

Algae Dome

Chart Architecture Competition 2017



VISION

Algae. The future's biofuel.

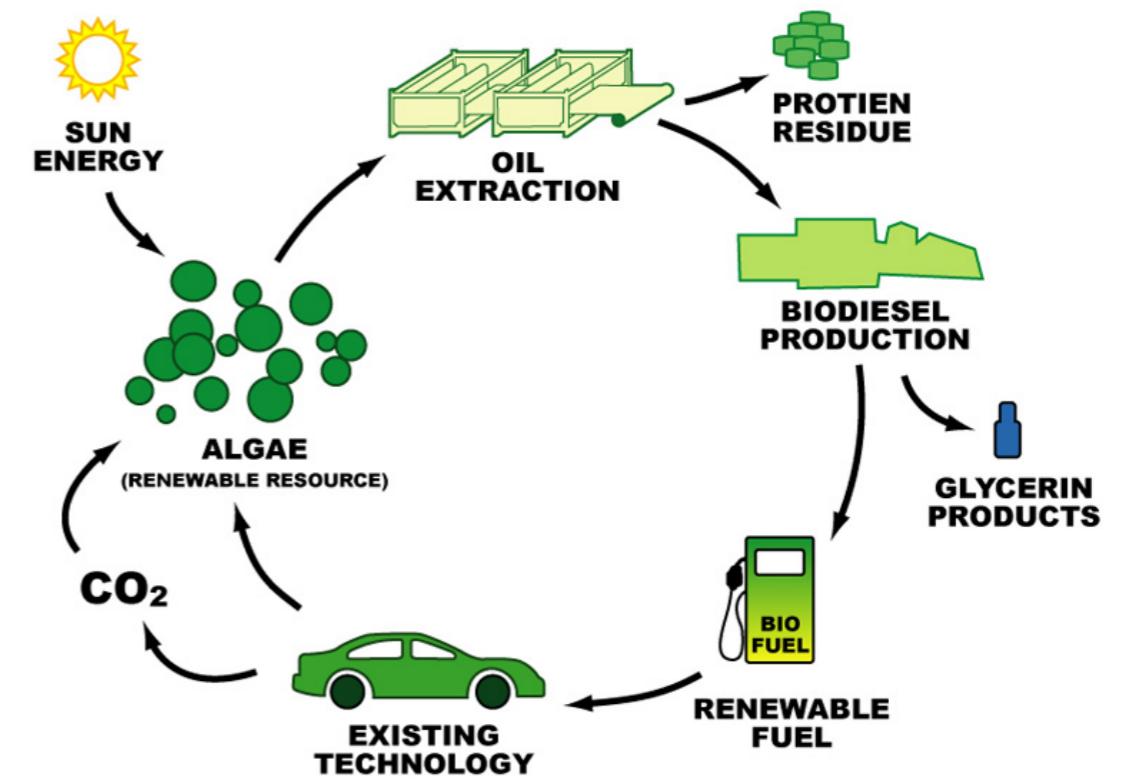
With the increase of population and expanding economy, there will be increased fossil fuel use. In addition, there comes increasing atmospheric CO₂ concentration, and the potential for significant greenhouse gas-mediated climate change, which now seems likely to affect all parts of the world. Finally, petroleum is a limited resource that will eventually run out or become too expensive to recover. These factors are driving the development of renewable energy sources that can supplant fossil fuels, and allow greater access to fuel resources for all nations, while greatly reducing carbon emissions into the atmosphere.

Algae biofuels may provide a viable alternative to fossil fuels, as it can produce biomass very rapidly, with some species doubling in as few as 6 h, and many exhibiting two doublings per day. All algae have the capacity to produce energy-rich oils.

Algae as an architectural material

Integrating algae into architectural environment manifests the importance of pursuing for a more sustainable and ecological material solutions.

Algae, unlike conventional building materials, is a living material. Integrated into architecture it creates sort of a living structure. It can recycle light, heat, and carbon dioxide from buildings and their inhabitants and produce rich green biomass that can be converted to biofuel, consumed as sustenance or used as agricultural fertiliser.



