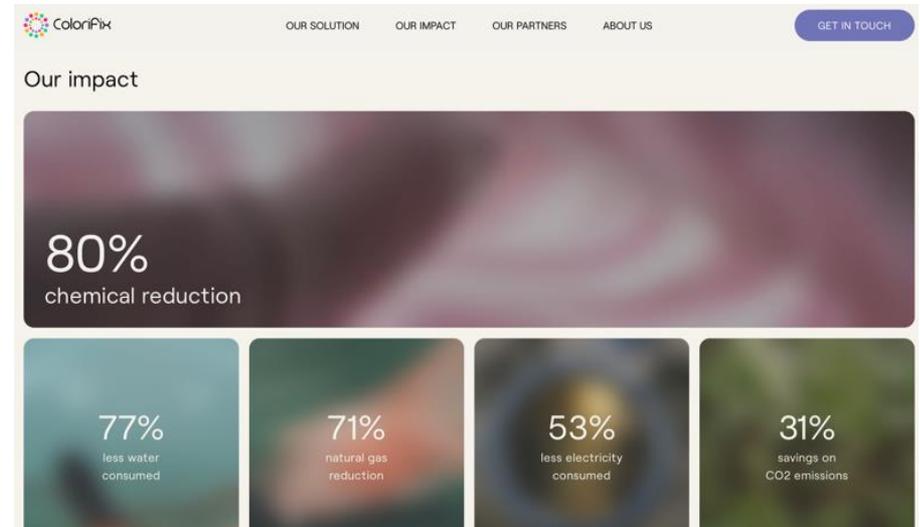
Ruth Llyod, PhD Candidate, Living Systems Lab

Funded by Colorifix and UAL

Director of Studies: Professor Carole Collet, Dr Alice Taylor, Dr Jim Ajioka (Colorifix)



At Colorifix, we have developed a biological process that replaces the use of harmful chemicals to create colour and dye textiles.





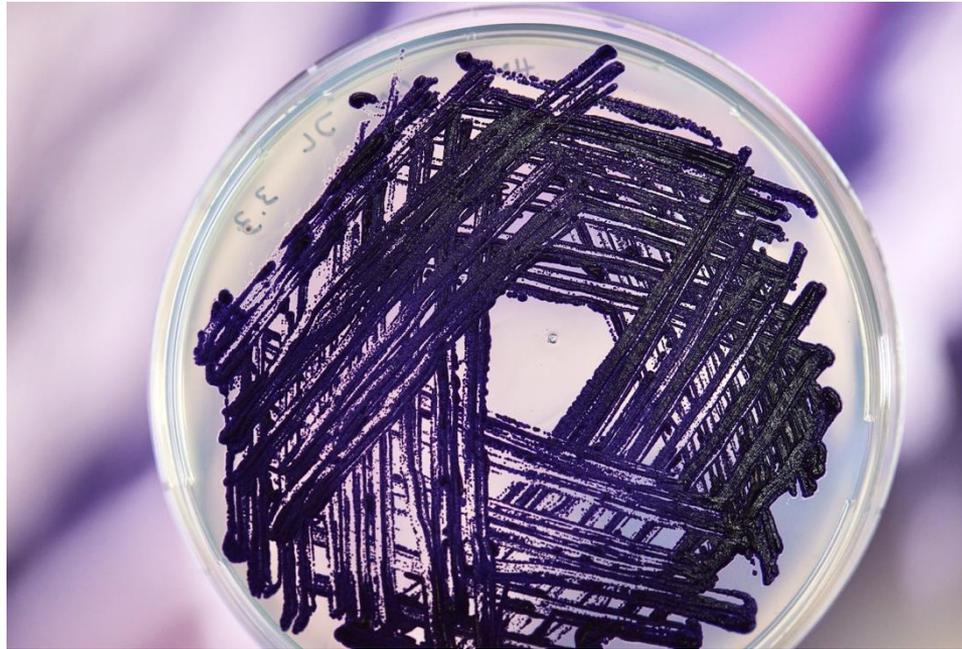
How can printed textile practice inform the development of an alternative microbial colour system to replace synthetic dyes in the textile industry?



