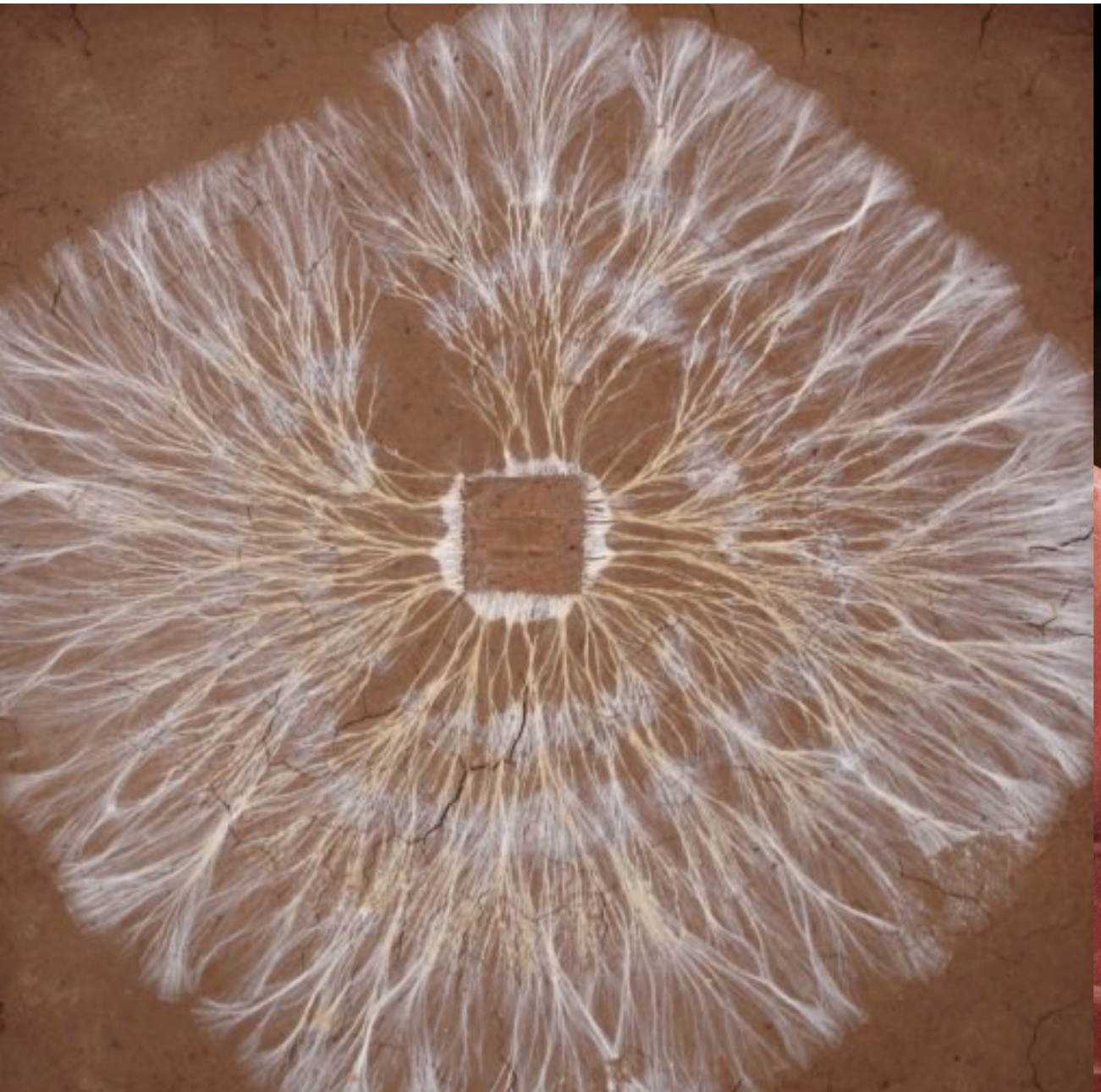
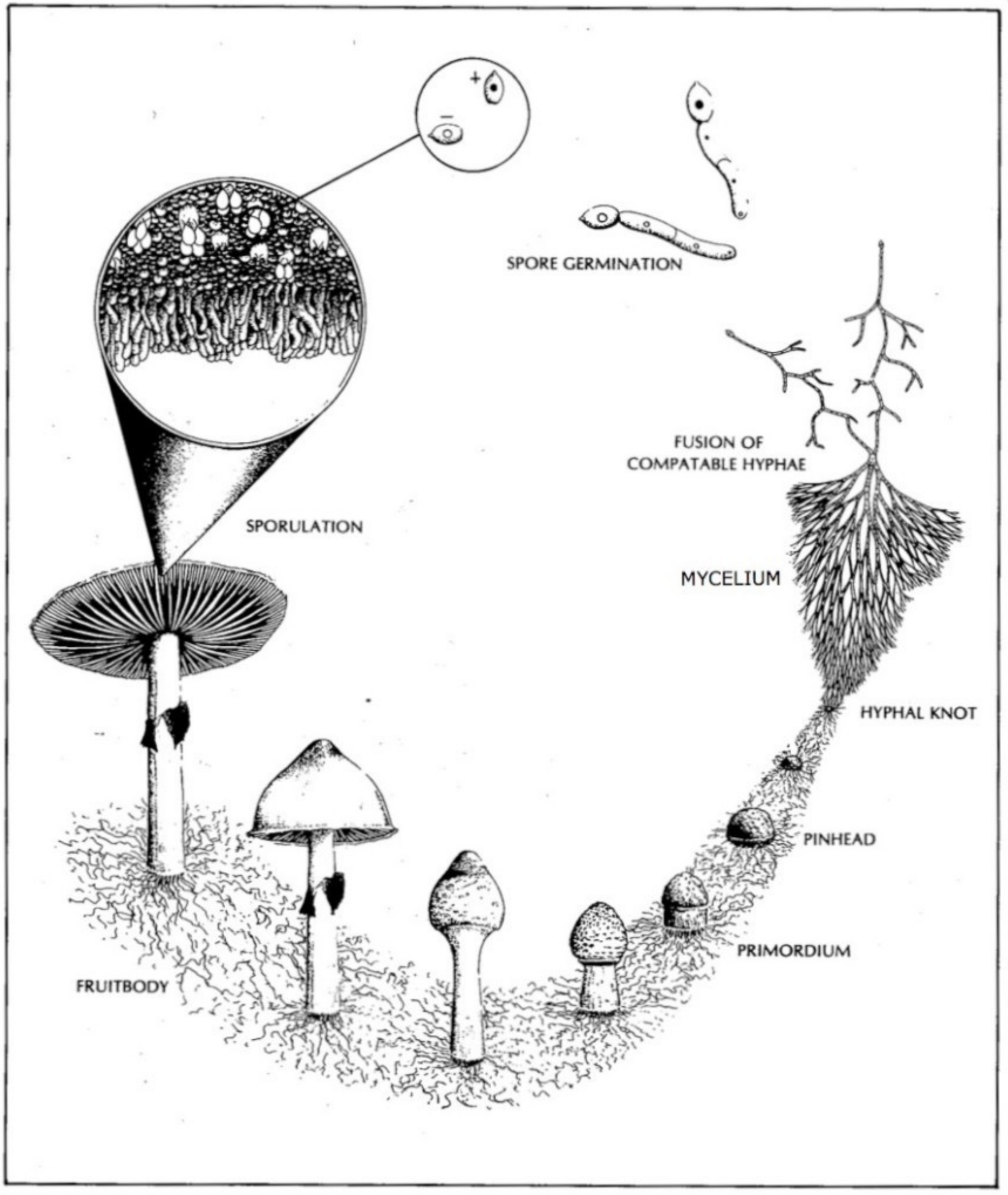
MYCELIUM

