



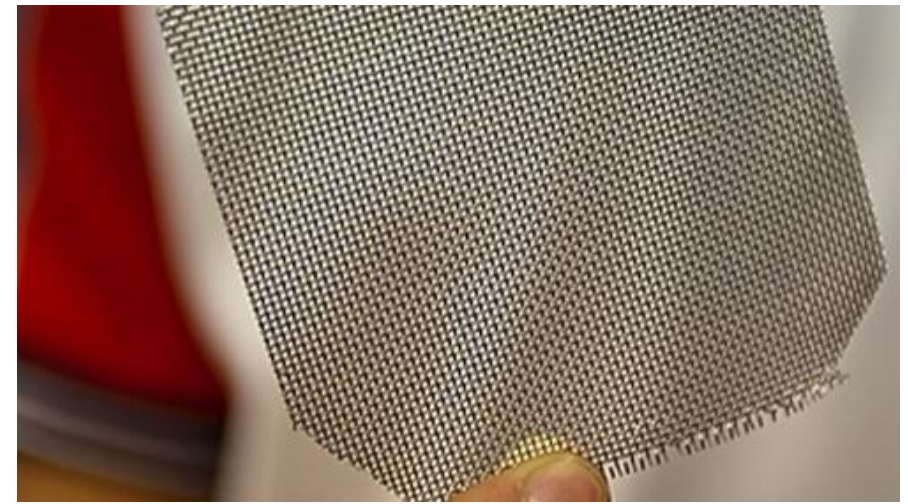
BIOMIMICRY & PARAMETRIC DESIGN

DAVIS SABATINO'S CASE STUDY PRESENTATION

ARCH 510 - PROFESSOR NANCY YEN-WEN CHENG FALL 2017

Fog Harvesting Mesh

- Shreerang Chhatre and team of MIT graduate students developed a fog harvesting mesh which can capture moisture in the foggy air and direct it towards storage tanks to be used as a source of potable water.
- Their team was not the first to invent this technology; they simply wanted to optimize the existing fog harvesting technologies by mimicking a natural precedent.



<https://www.designnews.com/sites/default/files/fog-collector-sheet.jpg>



http://www.climatetechwiki.org/sites/clinatetechwiki.org/files/images/teaser/teaser_image_40.jpg

Biology to Design Process

1. Discover Natural Models

Selection of Natural Precedent

2. Abstract Biological Strategies

Study of Natural Precedents Strategy

3. Identify Function

Define what function must be met

4. Define Context

Circumstances where function is needed

5. Brainstorm Bio Inspired Design

Development of product based on natural precedent

6. Integrate Lifes Principles

Incorporate Lifes Principles

7. Emulate Design Principles

Develop Design concept incorporating natural strategies

8. Measure using Life's Principles

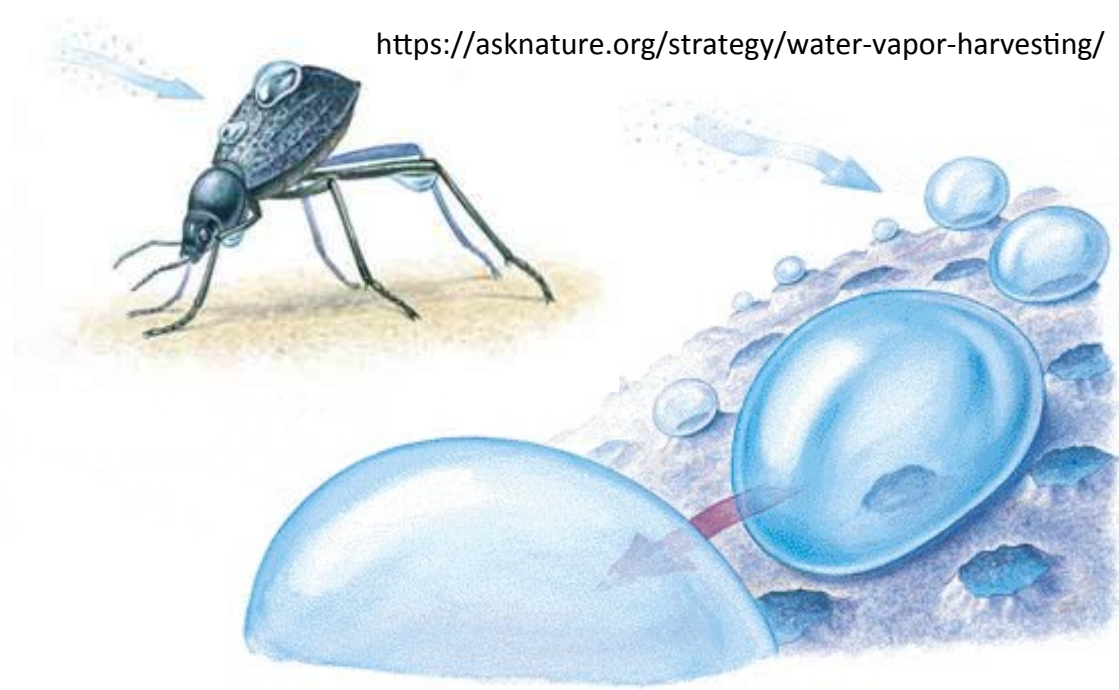
Evaluate product using Life Principles as criteria