Ruth Llyod, photography Paul Cochrane

Automating Violacein: Machine Printing with Bacteria

Charlotte Werth, Designer in Residence, Maison/0





Charlotte Werth, photography Paul Cochrane



Charlotte Werth, photography Paul Cochrane



Charlotte Werth, photography Paul Cochrane

Developing carbon-capture materials through biomineralisation with cyanobacteria for future circular product design

Hyejo Shin, PhD Candidate, Living Systems Lab

Director of Studies and co-supervisors : Professor Carole Collet, Dr Alice Taylor, Dr Lorraine Archer, Dr Mat Malpass



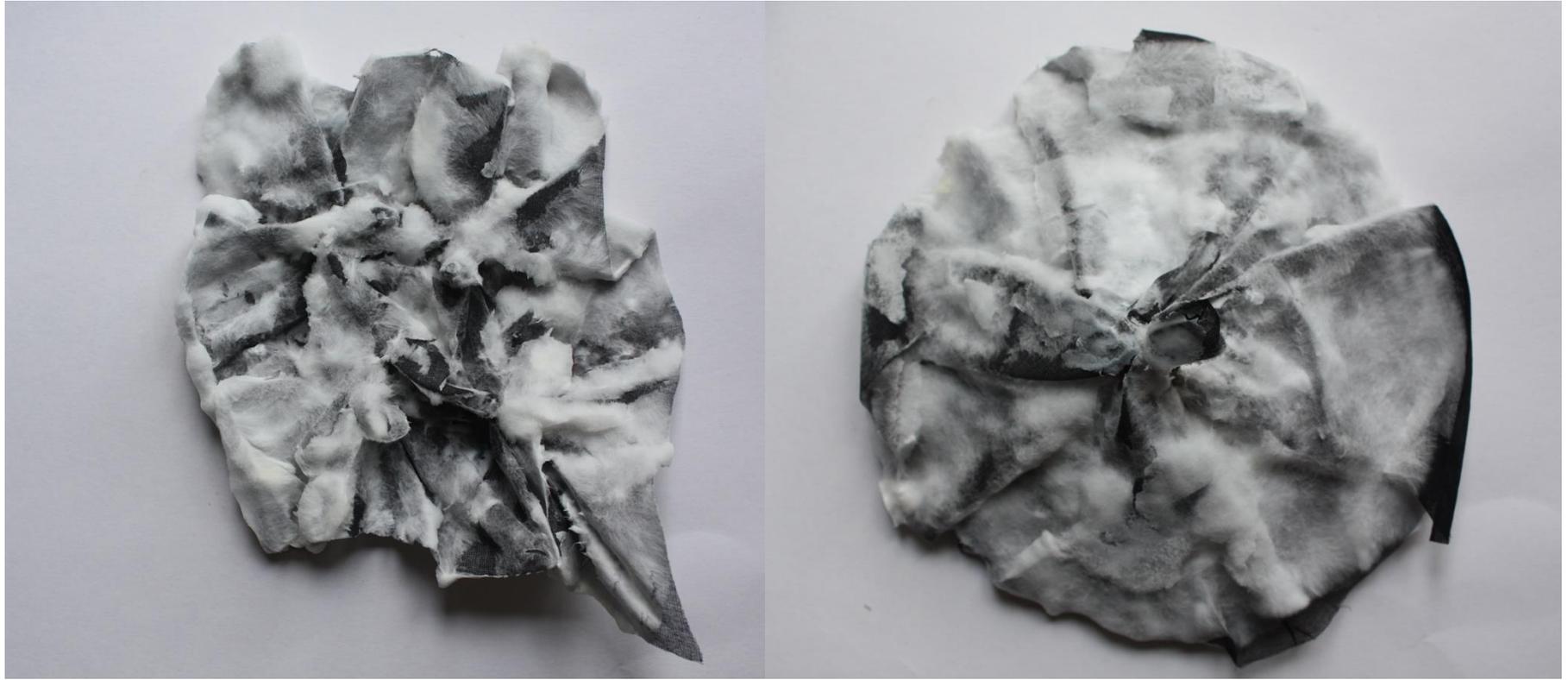


Hyejo Shin, photography Paul Cochrane

Fungi

Mycelium Textiles (2016-2019)

Mycelium Textiles investigates the possibilities of integrating and controlling the living dynamic properties of mycelium into the textile design process, and of combining traditional textile craft know-how with the production of mycelium material to develop sustainable textile embellishment techniques for a post-petrol textile industry.