Iconic branching of mycelium



Reishi (Ganoderma lucidum)
mycelium on
PDA agar medium


+
−
SPORE GERMINATION
FUSION OF
COMPATABLE HYPHAE
SPORULATION
MYCELIUM
HYPHAL KNOT
PINHEAD
PRIMORDIUM
FRUITBODY

The germ pore, a circular depression at one end of the spore, is the site of germination from which a haploid strand of mycelium called a **hypha** emanates. This hypha continues to grow, branches and becomes a **mycelial network.** When two sexually complementary hyphal networks intercept one another and make contact, cell walls separating the two hyphal systems dissolve and cytoplasmic and genetic materials are exchanged. Erotic or not, this is "mushroom sex". Henceforth, all resulting mycelium is **binucleate** and **dikaryotic.** This means each cell has two nuclei and a full complement of chromosomes. With few exceptions, only mated (dikaryotic) mycelia is fertile and capable of producing fruitbodies. Typically, dikaryotic mycelia is faster running and more

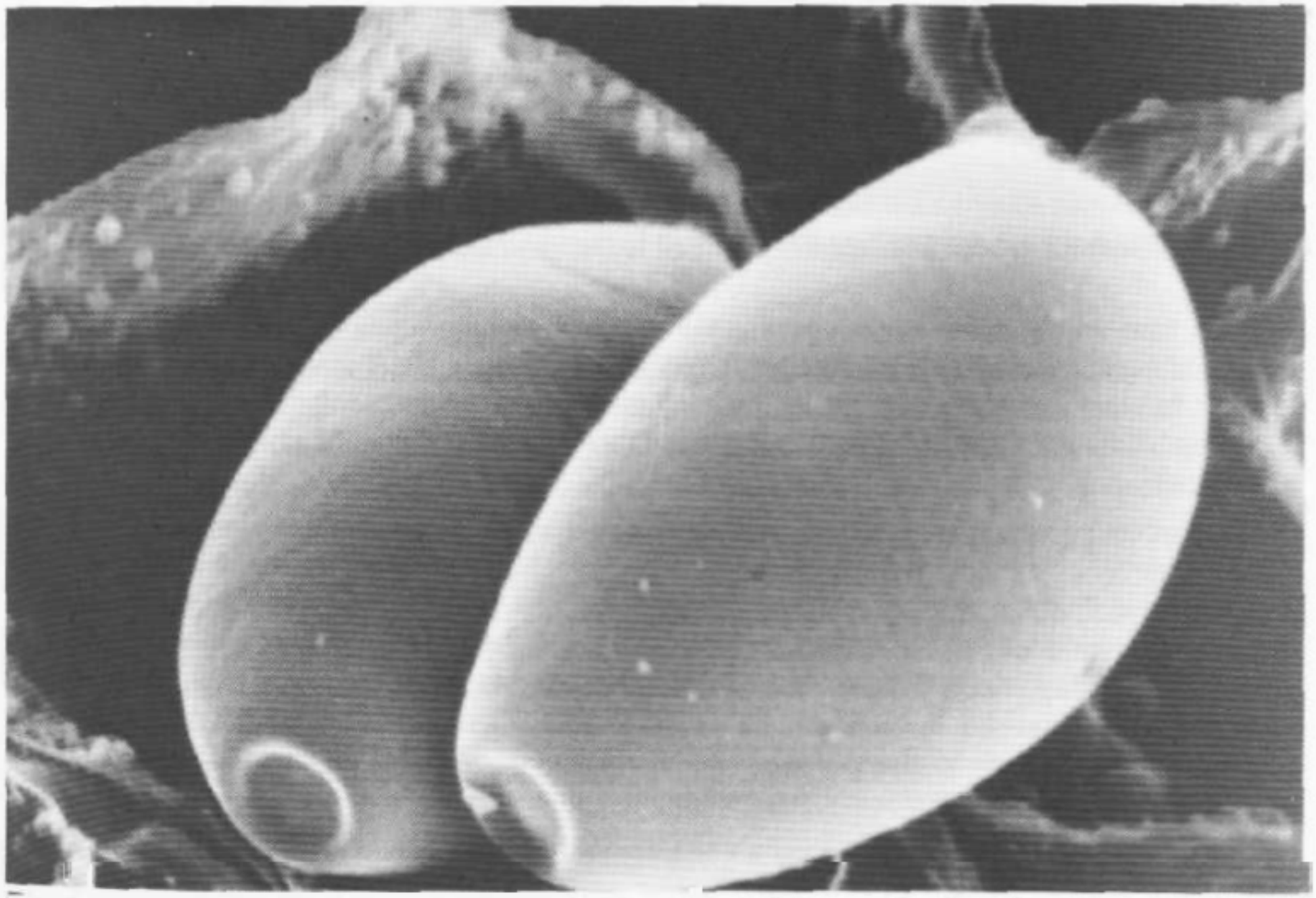
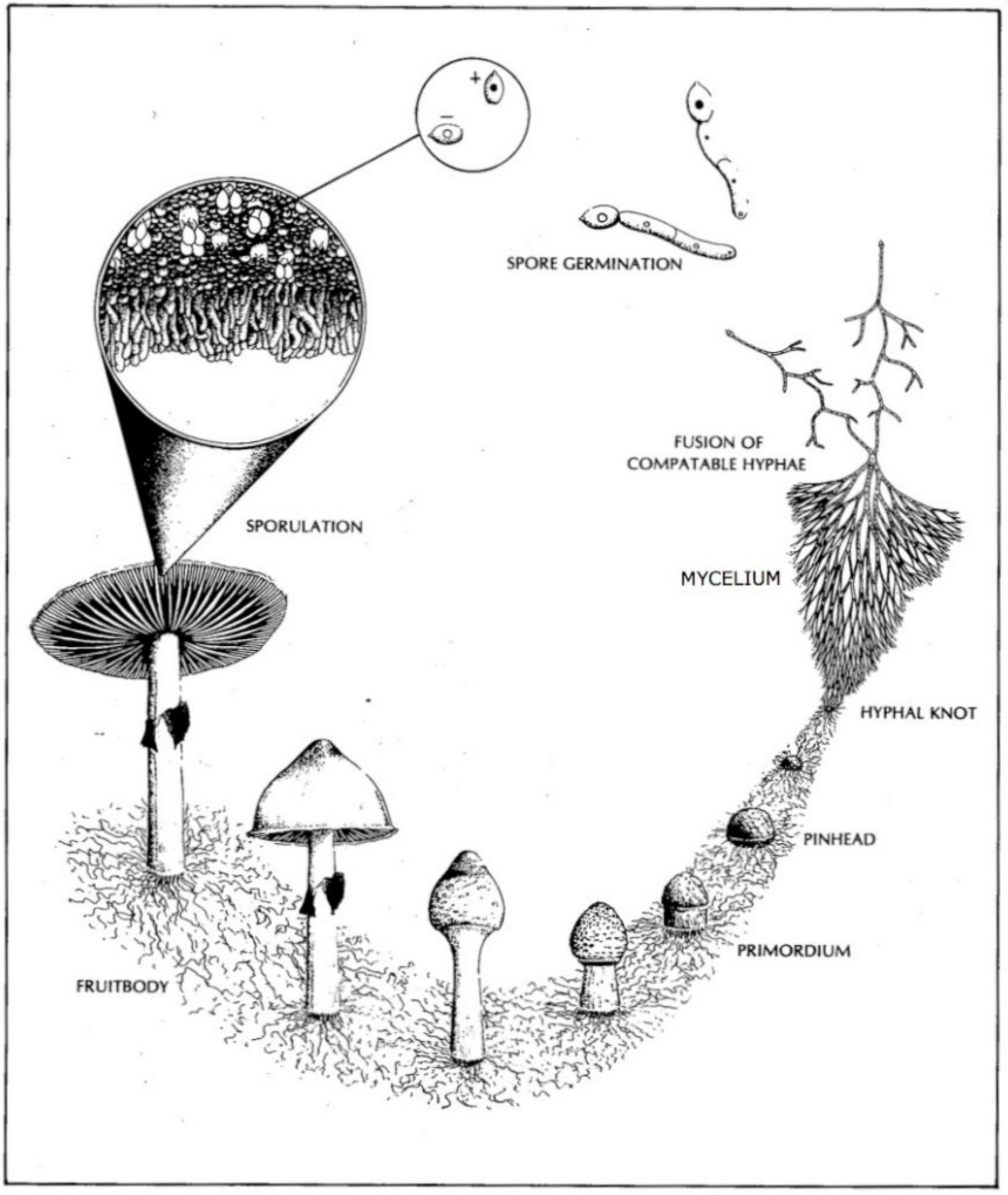


Figure 5 High resolution scanning electron micrograph showing germ pores of *Psilocybe pelliculosa* spores.