*Reference to Biomimicry DesignLens Resource

Stenocara Beetle

Discover Natural Models

- In the Namibian Desert, water sources are few and far between
- Stenocara Beetle uses its body surfaces to collect moisture in the air and funnel it down towards its mouth
- Uses a mix of hydrophilic (water attracting) and hydrophobic (water resisting) surfaces to collect and move water (Seely).
- The hydrophilic micro-sized bumps on hardened forewings condenses water to its surface (Seely).
- Hydrophobic troughs move water downwards towards beetles mouth (Seely).
- Some researchers believe that beetles propped body position is just as important in the collection of moisture as its surface properties



Identify Function and Define Context

Shreerang wanted his product to address a major global issue – access to clean water (David).

Specifically, Shreerang wanted to help underprivileged villagers collect clean water near their homes. Often times, these villagers need to travel far distances to collect potable water (David).

Initially, Shreerang wanted to apply this his fog harvesting product to the rural west coast of India, near to where he grew up but recognized that it could be utilized in climates which experience constant foggy weather with arid landscapes (Chile)

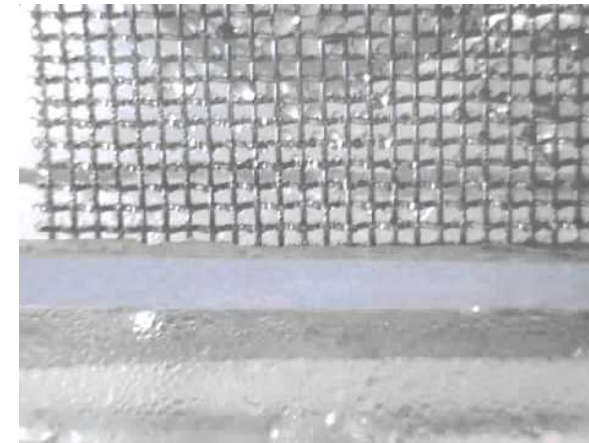
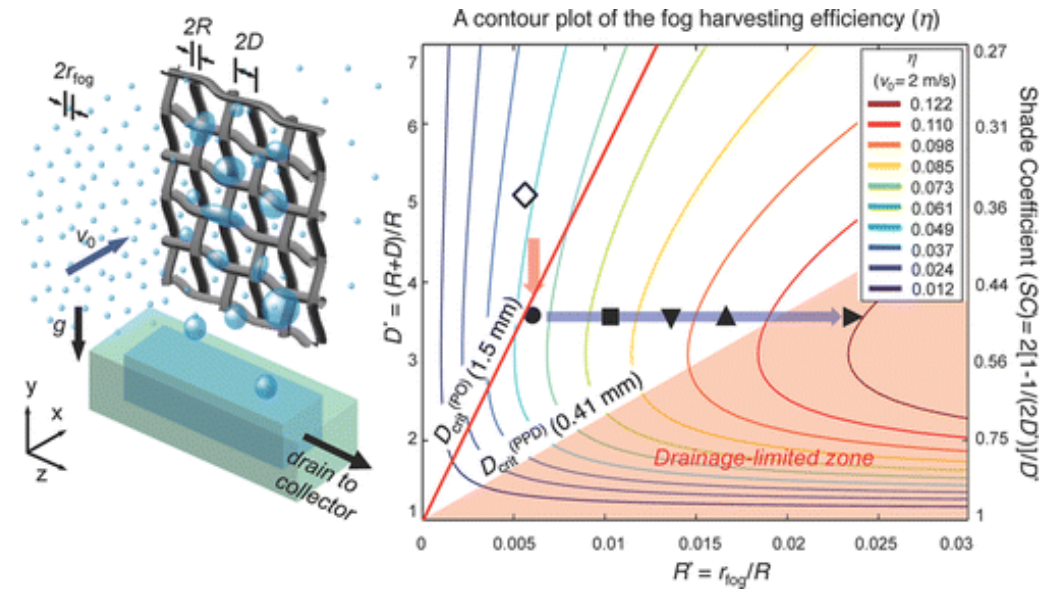


