PRELIMINARY DESIGN / RESEARCH PITCH

MYCO-SYMBIOSIS

A posthuman bicycle helmet

Mycelium leather / grown lattice / multispecies design



Not a helmet made from fungus,
but a helmet made with fungal life.

A wearable object that treats growth, variation, decay and ecological relation as design intelligence - rather than defects to be engineered away.

Visual concept study - August 2026

From object to relationship

The helmet begins with a familiar human need - head protection - but refuses to treat the nonhuman world as a silent reservoir of materials.



The design move

The overlapping padded ribs of an old leather cycling helmet become a contemporary lattice of mycelium-based bands: protective, ventilated, visibly assembled and potentially repairable.

FORM	Ribs become hyphal bands. Gaps become deliberate apertures. Junctions remain visible rather than being hidden beneath a seamless industrial shell.
ORGANISM	The growth process is allowed to influence density, texture and surface. The designer establishes conditions; the fungus participates in the result.
ETHICS	The object is conceived as temporary. Its materials have lives before the rider and obligations after the rider: cultivation, use, repair, disassembly and controlled return.

Design question

How much control can the designer surrender while still meeting the uncompromising safety demands of a bicycle helmet?

The ontophany of fungus

Using Stephane Vial's term beyond its original technology-focused context, this project asks how design can alter the way fungal being appears to us.

ONTOPHANY

ontos + phainein: being made manifest / appearing

Industrial material logic

- Origin disappears behind uniform surfaces and standardized finishes.
- Variation is treated as error; biological process is hidden or sterilized into a brand claim.
- Matter appears as passive resource, available for human intention.

Fungal ontophany

- Growth traces, branching, fibre direction and small irregularities remain perceptible.
- The helmet makes fungal process present without pretending to know a fungus from the inside.
- Material appears as an event and a relationship - not merely a substance.

The philosophical work of the helmet is to make fungal being perceptible.

Conceptual source: Stephane Vial, Ontophany Theory (2018). Application to fungi here is an experimental extension.

Multispecies agency without anthropomorphism

The project does not need to claim that fungi "intend" a helmet. Agency can be understood more carefully: as the capacity of another living system to make a difference to what happens.

AGENCY = DIFFERENCE

The fungus acts by growing, branching, metabolising, responding and transforming.

Its agency is material and ecological rather than a projection of human-style consciousness.

1. Bounded co-design

Set mould, substrate and safety constraints, but record and preserve meaningful material variation produced by growth.

2. Environmental co-authorship

Humidity, temperature, nutrient composition and time become part of the design history, not invisible production variables.

3. Material passport

Document fungal strain, substrate, cultivation conditions, drying/finishing and end-of-life pathway for every prototype.

4. No ecological theatre

Do not release cultured fungi or spores casually, and do not equate "biological" with automatically benign. Species, sourcing and disposal matter.

5. Agency can precede the product

The final helmet need not remain biologically active. Fungal agency may be expressed during growth and in the ecological relationships that make the material possible.

Multispecies frame: Kirksey & Helmreich (2010); Tsing (2015); Haraway (2016).

Basket fungus as structural teacher

The strongest biological reference is Ileodictyon cibarium - the white basket fungus - rather than a generic mushroom surface.

Ileodictyon cibarium

white basket fungus / lattice fungus

Its fruiting body opens into a spherical white lattice. In Aotearoa New Zealand it is a familiar native fungal form: porous, distributed and visibly constructed through repeated junctions.

Design translations

LATTICE OVER SHELL	Protection need not visually mean enclosure. Repeated ribs can define a protective volume while retaining air and light.
JUNCTIONS MATTER	Structural intelligence can concentrate at intersections rather than across a uniformly thick surface.
VARIABLE APERTURE	Openings can tighten over high-risk zones and expand where ventilation is desirable.
EMERGENCE	The basket is a form that unfolds. The helmet can expose process - moulding, growth, drying and assembly - rather than presenting itself as timeless.

Important: this is a biological analogy, not a claim that the fungus has evolved for impact protection. Its value is as a structural and philosophical teacher.



Species reference: Manaaki Whenua / Biota of New Zealand.

From leather ribs to mycelial lattice

The vintage helmet is useful because its construction is legible: repeated padded bands, air between ribs, repairable fastenings and a visible relationship between protection and craft.