+
−
SPORE GERMINATION
FUSION OF
COMPATABLE HYPHAE
SPORULATION
MYCELIUM
HYPHAL KNOT
PINHEAD
PRIMORDIUM
FRUITBODY

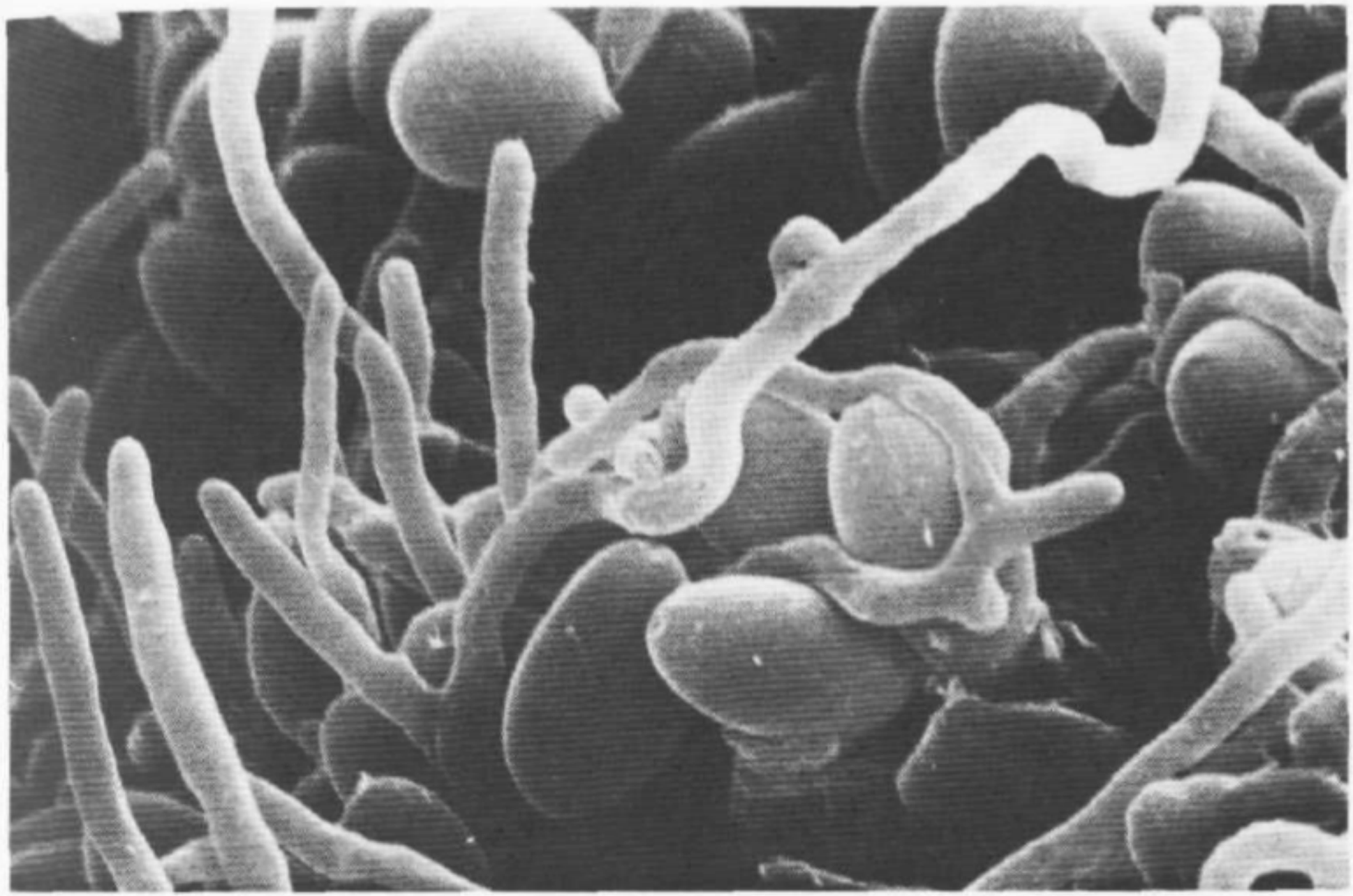


Figure 7 Scanning electron micrograph of hyphae emanating from a bed of germinating *Psilocybe cubensis* spores.

When a mycelium produces mushrooms, several radical changes in its metabolism occurs. Up to this point, the mycelium has been growing vegetatively. In the vegetative state, hyphal cells are amassing nutrients. Curiously, there is a gradual increase in the number of nuclei per cell, sometimes to as many as ten just prior to the formation of mushrooms. Immediately before fruitbodies form, new cell walls divide the nuclei, reducing Their number per cell to an average of two. The high

Mycelium growing on a substrate

Mycelium in grow bags

Mediamatic spawn experiments

1:1 mixture
Beer grain : cacao/wheat husks/sawdust

4 Types of Mushrooms

(based on how they feed)

- Sapropytic (decomposers) Morels, Reishi…
- Parasitic : Honey Mushroom
- Mycorrhizal (ecto): Plant-fungi symbiosis, attaching on the inside or outside of the plant.
- Endophytic: Plant-fungi symbiosis: mycelium invade the tissue of the plant.