http://s1.firstpost.in/wp-content/uploads/2015/06/02_WATER-WIVES.jpg



Fog Harvesting Mesh Development

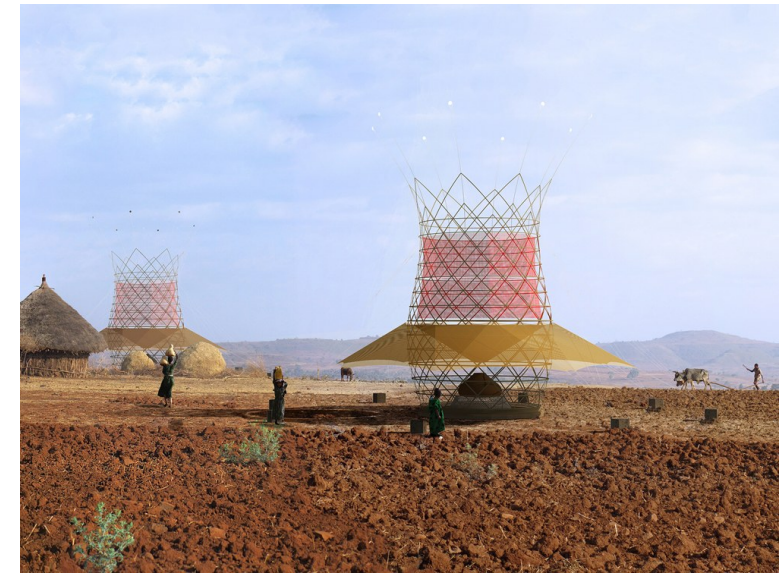
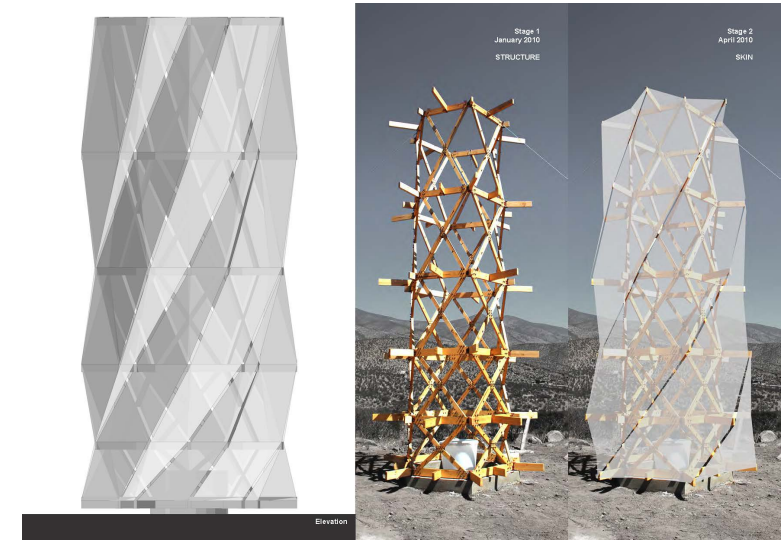
- After identifying the beetles strategy and identifying their projects function and context, Shreerang and his team then applied it to their fog catching design.
- Sought ways to create hydrophilic and hydrophobic surfaces (David). They found that by soaking their material in charged polymer chains dissolved in water, they could alter the surface properties to mimic the hydrophilic and hydrophobic surfaces of the beetles wings and shell (David).
- The result of multiple lab tests and calculations resulted in the development of a stainless-steel mesh which could collect up to 12 liters of clean water per day and function using earths natural functions (David).



<https://i.ytimg.com/vi/p2invVwyC6k/hqdefault.jpg>

Application

- After the development of the fog harvesting mesh, its application is being explored in different locations across the globe
- In Chile, researchers and students are working with MIT graduates to develop structures which are wrapped in the mesh allowing for optimal fog harvesting.
- In arid areas of Ethiopia, fog harvesting towers are being constructed of local bamboo. The design allows for fog harvesting as well as programed space at the towers base.



<https://media.wired.com/photos/593295dc4cd5ce6f96c0ad2f/master/pass/warka2.jpg>

Davis Sabatino
davis.sabatino94@gmail.com

Key documents consulted

David L. Chandler, MIT News Office. “How to Get Fresh Water out of Thin Air.” MIT News, 30 Aug. 2013, news.mit.edu/2013/how-to-get-fresh-water-out-of-thin-air-0830

“MIT Develops Advanced Fog Harvesting Material That Pulls 5x More Water from Thin Air.” Inhabitat Green Design Innovation Architecture Green Building, 17 May 2015, inhabitat.com/mit-develops-advanced-fog-harvesting-material-that-pulls-5x-more-water-from-thin-air

Peter Dizikes MIT News. “Out of Thick Air.” MIT News, 21 Apr 2011, MIT news.mit.edu/2011/fog-harvesting-0421

Seely, M.K. “Irregular Fog as a Water Source for Desert Dune Beetles.” SpringerLink, Springer-Verlag, link.springer.com/article/10.1007%2FBF00344858

Credits

Davis Sabatino's PORTFOLIO

PROFESSOR NANCY YEN-WEN CHENG FALL 2017