CONCEPT

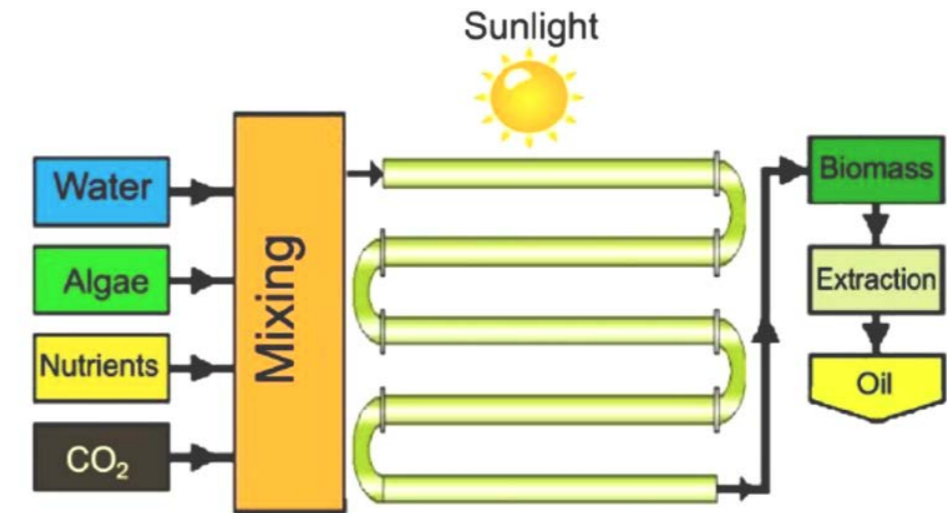
Algae photobioreactor

A photobioreactor utilizes light to cultivate algae. These organisms use photosynthesis to generate biomass from light and carbon dioxide. A photobioreactor allows much higher growth rates and purity levels than anywhere in nature. The output of the process is an algae biomass - a material of a great potential, with a wide variety of uses- from biofuel, bioplastics to fertilizers and colorants.

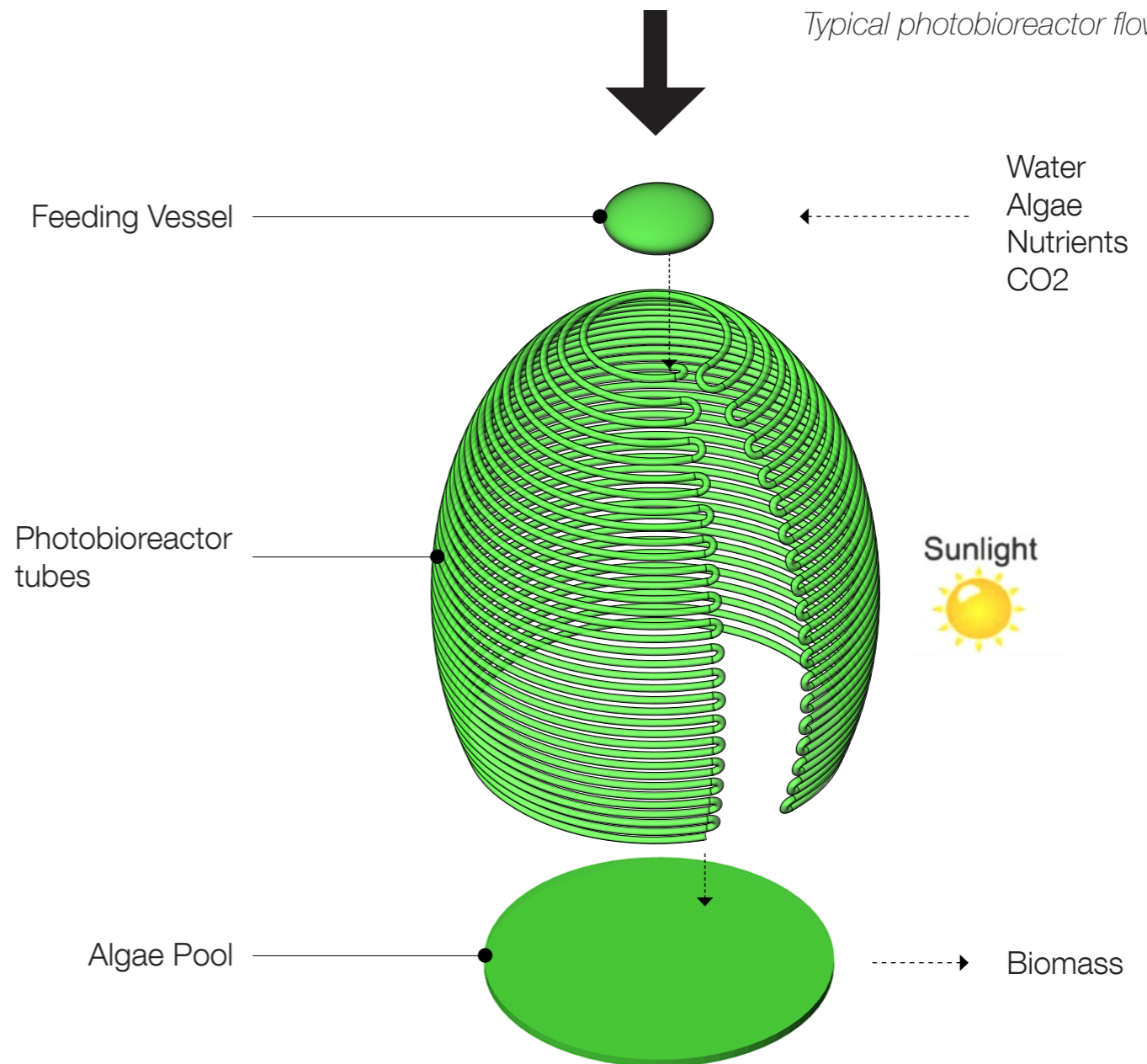
Algae Dome. A photobioreactor that becomes architecture.