Mycorrhizal fungi

Caring for mycelium

Necessary conditions for growth:

Diet: Different species like different food (substrate)

Temperature: 18-25°c...

Oxygen intake and C02 release

- Prepare medium
- Start a culture (from spores or clone a freshly picked mushroom)
- Inoculate agar medium (In a sterile environment)
- Incubate 25 - 28 °c

- Prepare substrate (sterilise)
- Inoculate (In a sterile environment)
- Incubate 25 - 28 °c
- Fructify or heat treat

Sterile Technique & Agar Culture

Starting a culture with:

- Spore Prints
- Live tissue culture

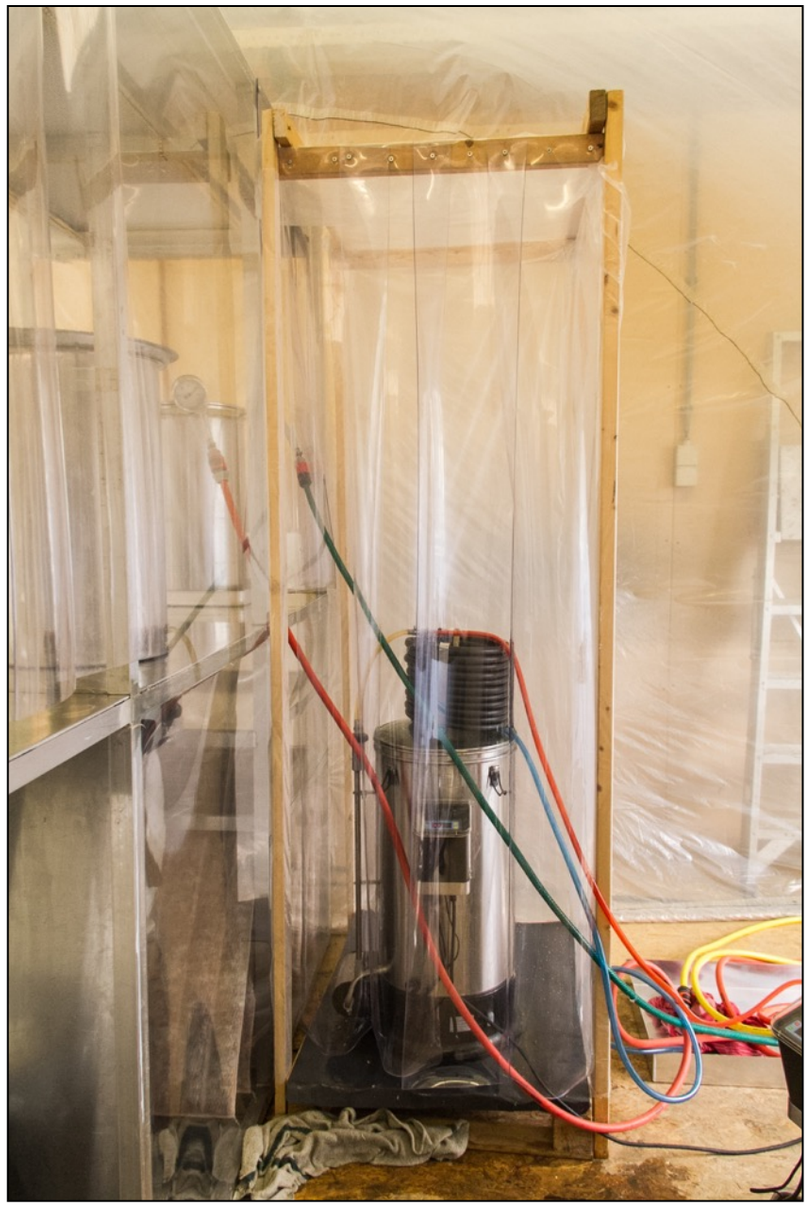
Mycelium in BioArt

3D printed mycelium chair by Eric Klarenbeek (Dutch)

Ecovative

(New York based company)

Biodegradable myco-materials: from replacing plastic packaging to building insulation material.



