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Mycelium-based Biomaterial As a Substitute to Plastics in the Interior
Design of Transportation Vehicles? Toward a Bio-Inspired Metro System

April 2017

Concerns about the end of life of vehicles:

- Rising number of vehicles sent to trash yard
- Bigger vehicles
- More complex material
- Limited consideration during design phase

Focusing on metro cars:

- The context of the STM and the old MR-63
- A right balance of technical constraints

Focusing on interior design:

- Targeting glass fiber
- Seats
- Plastic surfaces



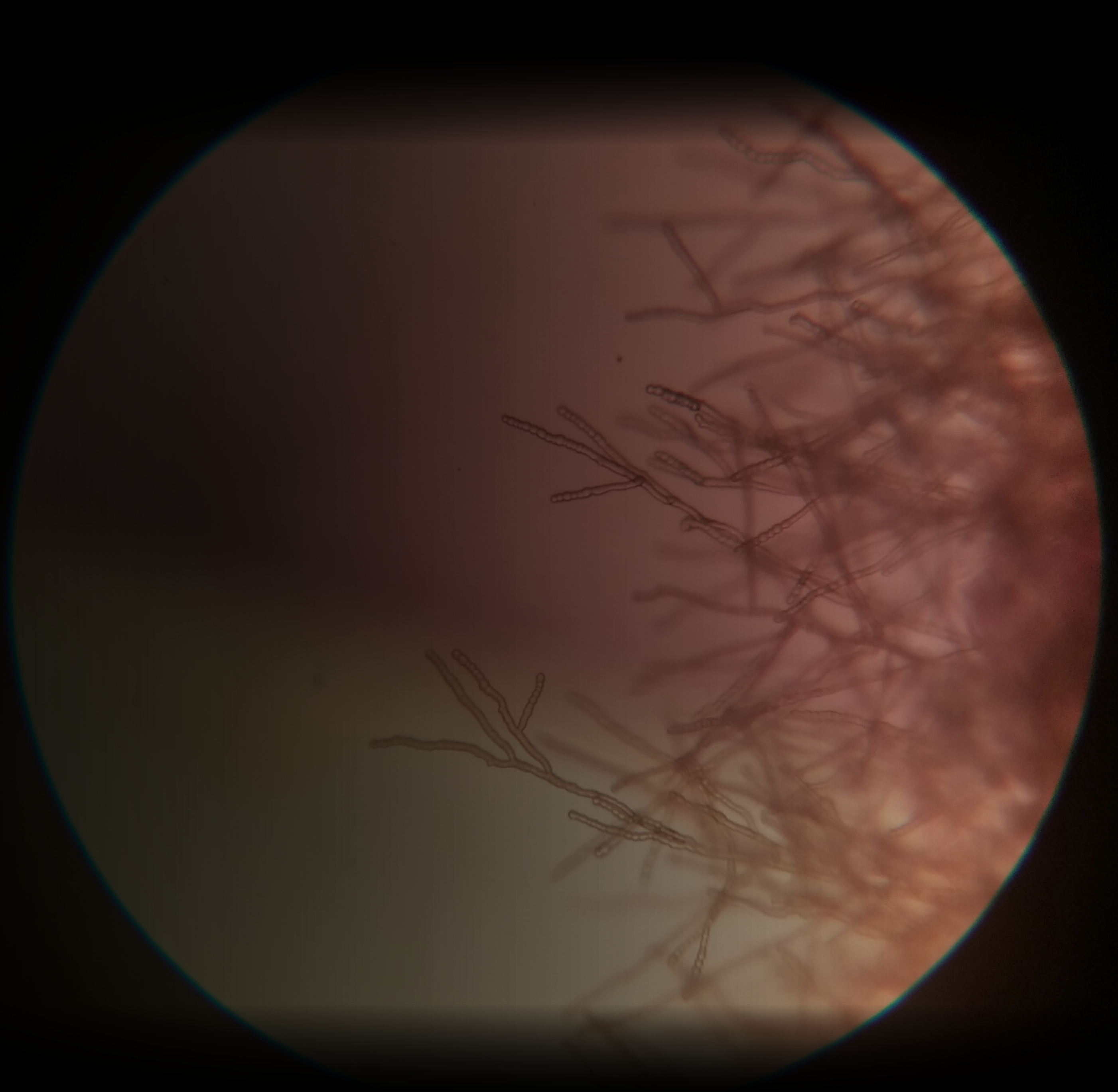
Mycelium as a biomaterial:

- An alternative to plastics and composites
- A sustainable alternative
- A new paradigm of production



What is Mycelium?

- Mushroom roots
- Fibrous web of hyphae
- Symbiotic element of the soil



Toward Biomimetism

- Cradle to cradle
- Empowering natural agents
- Bio-inspired design



ecovative
ecovatedesign.com

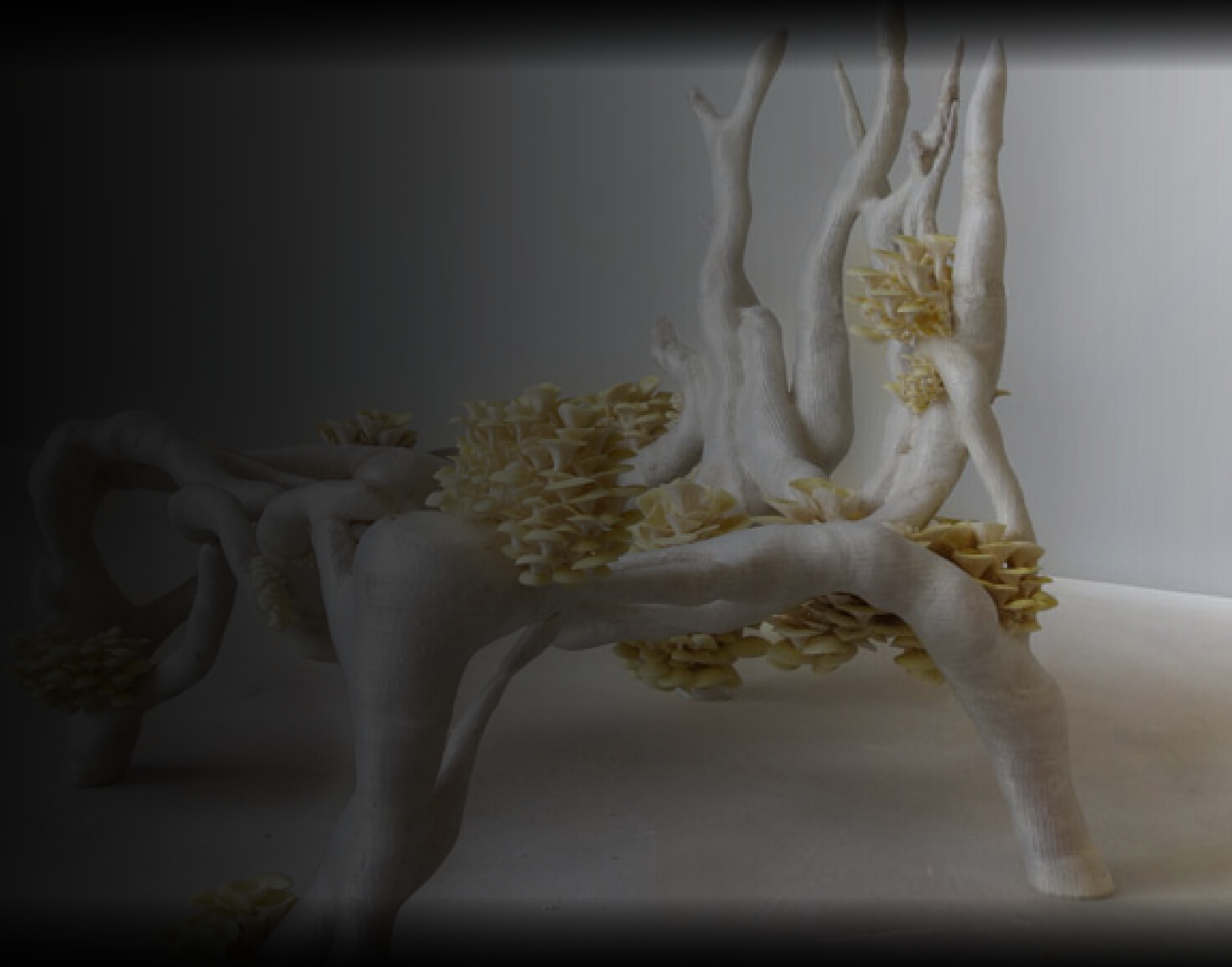
Myco-inspiration: Mycotecture

- Philip Ross, *Tea House* (2009)



Myco-inspiration: Design

- Erick Klarenbeek, *Mycelium Chair* (2014)



Myco-inspiration: Architecture

- David Benjamin (The Living), *Hy-Fi* (2014)



Myco-inspiration: Fashion

- Mycoworks, Mushroom Leather

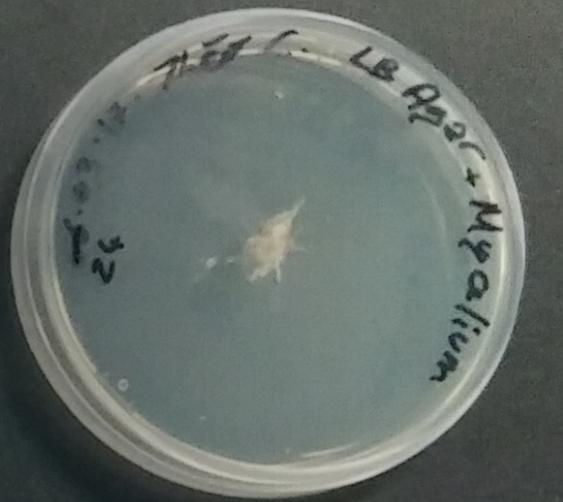
Being in touch

- Ecovative Grow It Yourself (GIY)
- Growing mycelium
- Shaping mycelium
- Analyzing formal qualities
- Material testing



Playing with materiality

- Discovering textures
- Making variations
- Trying to alter the materiality
- Testing mechanical properties



Test tiles



Playing with substrate: GY



Playing with substrate: GY + Coffee



11. 614 + Coffee - 7C - 26/03/17

Playing with substrate: GY + Coffee + Sawdust



12 GY + Coffee + Saw Dust - 7C - 24/03/17

Playing with substrate: GY + Coffee + Wood Chips



Playing with substrate: GY + Sawdust



15 GY + Saw Dust - 7L - 26/03/17

Playing with substrate: GY + Wood Chips



16 GY + Wood Chips (coarse) - 7C-28/03/10

Long process of growth: 2 weeks of patience

Conclusion:

- Not enough iterations and variations to establish rules
- No big change in the texture
- Sawdust doesn't work
- Moisture matters
- Light matters
- Longer growth time, fluffier mycelium
- Coffee gives a boost