We propose a pavilion that is a simple and direct translation of a photobioreactor's diagram into architecture. By arranging the tubular system with algae into a dome-like shape we create a pavilion that functions as a photobioreactor. The very utilitarian and technological infrastructure becomes architecture. It's inviting, yet enclosed form provides shelter and creates an oasis for social interaction. By its distinctive architectural elements- the feeding vessel at the top, the tubular system and the algae pond on the floor, it strongly informs about the algae cultivation process. From the feeding vessel, the flow progresses to the tubular system. The transparent tubes provide light for the photosynthesis process. After the algae have completed the flow through the photobioreactor, it passes back to the feeding vessel. When the algae are ready for harvesting, they pass through the connected filtering system. The harvested algae is ready for processing. We propose to keep part of it in the algae pool- a super thin layer of algae water on the floor of the pavilion. It provides a unique visual experience - reflecting the interior of the pavilion, but also a sensory experience- it gives a chance to sense the algae, touch it and feel its texture.

The Algae Dome is a building made with a living material- advocating for a living city. Its aim is to provoke and trigger the debate on future's sustainable solutions, yet providing a unique architectural and spatial experience.



Typical photobioreactor flow diagram



Algae Dome flow diagram



Example of a tubular photobioreactor



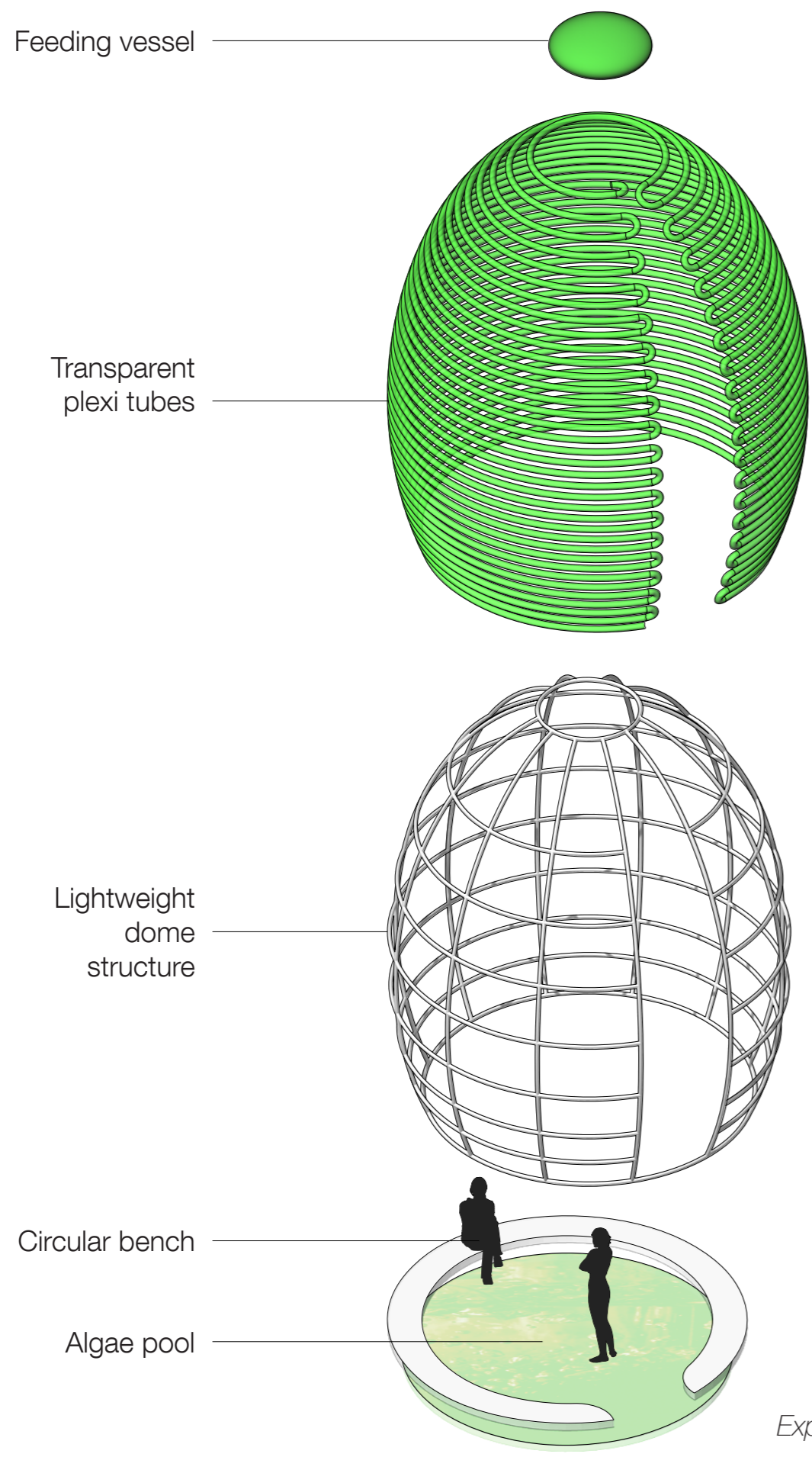
Photobioreactor detail



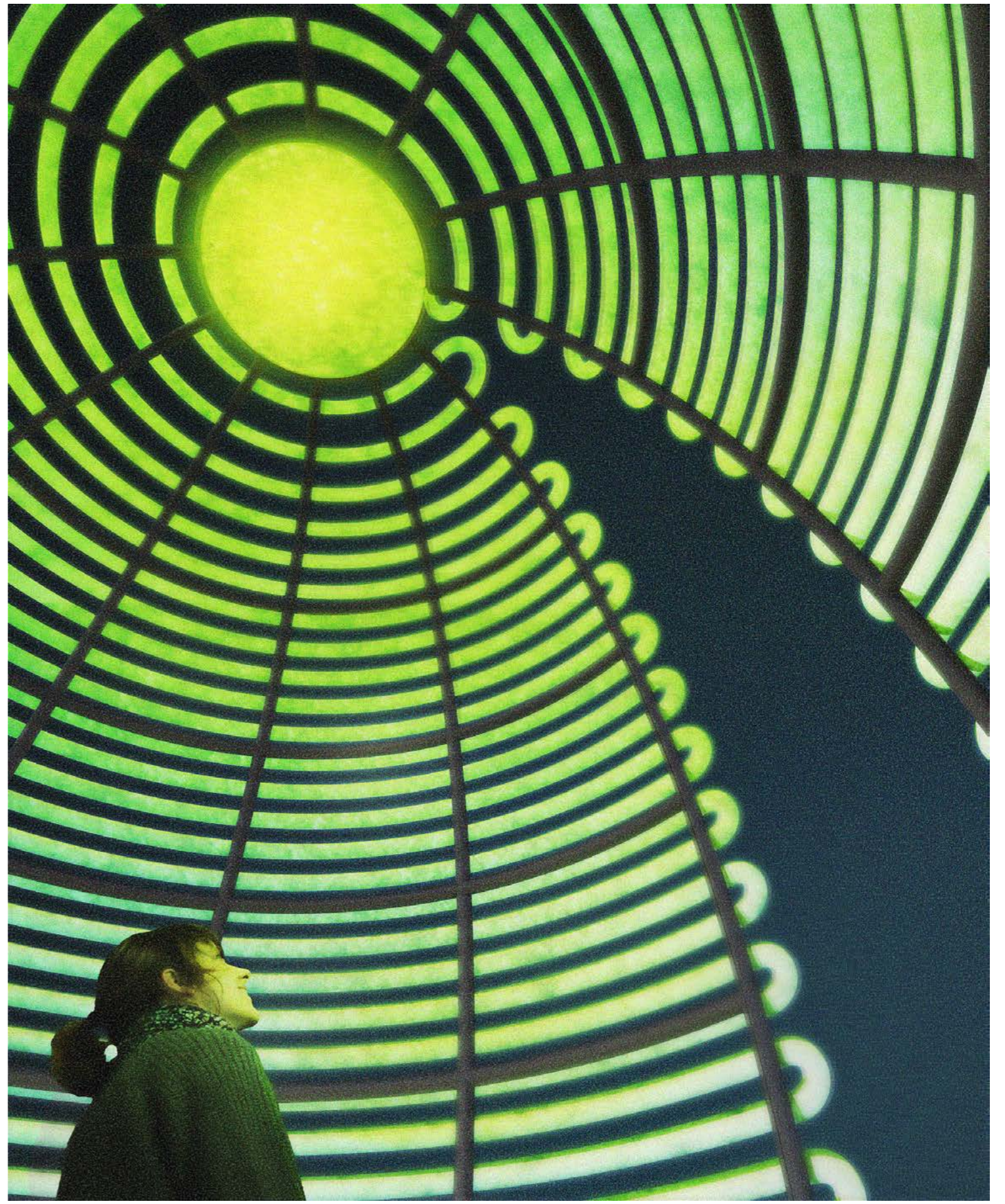
Example of a Christmas tree photobioreactor



