



Start building by drinking water.

Problem

Greece, Lesbos

Temporary refugee camps on the Aegean Islands are currently overflowing with refugees at six times their capacity. This leaves the refugees to survive in inhumane conditions, lacking basic resources like a proper shelter. Furthermore, poor waste management in the camps results in rivers of (plastic) trash.

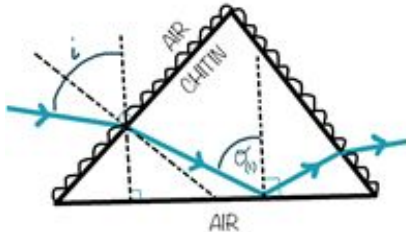


Biomimetic Strategies

BottleBricks are inspired by organisms which are experts on survival under harsh weather conditions.

Saharan silver ant (cooling) (*Cataglyphis bombycina*)

Can withstand high temperatures by maximising light reflection and heat dissipation. These properties arise from the structure of the ant's hairs which are elongated along its body. When zooming in, one can see that the triangular hairs have corrugations running along their length.



Total
Internal
Reflection

Occurs when angle θ
Exceeds the critical angle
Resulting in a minimum
light incidence angle
Above which light is fully
reflected away from the
hair, preventing the ant
from heating up

Covering its elliptical body with these hairs, the ant is able to reflect over 90% of incident light at a wide distribution of incident angles.

By recreating the filled, triangular and corrugated structure around the bottle, we emulate the heat reflecting function. The side of the bottle with these structures will reflect heat away on sunny days, thereby having a cooling effect.

Nacre (aragonite) in molluscs (stacking)

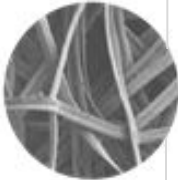


An interlocking system between small sections makes the overall structure strong. The triangular ridges can be interlocked between bottles to provide strength and stability to a full wall construct.

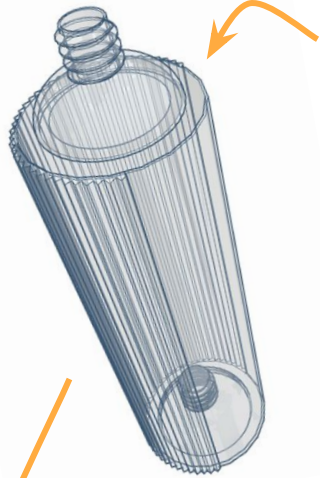
Silk cocoons (insulation) (*S. cynthia*, *A. pernyi* and *A. mylitta*)



Still air trapped within the porous cocoons provides a thermal buffer to protect against outside temperature changes. The crystals on the outer surface decrease wind penetration, creating an enclosed structure and effectively maintaining thermal insulation under windy conditions. Using an enclosed structure is an efficient way to trap stagnant air for insulation in cold environments.



Solution & Product



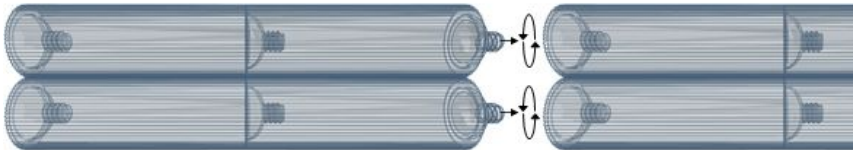
BottleBricks

Multifunctional water bottles delivered to refugees as their daily water supply.

Two sides enable for adaptability to seasons:

- **The smooth side** will capture sun energy in winter.
- **The ridged side** will reflect sunlight and protect from heat in summer.
- **The enclosed structure** traps air and provides insulation in all seasons.

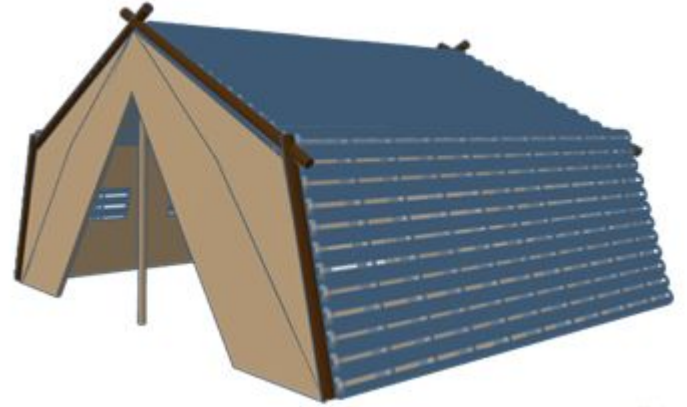
screw them



stack them



improve shelter



Customer Profile

We principally target humanitarian aid agencies.