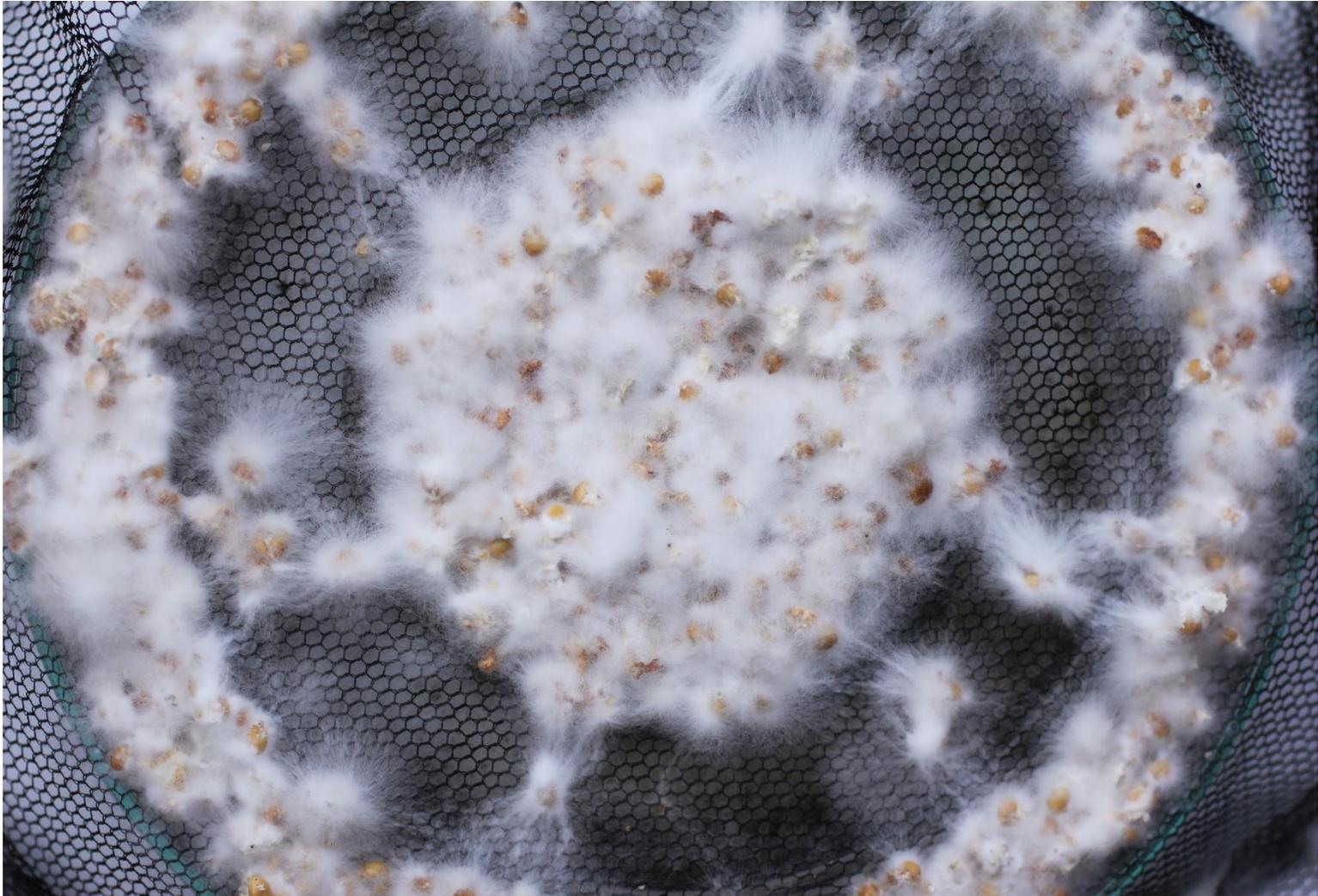


Tye-Grow



















Who is the designer?