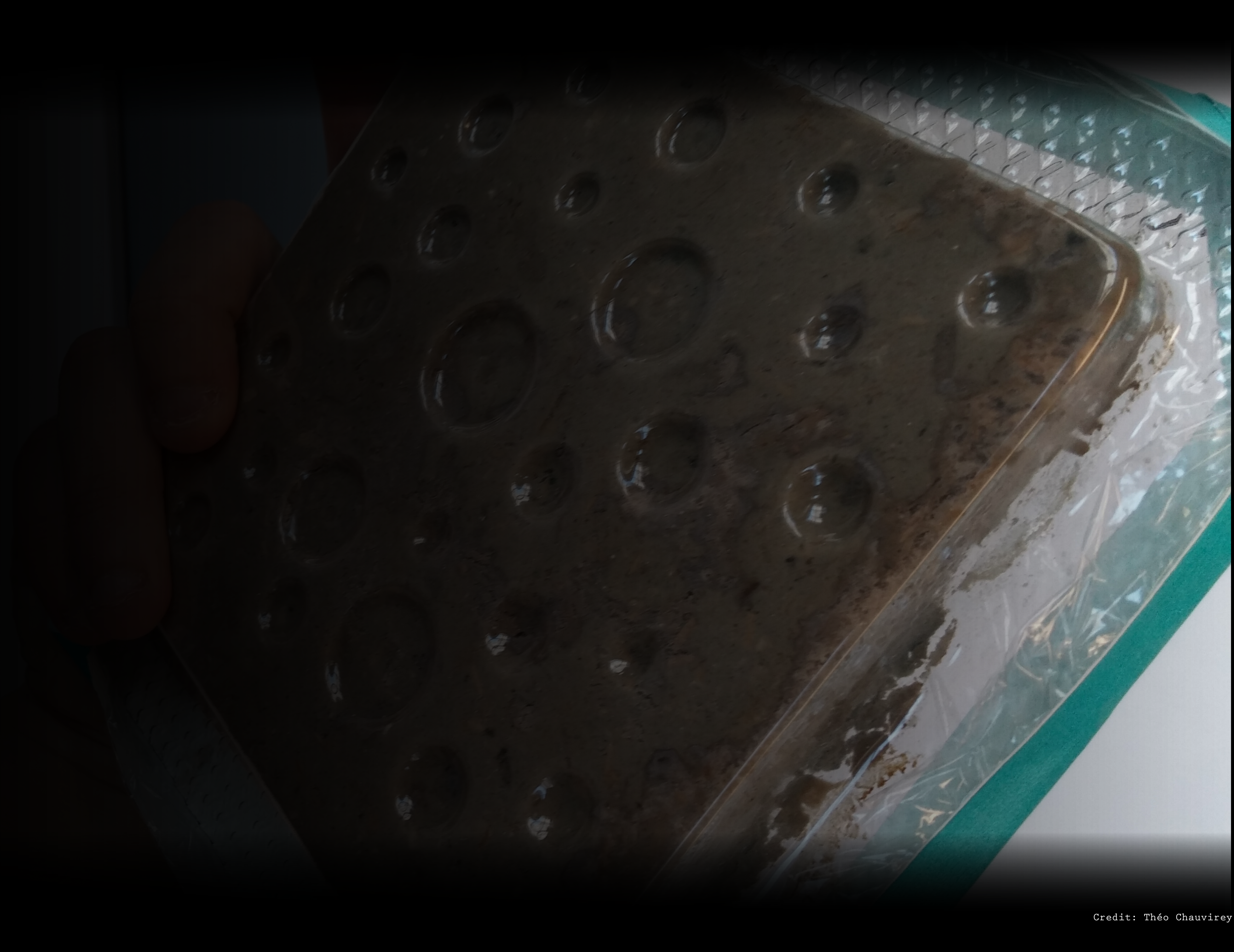


Playing with forming

- Trying different processes
- Testing formal possibilities
- Texturizing the matter
- Discovering Properties



