Designing a Fog Harvesting Surface for Arid Climates

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Capstone Design Award

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The United Nations “Water for Life” program, headed by the UN Department of Economic and Social Affairs, predicted that by 2025, nearly 1.8 billion people will live in areas of physical water scarcity. Many of these areas experience extremely low rain falls and lack access to steady sources of freshwater such as rivers and lakes. Two regions that experience extreme aridity are the Atacama Desert of Chile and the Namib Desert of southern Africa. Despite their low rainfall, these deserts are known for their thick fogs that generate along the coast and move inland. Much of the ecosystem of these deserts have adapted to the region by taking advantage of these fogs. The Namib desert beetle for instance, drinks the water that collects upon its wings when a fog rolls past it. Largely beginning in the 20th century, innovators took inspiration from the local ecosystem and began experimenting with the idea of large meshes strung up between poles with the purpose of capturing the moisture of the fog.

Fog harvesting surfaces can produce enough fresh water for a vast number of people in need if they are designed efficiently and properly. The amount of water in one cubic mile of fog can consist of up to 50,000 gallons of water. If this amount of water could be harvested at even 10% efficiency, an entire village worth of people would have a healthy amount of drinking water to use throughout a day. Considering the predicted water scarcity crisis, fog harvesters could provide lifesaving relief to those living in extremely arid climates.

Usage of fog harvesters has many benefits. They provide a source of clean, fresh water while having a minimal impact on the environment. Construction of fog harvesters are simple and maintenance is straightforward, if replacement materials are on hand. They also have no need for a power source as the process is natural. The main drawback is that fog can be difficult to predict aside from certain regions such as the Atacama Desert, and modern mesh and fiber designs are still rather inefficient.

The proposed design aims to create a fiber and mesh network capable of superior fog collecting capabilities. To do so, new fiber geometries will be tested to determine the most efficient mesh, while being kept to the smallest possible width as not to impede the manufacturability or efficiency of the fiber. This project aims to do so by improving upon fiber cross-sections, mesh geometry, and fiber coatings through research and testing.

https://www.smithsonianmag.com “Five Wild Ways to Get Drink in the Desert”