MEEG867
Novel Design Proposal
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WHY: Water scarcity is a critical issue faced by communities worldwide, which is escalated by climate change and population growth. Access to water is essential for survival and well-being. Existing water collection methods are often energy-intensive, costly, and can have negative environmental impacts. There is a pressing need for innovative pumping solutions that can control, store and provide water effectively without any leakages which also can be used in lab testing, space agriculture and AquaRescue kits.

HOW: We were inspired by the remarkable ability of the Thorny Devil lizard to collect water from the environment by simply standing on wet surfaces through its hydrophilic skin, and the surface texture, which supports water's surface tension to draw it in. The Thorny Devil's skin is covered with microscopic channels and grooves that allow water to be transported through capillary action and also with the help of water surface tension. Where our design aims to replicate this natural phenomenon.

WHAT: Inspired by the methodology of lizards, we have designed a model that harnesses the power of surface tension through micro-architecture. This innovative approach utilizes tiny 3D cells, each measuring nearly to 1mm wide. In this process, water molecules exhibit a remarkable phenomenon known as surface tension, causing them to adhere to themselves and their surroundings. These miniature cubes are strategically designed to be small enough to hold water. Our model is engineered to absorb water from the surface and stack it, enabling it to defy gravity. The sides of these miniature cubes can remain completely open without water spilling out, due to the intricate balance of surface tension forces. By ingeniously stacking hundreds of these tiny cubes together, we have created a scaffolding system that allows liquids to climb upwards without the need for enclosure. This novel design leverages the principles of surface tension and micro-architecture to facilitate efficient water transportation and management, potentially revolutionizing various applications, including water harvesting, and distribution.

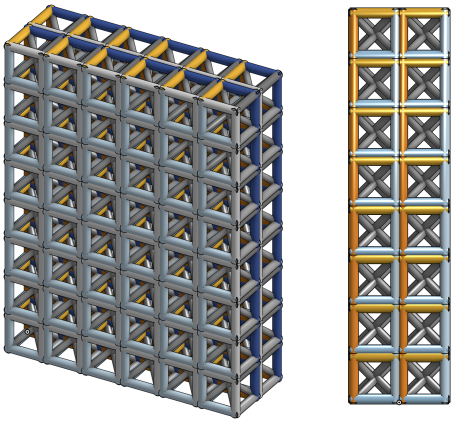

Figure 1 : Our Proposed Design

SO-WHAT: Our design pumps water by controlling it in a direction of a constructed model with microarchitectural cells and also these cells hold water molecules with the help of water surface tension. The design enables fast and effective water transfer to the required location without any leakages, ensuring precise control and reliable water management. This model can be used for space agriculture to grow seeds without water leakage and for storing pure water in disaster situations with the "AquaRescue Kit."

Refer drive link for more detailed figures. Drive_link