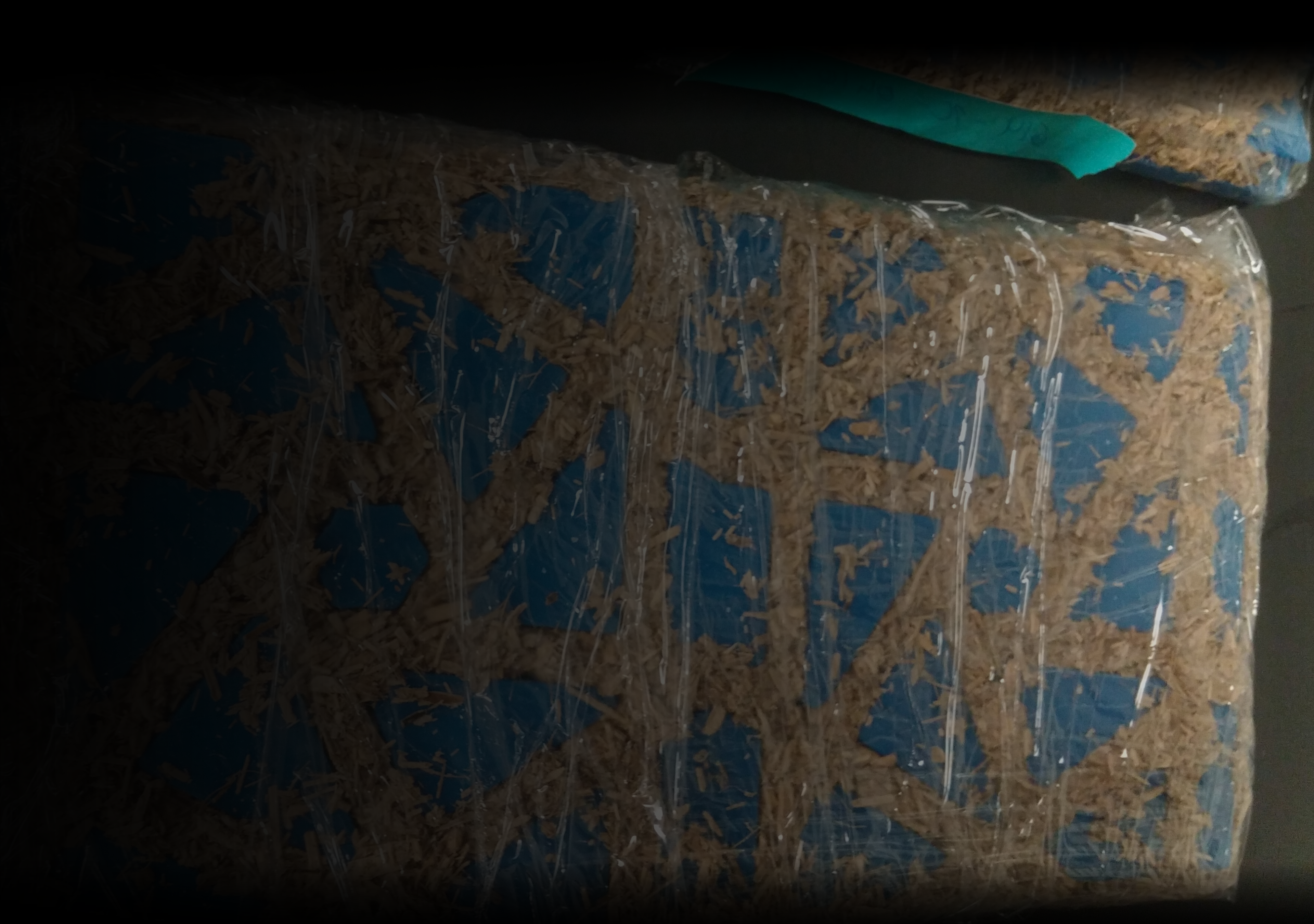
Vacuum Forming



3D Printing



Silicone



Silicone - Self Assembling



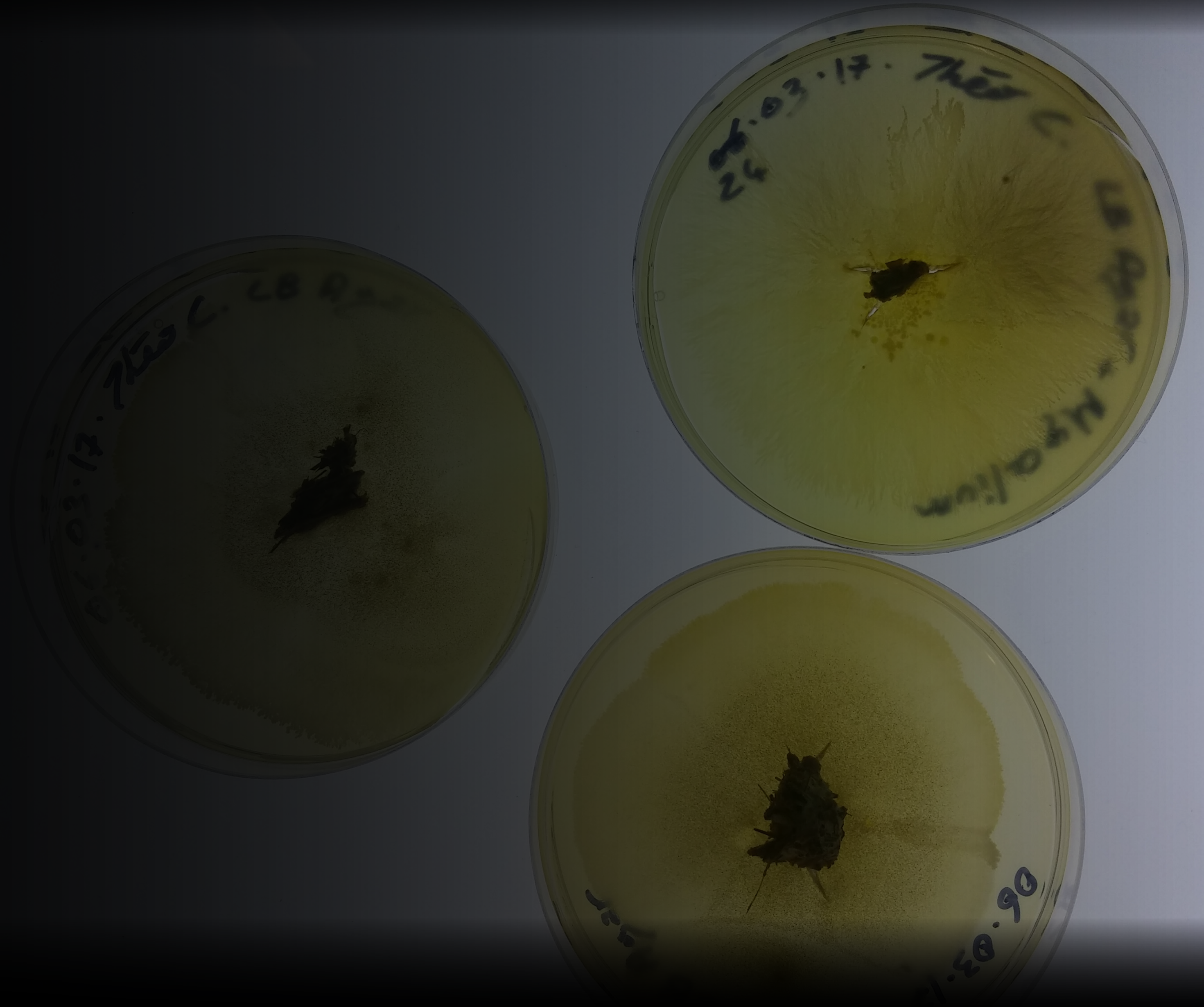
Conclusion:

- All processes are good
- Moulds have influence on texture
- Possibility to make complex shapes
- High fidelity duplication of fine details possible
- Mycelium as a self-assembling material