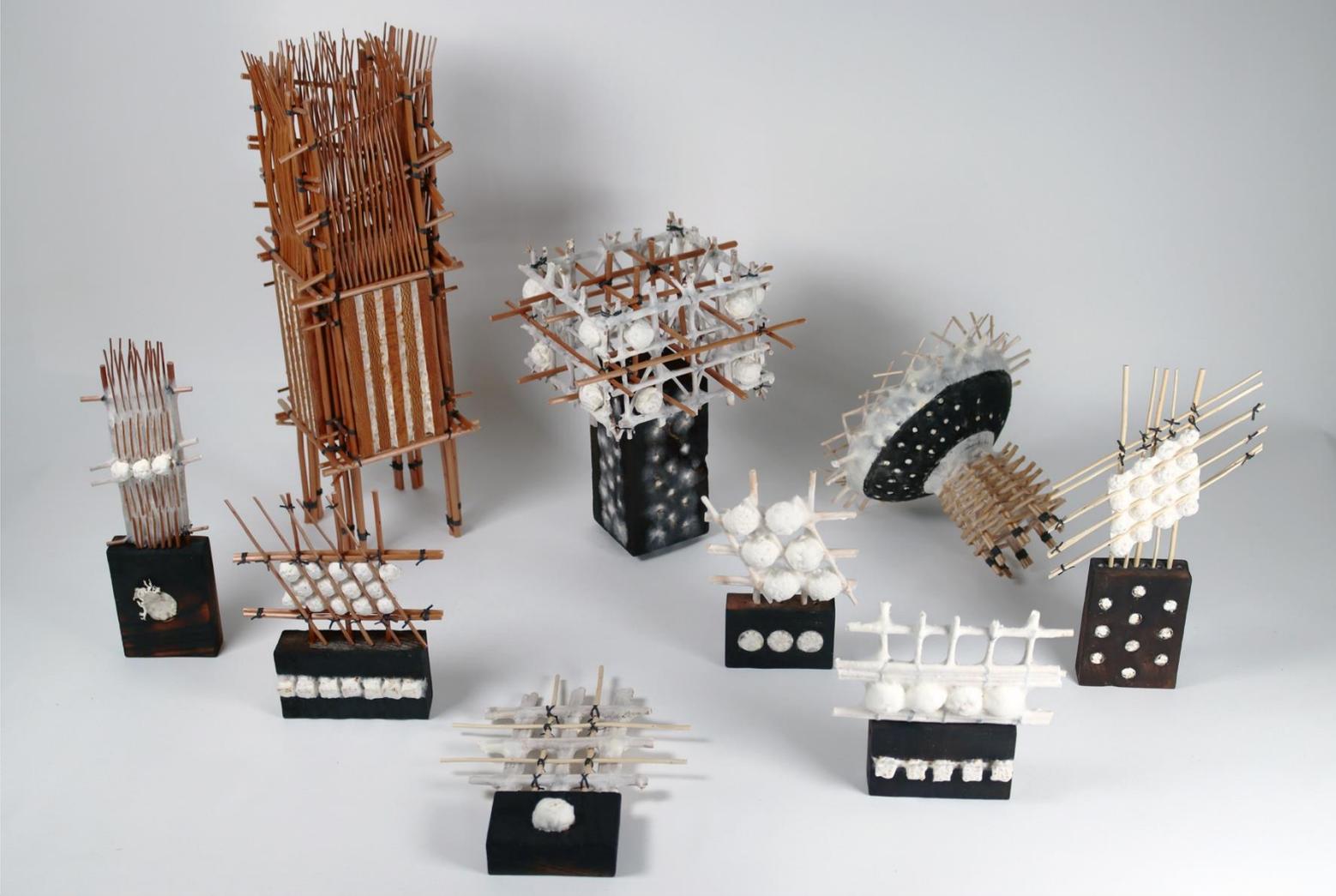
Self-patterning mycelium rubber made from coffee ground waste and a mycelium culture,
Carole Collet, Living Systems Lab, 2016

Fungi

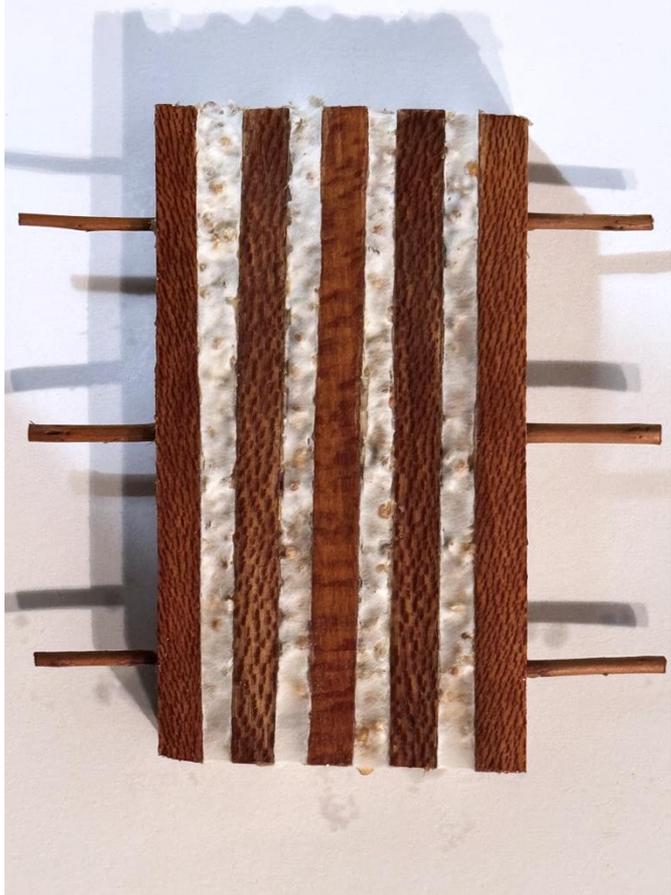
Harvested Assemblies (2025)