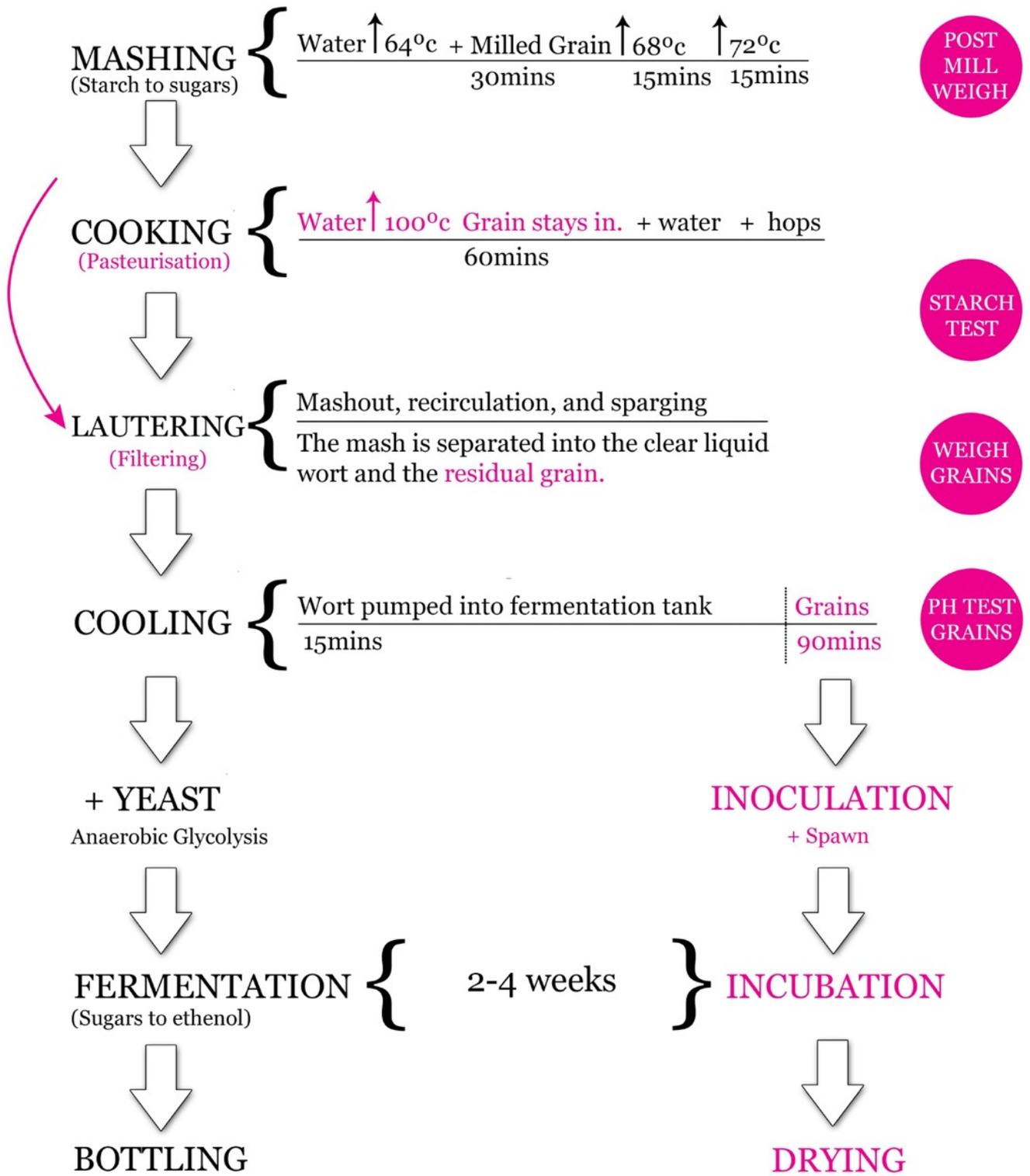
Mediamatic

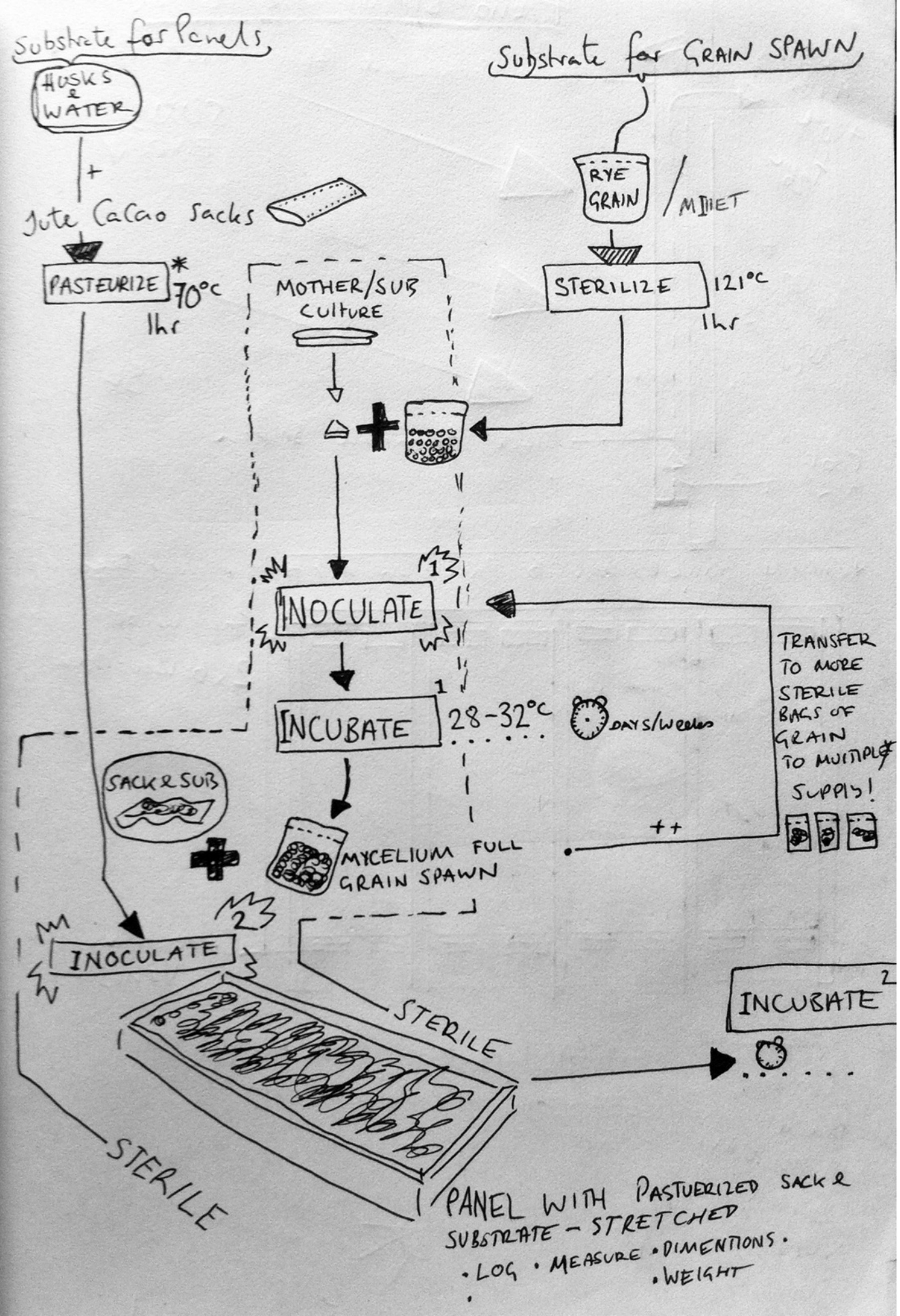
(Amsterdam based media art company)