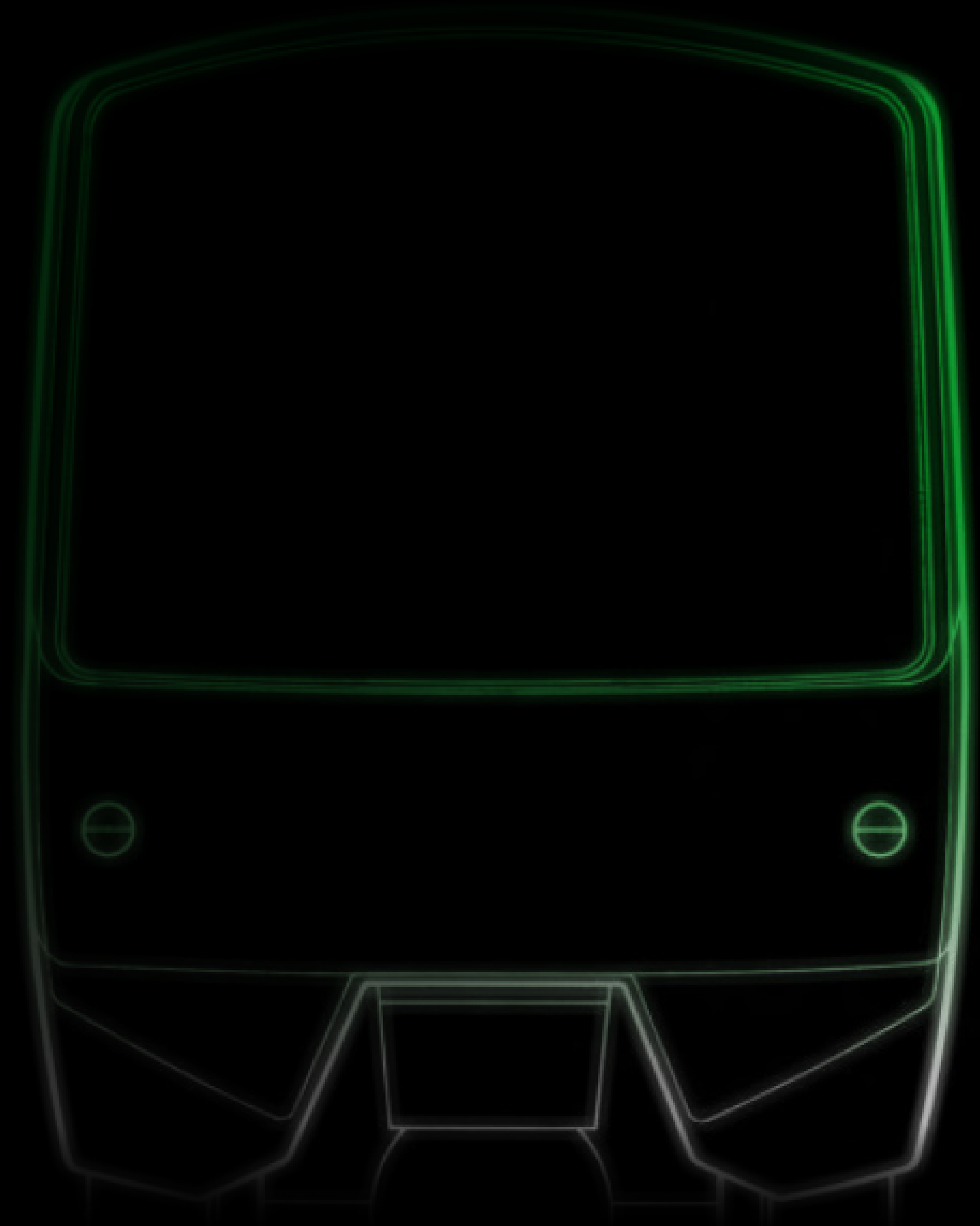
What's next?

- More iterations with new blends (cellulose)
- Mechanical resistance tests
- Color and coating testing
- Sculpting, machining, sanding mycelium



What about the thesis?

- Better understanding of my own approach
- Better understanding of mycelium
- Anticipation of potential problems
- New ideas



Next steps for the thesis?

Winter 2017

- Literature review
- Material exploration
- Contacting STM, Bombarier Transport.