Can mycelium growth protocols lead to the invention of new craft typologies?

The biological capacity of mycelium to digest and transform materials is incorporated into the process of weaving and woodwork to craft bio-assemblies. Harvested and grown, the materials are sourced from fallen trees, horticultural garden waste, organic willow and deadstock textiles. The surface patterns emerge from the intersection of hand-made processes (carving, weaving, inlay) and grow-made protocols.



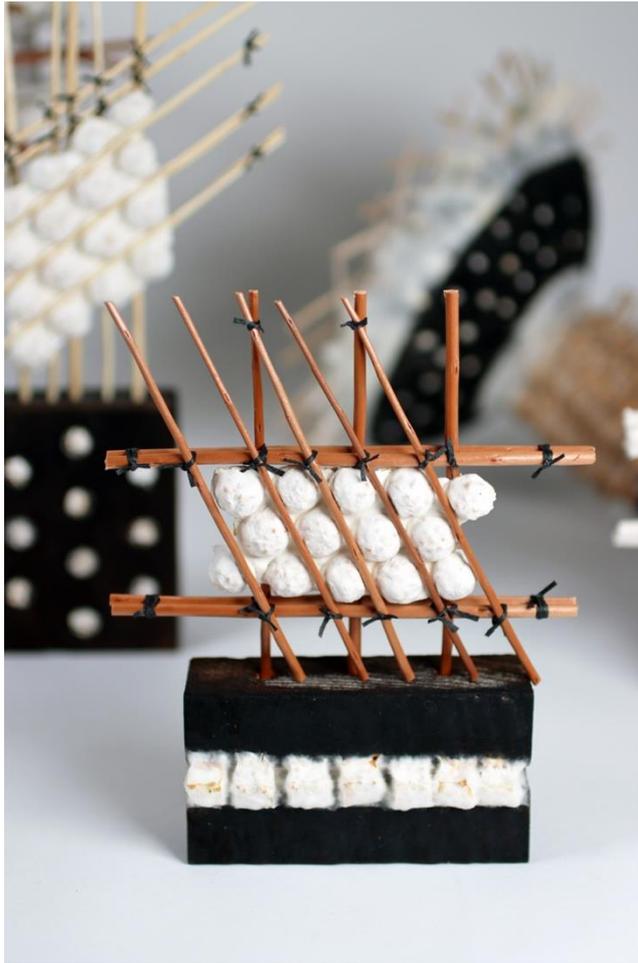
Carole Collet 2025

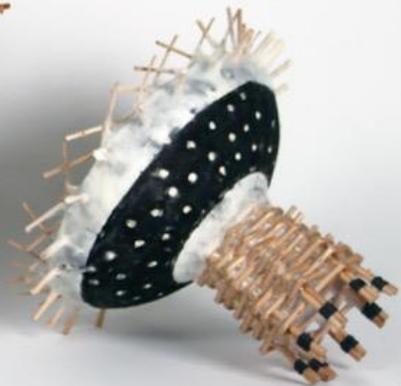












Ecosystems thinking

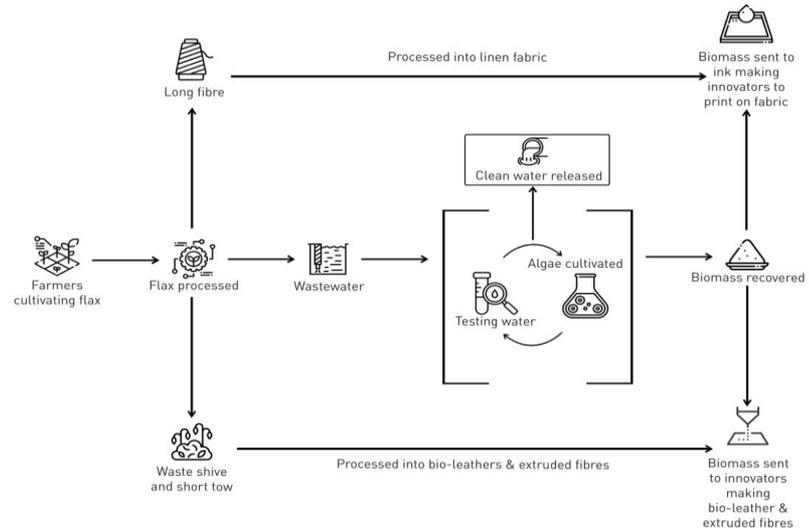
Detoxing flax retting wastewater with algae.

A biodesign-led investigation into creating a sustainable model for treating flax retting wastewater using microalgae to produce textile pigments.

Cassandra Quinn,
PhD Candidate, Living Systems Lab
Funded by Monsoon Accessorize and UAL

*Director of Studies and co-supervisors:
Professor Carole Collet, Dr Alice Taylor, Dr
Lorraine Archer*

Flax waste to algae biomass diagram





Olfactory Echoes: Preserving and Reimagining Rome's Climate-threatened Olfactory Heritage Through Microbial Scents.

Lucrezia Alessandrini,
PhD Candidate, Living Systems Lab
Funded by UAL

*Director of Studies and co-supervisors: Professor Carole Collet,