Myco-brewery project

Standard Beer Brewing Process

Adapted for Mycoinsulation




Substrate for Panels
Husks & WATER
+
Jute Cacao Sacks
PASTEURIZE
70°c
1hr
Substrate for GRAIN SPAWN
RYE GRAIN
/MILLET
STERILIZE
121°c
1hr
MOTHER/SUB CULTURE
INOCULATE
INCUBATE
28-32°c
DAYS/Weeks
TRANSFER TO MORE STERILE BAGS OF GRAIN TO MULTIPLY SUPPLY!
++
SACK & SUB
MYCELIUM FULL GRAIN SPAWN
INOCULATE
STERILE
STERILE
INCUBATE
PANEL WITH PASTUERIZED SACK & SUBSTRATE - STRETCHED
• LOG • MEASURE • DIMENTIONS • WEIGHT


Schizophyllum 23/5
on
Straw bio bassel

CONTINUOUS BODIES

cycles of decomposition triggering a symbiotic partnership between humans and fungi

Contents

Maurizio Montalti

(Amsterdam Based Artist)

Master Thesis - Conceptual Design in
Context: Design Academy Eindhoven 2010

Design

My final design project consists of 2 parts, that are a result of my process.

First Part
BODIES OF CHANGE:
the dynamic lifecycle of fungi as a remedy for denial

MYCELIUM SHROUD - WEARING FUNGI FOR DEATH -

After investigating current burial practices, i designed a new possibility and a new scenario in which **fungi act as the primary decomposition agent on the human body**.

This design, consisting of a shroud inoculated with fungal mycelia, is a **direct challenge to the general attitude of denial**, that most of the traditional practices tend to enhance.

The mycelium's action would mainly contribute in favouring the decomposition process of the body, while collecting and neutralizing toxic elements stored in time within the organism and distributing different nutrient supply originated from the body, to surrounding life forms.[22]

This "innovative" funeral methodology represents **an effort to make the passage from life to death more personal and connected with the rest of our lives** and aims to remind us that physical death and physical decay are natural processes, without which there could be no new life.

Design

Second Part
THE EPHEMERAL ICON:
"death-cycle" of a plastic chair

BIO-COVER

In order to translate my overall topic and adress issues related to plastic toxicity, and the possibility of having fungi being able to "kill" this immortal materials, i decided to focus my attention on a globally well-known pragmatic object: **the plastic monobloc chair.**

I find it to be a perfect iconic example for adressing issues related to plastics and disposability; it is ubiquitous in the world, very cheap and not very sturdy.

I use this chair as a statement about the life-cycles of consumer products in direct comparison with the immortality of the materials, most of the consumer products are made of.

Every 70 seconds a monobloc chair comes out from a single press; consisting of a single piece of about two kilos of polypropilene, it was initially costing around 60 dollars but as more and more were manufactured, the price dropped to less than $3.
Monoblocs are a universally accessible, mass-manufactured object, landfill sites are stuffed with them, and millions more are on their way.

Highlighting the complementarity of life and death as a whole, with my design **i play with the idea of infusing life in a dead everlasting material, in order to trigger a process of final dissolution.**

Why should not a chair, completely made out of synthetic, inhert, immortal material, dress up for death?

I initially thought about developing and designing a sort of "infectious fungus" patch[23], as a tool for transferring life in an inanimate object; the fungal mycelia would start spreading from the patch on the object while slowly colonizing it, until it would decompose and die. The quality of this "solution" resides in its extreme flexibility and adaptability, as the patch could be applied on every different kind of plastic surface.

However, in order to facilitate the action of the fungus on plastic and to favour its survival and a faster colonization process, I decided to develop the design of a coating for the plastic chair, a layer that would trigger the decaying process, while providing an all-round surface of mineral nutrients (sulfur, nitrogen, phosphor, potassium, calcium, magnesium) and allowing the inoculation of the decomposing fungus from multiple points.

The "Bio Cover" is intended as a tool-product for turning an inanimate synthetic object into a living entity.