Customer Goals

- Provide basic needs for camp inhabitants, such as water, food, accommodation and equipment.
- Set up and maintain a safe and hygienic environment.
- Organize, distribute and maintain resource capacity and regulate rules/institutions.
- Inform and connect volunteer help organizations for aid and supplies.



Customer Pains

- Demand for help and settlement exceeds capacities.
- Is guided/limited by overarching regulations from European government – asylum Law.
- Severely constrained by funding limitations.



Preferred channels

Traditional Ads



Online & Social Media



Referral



Guerrilla Efforts & PR



Revenue Model

Our revenue model is in development.

Currently, our focus is on exploring a licensing model.



Thereby, the aim is to set up collaborations with existing plastic bottle producers.

These producers will be authorized to manufacture the bottle shape design of BottleBricks.

Outreach

Supporters

- Biomimicry Institute
Part of the Biomimicry Global Design Challenge Finals
- Utrecht University

Publicity

- Biomimicry Institute
- BioSCOPE (local Biology magazine)
- Utrecht University
- RTV Utrecht (local radio station)



BOTTLEBRICKS; HOW OUR DESIGN COULD HELP REFUGEES

by Vera den Besten

These days it can be tough to follow the news. Globally, there are so many bad things happening that it can be quite depressing to read and watch it all. Still, I believe (and hope) that many of us, students, will not look away but instead start thinking about ways to make the world a better place. This is what I've been working on for the past year: diving into one of the big world problems and trying to come up with a solution that is inspired by nature. Maybe this month's assignment was also a new experience for me, but we came up with a pretty cool design and became finalists in the design challenge!

Biomimicry Global Design Challenge

As part of the Master's programme Bio Inspired Innovation, I participated in the Biomimicry Global Design Challenge with my team of fellow BII students: Bassem Hamed, Hanneke Hartmann, Gloria Gama, Laila Karam and Pieter Smit. The challenge is organized by the Biomimicry Institute and is meant for students and young professionals around the globe. Participating gives us the opportunity to not only study, but also practice biomimicry design. For those of you who don't know the term, "Biomimicry is the practice of applying lessons from nature to the innovation of technology, more sustainable technologies for people. Biomimicry design goes from understanding, learning from, and emulating the strategies used by living things, with the intention of creating designs and technologies that are sustainable!" [1]. So we learned to use biomimicry to create bio-inspired solutions that are aligned both with nature and the UN's Sustainable Development Goals (SDGs). We came up with "BottleBricks" to address the growing problem of lack of adequate housing in refugee camps.

The problem
One of the world's biggest refugee crises is currently taking place on the Greek Aegean islands. The refugee camp on the island of Lesvos, called Mios, was originally set up to shelter around 2,200 people, but is currently overflowing.

Refugees and volunteers from different help organizations on Lesvos have identified lack of shelter as one of the most problems. Adequate shelter should provide security and protection from the cold winds, frequent rain and discomforts in winter, with average temperatures below 10°C. The climate during the summer months is equally challenging, with hot, strong sunlight and temperatures up to 30°C. The refugees don't have financial means and/or access to building materials to remedy the situation. They have to live in makeshift shacks built of low quality products, like sheets and woven sticks, materials with low insulating properties. The immediate and long-term physical and psychological impacts that the lack of proper shelter has on refugees is a bitter sad effect. Providing relief to this situation was therefore our main focus point.



Time at Mios, Lesvos. Picture by Euro on their Flickr-queue: Skiing V Judding.

Inspiration from nature
To find a solution for the refugees, we looked at different organisms in nature that create resilient, modular structures to protect themselves from hot, cold, rain and windy climates. Nature offers very diverse thermoregulation ways that either we imitate or learn from. For example, have a specific look at all organisms that create an exposed to wind. Moths: The silk cocoons of moths that prevent against air circulation. Another



Figure 1: A cocoon of a moth, showing the silk cocoon structure that protects against wind.

thermoregulatory strategy we implemented in our concept is the use of a physical structure to reflect light. Sahara solar fans have a particular structure that creates that makes the fan to reflect light very efficiently. The edges allow a large amount of light to come into and go out of the fan, thereby ensuring light reflection [2]. By integrating both strategies, organic air and light reflection, we came up with the idea of creating BottleBricks.

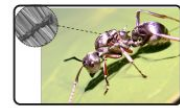


Figure 1: Sahara solar fan with irregularly shaped fans that are light reflecting.