Dr Barbara Smith*

*How can microbial scents be
designed to echo the Roman
Olfactory Heritage impacted by
Climate Change?*





Ecosystems thinking

Weaving Paths for Regenerative Crafts in the Bolivian Amazon (2025)

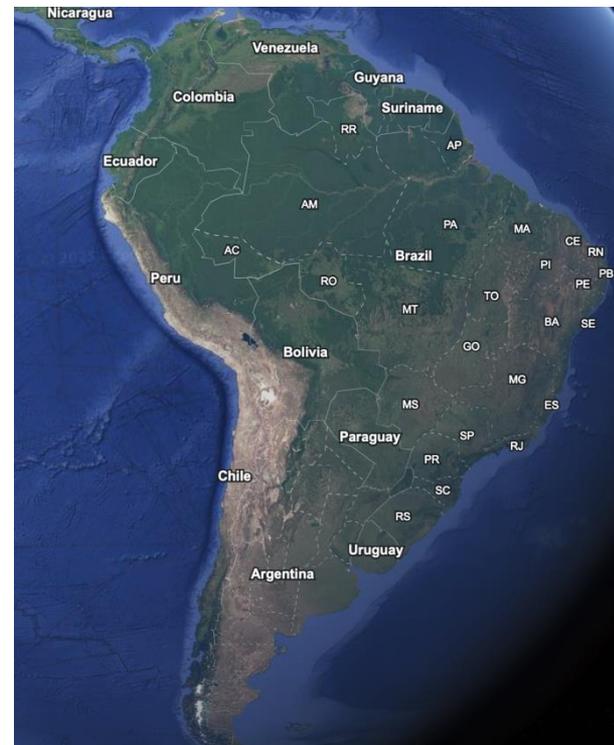
A UNESCO - LVMH Amazon Biosphere Reserves project, in collaboration with Maison/O, Central Saint Martins UAL, and the Estación Biológica del Beni and Pilon Lajas Biosphere Reserves in Bolivia



Pilón Lajas Biosphere Reserve, Bolivia



Pilón - Lajas Biosphere Reserve is located on the far eastern spur of the Andes. It comprises mixed mountain and highland systems, low hills and Amazonian plains, covered with tropical humid forests, sub-tropical and tropical forest, forests in ancient alluvial terraces, and mountain and valley forests.



Designation date: 1977

Networks

Regional network: [Red de Comités y Reservas de Biosfera de Iberoamérica y el Caribe \(IberoMAB\)](#)

Ecosystem-based network:

Description

Map

Surface : 400,000 ha

- Core area(s): 143,382.89 ha
- Buffer zone(s): 179,966.32
- Transition zone(s): 62,501.38 ha

Location: 15°00'S to 67°20'W

Administrative Authorities

Félix Gonzales Bernal

Servicio Nacional de Áreas Protegidas (SERNAP)
Calle Francisco Bedregal N° 2904 final Av. Víctor Sanjinés
Sopocachi - La Paz
Bolivia



