

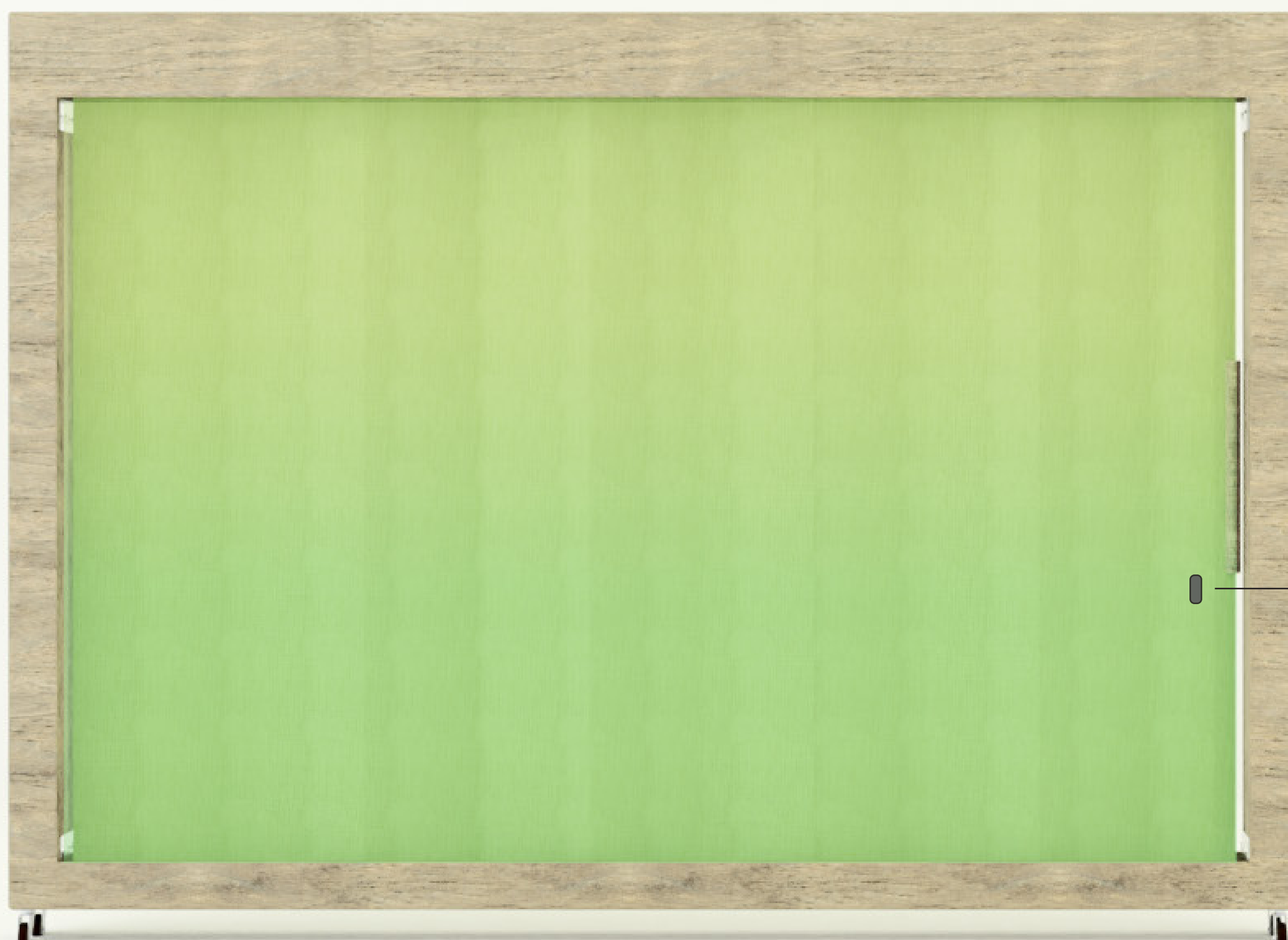
# Living Textiles: Exploring Microalgae Growth on 3D Woven Structures in Design