Our design solution
Each refugee receives one water bottle per day in Mios. When they have finished the water, most of the bottles end up as trash in the camp. We made a design for a special type of water bottle, one with some extra features that prevent it from turning into waste. Our bottle can be used by refugees as bricks to build a "bottle-house" around their existing shacks. Therefore we named the solution BottleBricks!

BottleBricks are covered with a cap and contain examples of recycled structures that can trap moisture as results. Because it is not covered by empty bottles, it would be an amazing initiative for people outside camps and refugees all over the world. We think the designed bottle that can be connected to each other through securing the neck of one bottle into the bottom of another. Multiple bottles connected in this way



Figure 2: A structure of bottle pillars can be stacked and form a bottle-house around existing shacks.

creates bottle-pillars. When horizontally placed and stacked, multiple bottle pillars will create a structure that can be built around a tent (see figure 2).

Inspired by the Sahara Solar fan, we covered 70% of the bottle with ridges. The ridged surface will serve as the light reflecting side in summer. When the reflective side is facing the sun, the diaphragm will remain cooler. In winter the bottle-pillars can be turned so that the smooth surface is faced towards the sun. The sun will not be reflected but instead absorbed, heating up the structure as inside, and will then make the diaphragm warmer. The second function of the ridges will be to make the stacking of the horizontal pillars possible. This stacking may be done in a stable construction with tightly packed bottles in order to prevent the inside from rain. When our bottles, made from 100% recycled PET, replace the single-used bottles in the camps, refugees can improve their shelter and the amount of trash in the camp will be reduced.

We also made a nice video pitch about our design, which might explain how it works even better. This can be found via the following link: <https://vimeo.com/42431077>

Future
We are currently following the Launchpad of the BGDG, which means we are learning how to turn our idea into an actual start-up. We are therefore looking for experts in the field of bottle production, materials and refugee aid. If you are, or know someone that would like to help us, please contact us via help@bottlebricks.nl. You can also follow us on Instagram: BottleBricks.

References
[1] <https://biomimicry.org/innovation/>
[2] <https://ipatsia.com/news/2016/09/19/innovations-sahara-solar-fan/>

Nieuws

1 oktober 2020

BottleBricks: hoe een studentenontwerp vluchtelingen zou kunnen helpen

Deze zomer stonden masterstudenten van het masterprogramma Bio Inspired Innovation in de finale van de Biomimicry Global Design Challenge. In deze wereldwijde wedstrijd creëren studenten en jonge professionals bio-geminspireerde oplossingen die aansluiten bij zowel de natuur als de Sustainable Development Goals van de VN. Om het groeiende probleem van adequate huisvesting in vluchtelingenkampen aan te pakken, bedacht het studententeam van de Universiteit Utrecht BottleBricks. Geïnspireerd door isolatietechnieken van motten en mielen gebruiken ze in hun ontwerp het concept van afstaaende lucht en lichtreflectie als isolatie. BottleBricks stapelen lege waterflessen om daarmee een isolerend fessenhuis te bouwen rondom een bestaand onderkomen. Vanaf 14 september volgen ze het zogenaamde Launchpad, om van hun concept een start-up te maken.

Bottle BRICKS

uubeta BOTTLE BRICKS

This summer master students of the Master's programme Bio Inspired Innovation were in the finals of the Biomimicry Global Design Challenge. In this global challenge students and young professionals create bio-inspired solutions that align with both nature and the UN's Sustainable Development Goals. The student team of Utrecht University came up with BottleBricks, to address the growing problem of lack of adequate housing in refugee camps. Inspired by insulating techniques from moths and mielen they use the concept of stagnant air and light reflection to come up with BottleBricks.

venedbesten en 1 Anderen vinden dit leuk

7 october

En opmerking toevoegen...

Team



The success behind BottleBricks is that we all have a shared goal;

To create innovative solutions that contribute to a more sustainable and social future. Thanks to a composition of people with different educational backgrounds and personal strengths we complement each other ideally as a team.

Our advisors:
Lindsay James & Louisa Ulrich-Verderber

Contact

We are looking for contacts that have **experience** working on the **Greek Aegean islands**. Specifically, investors, partners and organisations that can **assist** us with **licensing agreements**.

Currently, we are working on developing the first **prototype**. Can you, or do you know people who can help us?

Please contact us through one of our channels!



Email: 

bottlebricksnl@gmail.com



LinkedIn:

[https://www.linkedin.com/
company/bottlebricksnl](https://www.linkedin.com/company/bottlebricksnl)



Instagram:

[https://www.instagram.co
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