TYPOLOGY / LEATHER RIB HELMET



TRANSLATION / GROWN RIB + LATTICE HELMET

Proposed first-generation material stack

01	**Outer skin**	Mycelium leather or fungal-derived sheet as tactile/weathering surface.
02	**Visible lattice**	Grown mycelium composite or fibre-mycelium hybrid ribs; replaceable as a design skin.
03	**Impact core**	For early functional prototypes, retain a proven impact-absorbing core while fungal materials are tested.
04	**Fit + straps**	Replaceable cradle and straps; plant-tanned, recycled or bio-based options tested for sweat and weather.

Safety first, philosophy intact

A meaningful posthuman material experiment cannot make an untested safety claim. The first road-worthy version should treat the fungal system as an experimental layer around a demonstrably protective core.

0

FORM

Digital lattice + physical mock-ups. No safety claim.

1

MATERIAL

Grow sheets, ribs and coupons. Characterise moisture, density and ageing.

2

HYBRID

Certified/proven impact core + fungal exterior. Laboratory drop testing.

3

SUBSTITUTE

Incrementally replace structural elements only when test data supports it.

4

CERTIFY

Test the complete helmet against the applicable bicycle-helmet standard, e.g. BS EN 1078 in the UK context.

What needs to be learned

- Energy absorption and failure mode under repeated temperature and humidity cycles.
- Weather resistance, sweat, UV, abrasion and microbial stability.
- Adhesives/finishes: toxicity, repairability and whether they undermine compostability.
- How much biological variability can be accepted without compromising predictable performance.
- End-of-life route: disassembly and controlled composting or material recovery - not casual environmental release.

More than a product

The project can operate simultaneously as a design prototype, a material experiment and a piece of public philosophy about how humans make things with other forms of life.

DESIGN OBJECT

A striking, wearable demonstrator linking historic cycle craft to living-material fabrication.

MATERIAL RESEARCH

A documented programme of growth, drying, weathering and impact tests that asks what mycelium can actually do.

MULTISPECIES ETHNOGRAPHY

The cultivation process itself can be observed: who - human and nonhuman - changes the form, and how those changes are negotiated.

PUBLIC PHILOSOPHY

The wearer encounters a familiar safety object whose surface reveals that materials have origins, histories, agencies and afterlives.

Core collaborators: mycologist / biomaterials scientist / helmet engineer / industrial designer / multispecies scholar / impact-testing laboratory

What an initial collaboration could produce

A small first phase can stay exploratory while still generating tangible evidence for a larger material and certification programme.

01 **BIOLOGY**

Select species/strain and substrate with ecological and material criteria.

02 **GROWTH**

Cultivate rib and sheet samples; document environmental conditions.

03 **FORM**

Build 1:1 non-protective demonstrator and refine lattice geometry.

04 **TEST**

Commission material coupon tests and hybrid helmet drop tests.

05 **STORY**

Create a material passport, photographic study and short process film.

NOT BIOMIMICRY AS EXTRACTION.

MULTISPECIES DESIGN AS NEGOTIATION.

Initial visual study - v1

The original generated concept board is retained here as an early mood and form study.

SPECIES CORRECTION: The v1 board labels Cyathus stercoreus. The basket-fungus reference developed in this pitch is Ileodictyon cibarium.



NOTES / REFERENCES

Starting bibliography

A compact theoretical and biological foundation for developing the object as both a helmet and a multispecies research proposition.

Stephane Vial (2018)	"Ontophany Theory: Historical Phenomenology of Technology and the Digital Age." Ontophany is developed as the manifestation of being and as a way technologies reshape the conditions through which things appear.
Eben Kirksey & Stefan Helmreich (2010)	"The Emergence of Multispecies Ethnography." Cultural Anthropology 25(4). A foundational account of ethnography that brings organisms and their linked social worlds into the foreground.
Anna Lowenhaupt Tsing (2015)	The Mushroom at the End of the World. A key account of fungi, collaboration, precarity and more-than-human world-making.
Donna J. Haraway (2016)	Staying with the Trouble. Companion species, sympoiesis and making-with rather than making over.
Manaaki Whenua - Landcare Research / University of Waikato	Ileodictyon cibarium basket fungus / lattice fungus. Biological reference for the project's open lattice form.
Safety pathway	Prototype testing should be undertaken with a qualified helmet engineer and accredited laboratory against the bicycle-helmet standard applicable in the intended market (for example BS EN 1078 in the UK context).

Working proposition: the helmet should not merely depict fungal aesthetics. It should preserve evidence of fungal participation in form, material and lifecycle - while remaining rigorous about safety, ecology and the limits of human interpretation.