

GSA SUSTAINABILITY NOMINATION

In order to create a truly sustainable building, the choice of material must be the first priority. One form of truly sustainable construction is Cob which by using this as a base but changing the core material from clay to Mycelium to form a new process of construction.

I chose to use mycelium, the root structure of mushrooms, in order to create the form of the building. Mycelium is found throughout the natural world, as the underlying bedrock for all forests, acting as a highway to interchange nutrients and information between species of plants and fungi. It is able to grow quickly through any cellulose material, gathering mass as it grows. If used when alive it is able to absorb pollutants, cleansing the surrounding environment. Once dried it forms a rigid mesh network, with a capacity to hold a significant compressive force of 33kg/ square inch. Relative to its weight a mycelium brick is stronger than concrete with a cubic metre of mycelium brick weighing 43 kg and a cubic metre of concrete weighing 2400 kg. It is also water resistant and flame retardant.

The process of growing Mycelium is relatively straightforward. A sample of mycelium is taken from a local mushroom species, then mixed with sterilised coffee grounds to increase the mass of the mycelium. The final step is then to mix the inoculated coffee grounds with a cellulose substrate to give strength and food. This substrate can be anything from straw to wood chip. Once mixed it is ready to be formed into the desired structure.

The structure

By varying the thickness of the walls, creating a natural flow of air, negating the need for mechanical ventilation. Creating thick walls where greatest sun exposure, capturing thermal mass, whilst thinning the walls at the cool areas.

Mycelium, according to several research papers, has a thermal conductivity value of 0.039 W/m K making it highly effective as an insulator and with a compressive

strength of 33kg/ square inch, it is also able to function as a primary support structure. Incorporating the ETH ultra-thin concrete shell design, which uses a steel cable net core and fabric outer skin, I believe it would be possible to create a mycelium building.

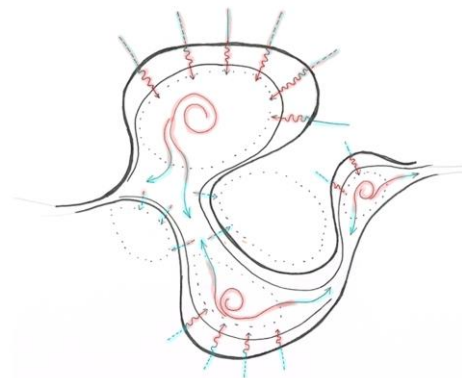
In order to create a water tight structure, a fabric 'sandwich' is constructed. With a core of Mycelium + steel cable net and outer skin of polyester fabric.

The use of flexible OLED lighting panels where needed in the interior along with flexible solar panels which are adhesively attached to the fabric on the exterior.

The Outcome - A breathable, structurally efficient, light weight, inexpensive, renewable material which can be used to create new environments. It could be said it is a form of 'organic concrete' which can be recycled to create more mycelium.

Ewan Hepburn

Architecture Stage 3



Concept Plan showing air flow