Photobioreactor detail



Exploded axo

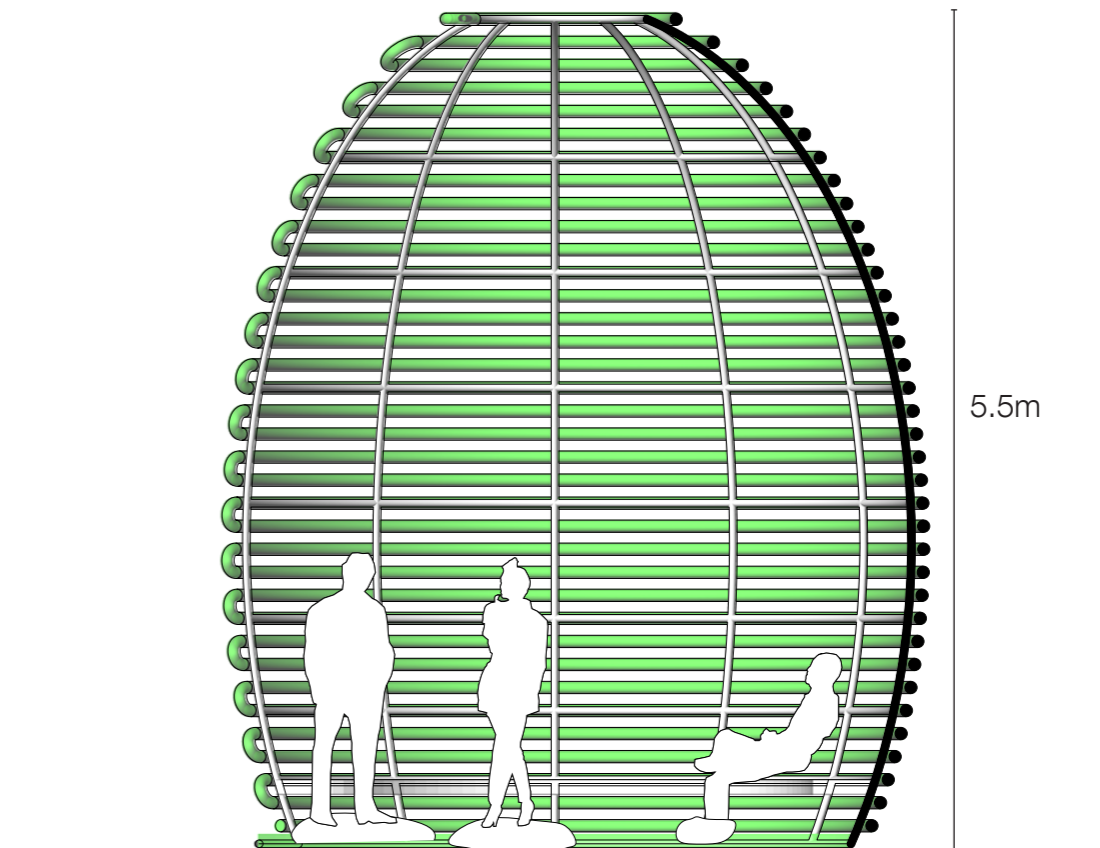


Functionality

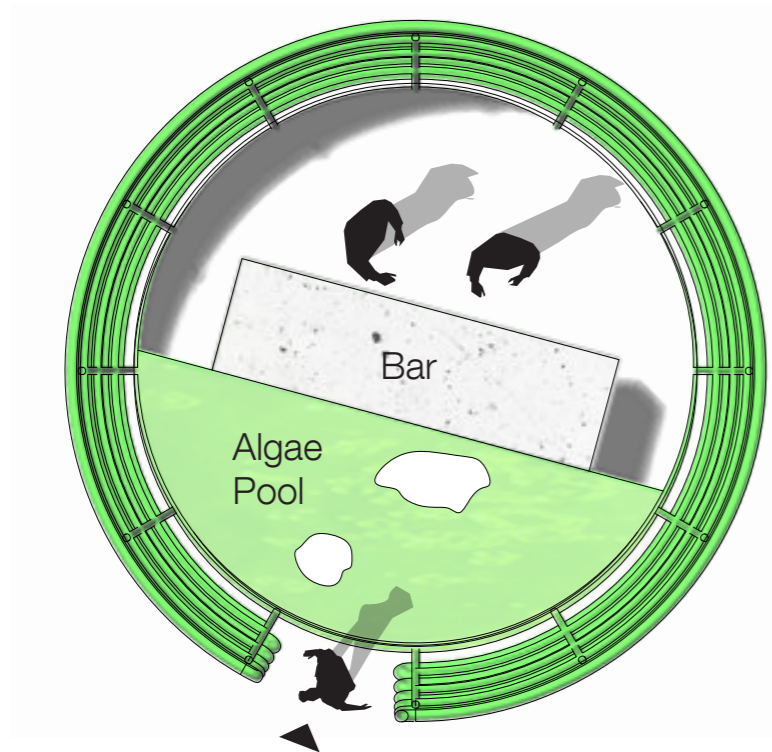
The pavilion is an egg-shaped 5.5 m high dome. It's footprint is a circle with a 4m radius. It has one main entrance. For the duration of the Chart Art Fair it is best suitable to go with a Space 10 function. There is an alternative