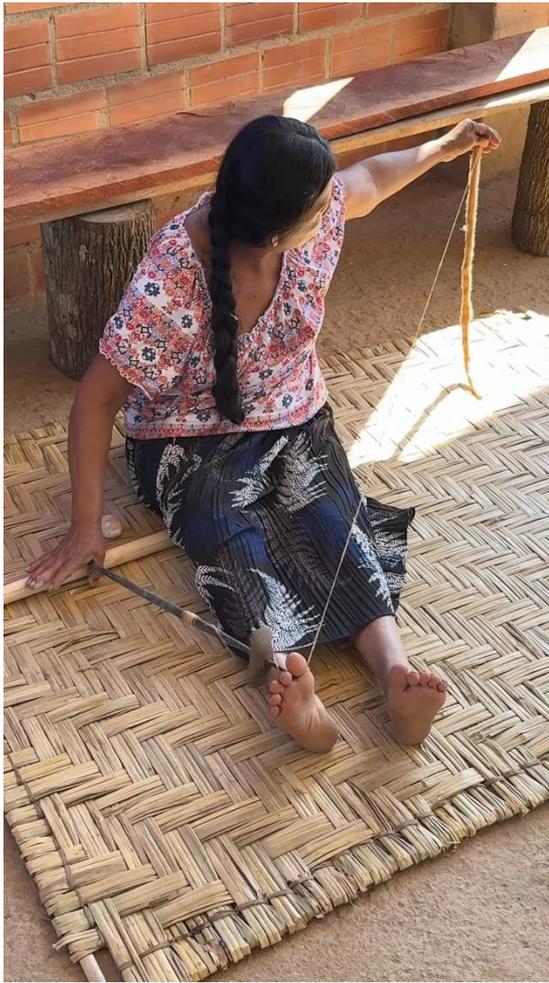
Tsimane village



Agroforestry



Artesanal Cacao Production



Tsimane weaving and
jewellery making



Biodiversity challenges

A (local)

- Forest timber and unproductive agricultural systems give poor returns and the land is often turned into pasture, a process which threatens sustainable cultures and practices of the indigenous people
- Fires destroying indigenous lands

B (regional/Beni)

- Indicator species? Keystone species? Invasive species?
- Endangered species/habitat list in Pilon Lajas and link to SJdC's work?

C (global)

Global drivers of biodiversity loss.

Climate challenges

A (local)

- Emissions linked to transport of food products to shops in La Paz.

B (regional)

Climate change prediction for Pilon Lajas? ?

Do we have scenarios for 1.5C, 2 C, 3 C?

Regional deforestation – increase of droughts and fires

C (global)

- Emissions linked to synthetic dye manufacture
- Rapid climate shift

Socio-cultural challenges

A (local)

- Social justice: gender inequality – need to empower indigenous women
- No branding/story telling related to the products
- Loss of traditional and local knowledge and use of local natural dye recipes (cultural know-how)
- Limited knowledge of Spanish language resulting lack of opportunities for women

B (regional)

More background info on San Jose de Canaan economics- social issues?

Policy at Pilon Lajas/national level (education, land tenure, etc.)

Relationship between Tsimane and colons to be revalorized?

C (global)

Revalorize indigenous knowledge
Revalorize endangered craft(s)
Promote gender equality

**Design to replenish
biodiversity**

*Ecological
restoration*

Source seeds of brown cotton from neighbourhood communities and expand agroforestry plots in the village to include brown cotton. This will promote genetic biodiversity.

Explore the introduction of local plants species for natural dyes and fibres as part of the agroforestry system.

Introduce the community to new ways of using food waste as a resource for textile dyes and fibre production (with waste avocado skin for dye and pineapple leaves for fibre)

**Design to drawdown
GHG
emissions**

Climate restoration

Agroforestry systems within the village bounds contribute to carbon capture capacity and can be developed where land has been impacted by wildfires.