By the action of being covered the plastic chair gains a new aestethic quality that requalifies it, while at the same time **the cover provides enough nutrients to trigger the action of the fungus**, that can start the colonization process.

While the fungus feeds on the plastic it gradually chews and substitute the material, whereas at the same time **the growing fungal biomass acts as a natural purifier, accumulating volatile toxic compounds** (biofilter).

Once the chair gets fully colonized the user can dispose of it, by placing it in the garden or litterally burying it, as if celebrating the death of the plastic[24].

The action of killing the "plastic chair" aims to act as a statement, referring to a reflection on the way we deal with our own "toxic" waste, while showing the potential of the waste itself for providing "free" health benefits to the conscious user.

Mycelium in popular culture

Hannibal - NBC TV series
S01e02

Play 40mins.17sec in

Phillip Ross

Mycotectural Alpha 2009

Grown from Ganoderma Lucidum Fungus

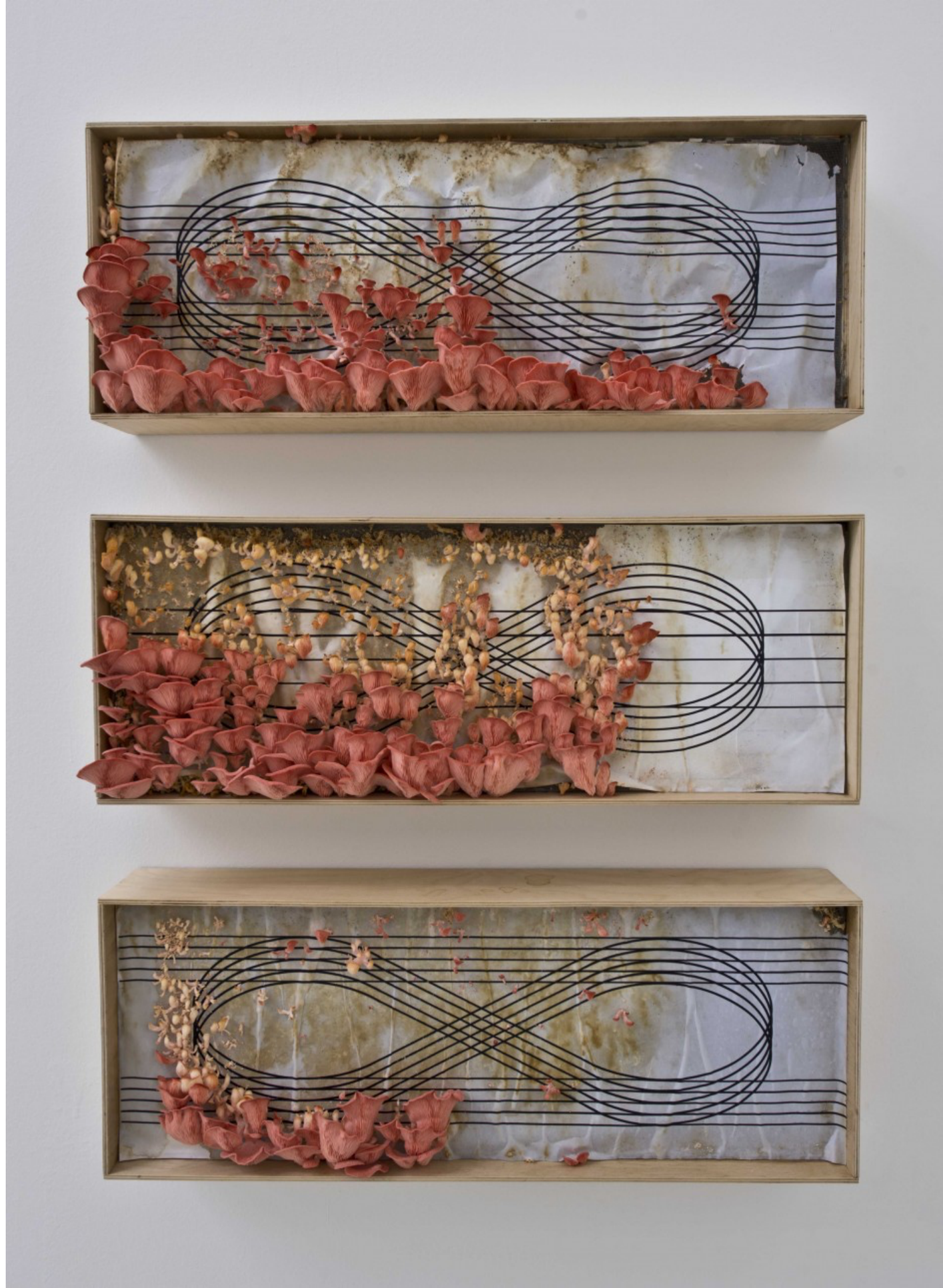
Zeger Reyers (Dutch)

Has been growing Fungi in different places

Installations in which he covers the interior of spaces with living fungi or moulds. He is fascinated by biological processes like eating and growing, budding, blossoming and dying.

DE/COMPOSITION FOR JOHN (CAGE)

Mushroom boxes in Prague
at DOX Contemporary Art Center,
June 5, 2012 by Jan Slavik &
Zeger Reyers



Other projects, networks:

Syndebio

Symbiotica

biofabricate

The power of fungi, mushrooms, and mycelium. 11mins video