to put gastronomy function, as there is a possibility to place a small 2.8 m x 1.0 m bar.

Construction

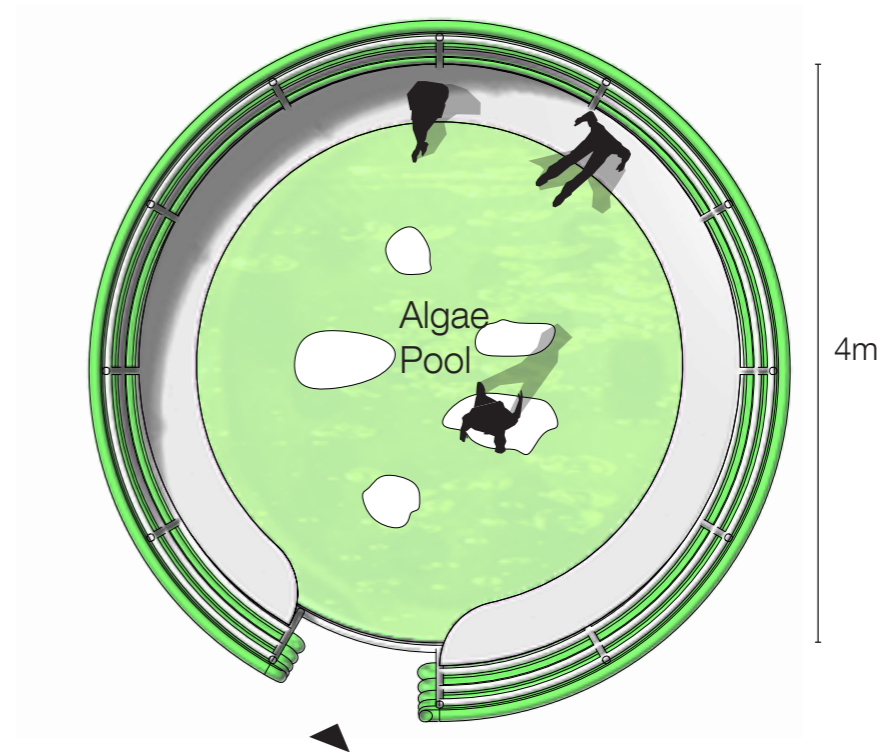
The pavilion has a lightweight metal structure, easy in assembly, disassembly and transportation. The system of plexi tubes is mounted directly to the structure.



Section



Gastronomy fuction. Plan



Space 10 function. Plan