Summer 2017

- Continuing literature review
- Leading new tests with mycelium
- Starting thesis writing
- Targeting design intervention
- Analysis of metro design
- Contacting and visiting Ecovative

Fall 2017

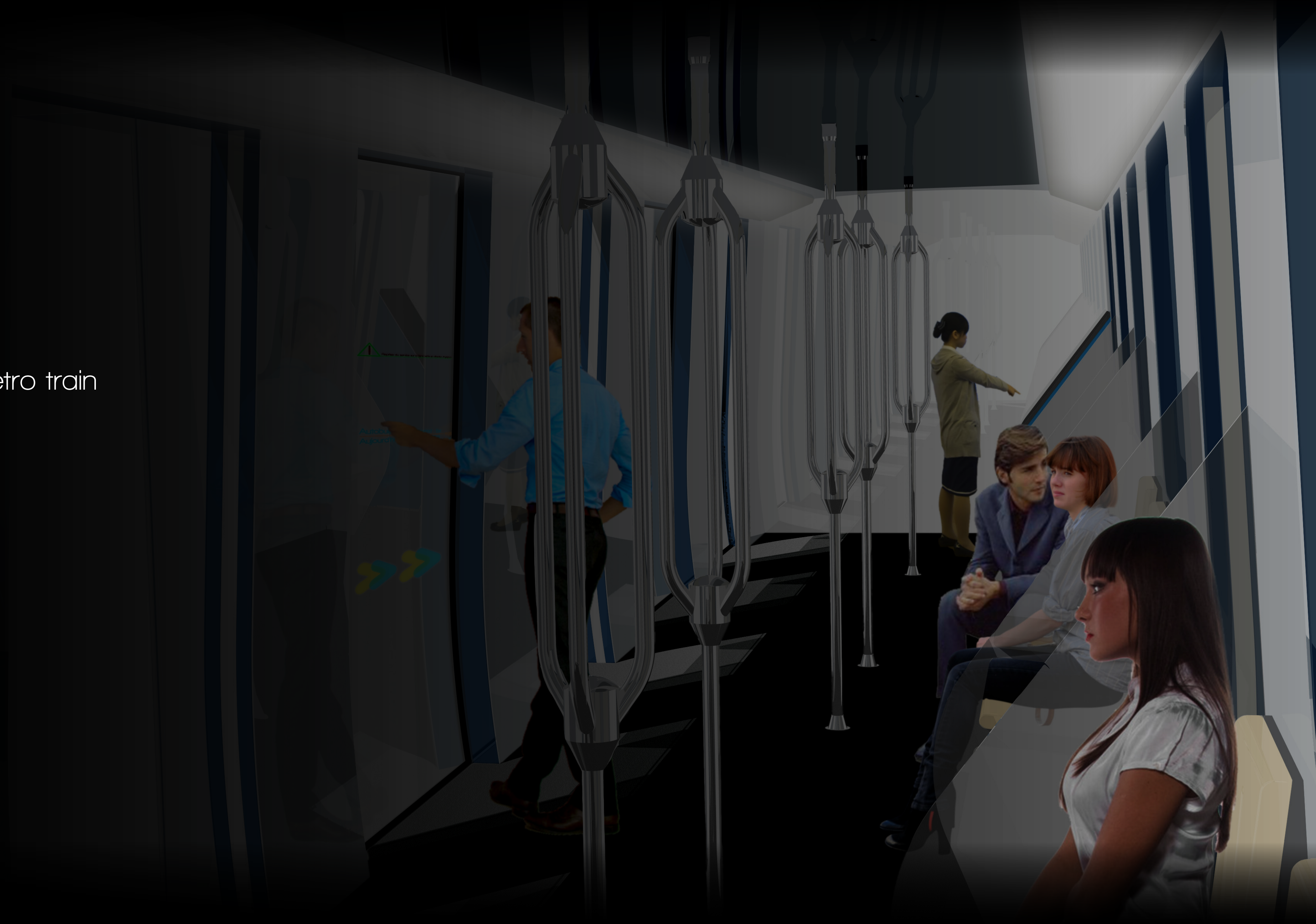
- Continuing literature review
- Continuing thesis writing
- Simplified Life-Cycle Assessment
- Preliminary design intervention
- Prototyping

Winter 2017

- Finalizing thesis writing
- Final production
- Exhibition

Final outcome

- Full scale model of a section of a metro train
- Small scale and full scale prototypes
- Poster and/or video





Thank you for your attention.