**Design for
communities and
cultures to flourish**

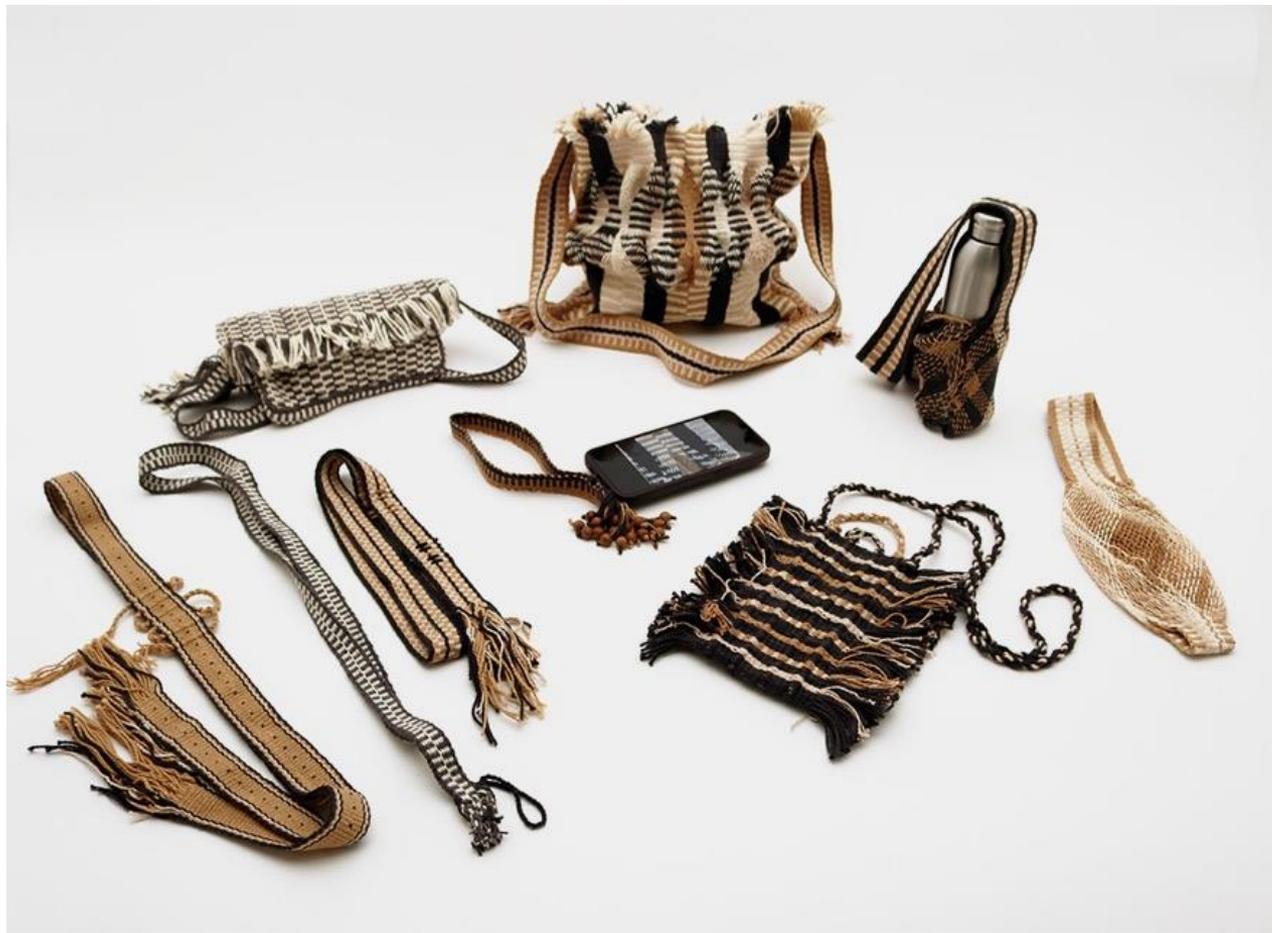
*Social justice
Cultural
Flourishment*

Address the current low level of local economic activity by liaising with contemporary craft stores in Santa Cruz de la Sierra and La Paz to develop a more resilient business plan for the community.

Promote the value of Tsimane heritage by exploring the potential for textile teaching tours, publications and exhibitions.

Promote an intergenerational knowledge exchange within the community to preserve the Tsimane textile heritage.

Liaise with the Tsimane' Mosekene Regional Council (CRTM) and the Tsimane' Grand Council (GCT) to develop the project further.



Prototypes developed by the Maison/0 design research team







2021

2022

2025

2026

2027



Project framing

Field research

Market research

Design development

Workshops in biospheres

Business plan

Brand identity

Mentoring and legacy planning

Toolkit dissemination



Post-workshop development – reintroduction of natural dyes and brown cotton



‘I measure my success by how many living things are benefiting from what I am doing’

Miguel Santistevan,
ethnobiologist and farmer

Thank you

c.collet@csm.arts.ac.uk

@livingsystems.lab

@maisonzero

@designandlivingsystems

ual: central
saint martins