## Shaping the new cultivation system

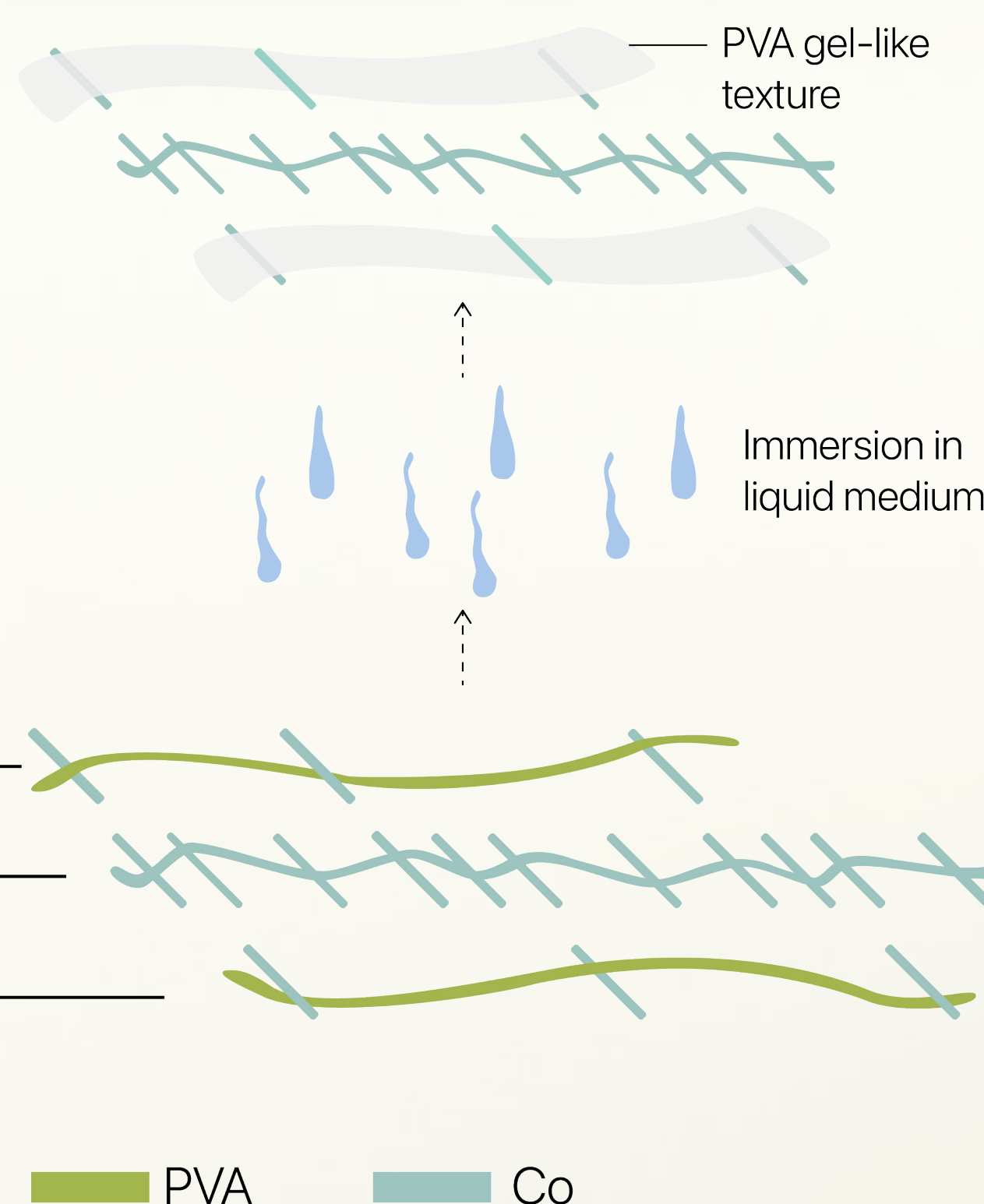
The vision behind the Living Textile is to create a bridge between two traditional microalgae cultivation methods: open ponds and photobioreactors (PBRs). By capturing the advantages of both approaches while eliminating their drawbacks, this innovative system aims to redefine how microalgae are cultivated. Beyond simply preserving microalgal viability and minimizing resource consumption, the Living Textile aspires to introduce a new kind of cultivation that effortlessly integrates into urban environments and workplaces, improving air quality and providing tangible environmental benefits to the population. The Living Textile functions as a system designed to sustain microalgae viability, but how does it achieve this over time? The key lies in the construction of the Living Climate Panel, a system engineered

to continuously monitor and adapt to the needs of the living culture, ensuring optimal conditions for its growth and longevity. A built-in humidity sensor continuously assesses moisture levels, ensuring that the microalgae receive the necessary hydration. When the environment becomes too dry, the sensor triggers a signal, prompting the system to release precise droplets of liquid medium, maintaining optimal conditions without unnecessary waste.

Gravity presents another challenge—over time, the liquid medium naturally shifts downward, carrying the microalgae with it. One might assume this would cause an imbalance, concentrating growth at the lower sections of the textile. However, the design of the Living Textile ensures that the microalgae remain embedded within its structure, allowing them to thrive without any problem. This interaction highlights the living nature of the material, reinforcing its role as both a functional and educational element in microalgae cultivation.



Humidity sensor



The Living Textile is not just a surface for microalgae growth; it is a hydrogel-based system designed to retain liquid medium, a crucial feature that ensures a stable supply of water and essential nutrients such as phosphorus and nitrate. Beyond hydration and nutrient delivery, the presence of cotton plays a vital role in maintaining an alkaline environment, a necessity for microalgae, which thrive in high-pH conditions.

At the same time, the textile's structure provides a semi-protected habitat, protecting and nurturing microalgae while still allowing light to penetrate. The spacing between cotton yarns, combined with the transparent hydrogel that forms between them, ensures that microalgae receive the illumination they need for photosynthesis without being exposed to harsh external conditions. This delicate balance of protection, hydration, and light accessibility makes the Living Textile an innovative and dynamic platform for microalgae cultivation.

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