

Urban Heat

Ontwerp van een gevelement dat hitte vermindert met de toepassing van biomimicry

Britta Hollebeek
Afstudeerproject voor studie Built Environment (HU)
Maart 2025

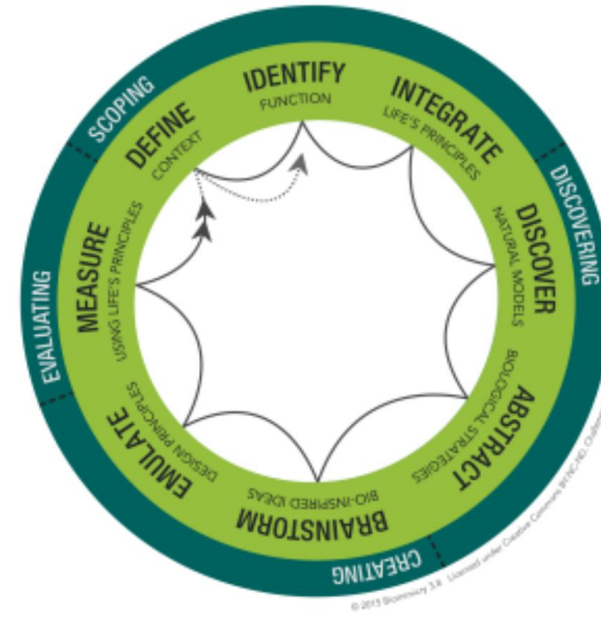


Inhoud

- ▶ Introductie
- ▶ Wat is biomimicry?
- ▶ Onderzoek
 - Bouwkunde
 - Biologie
- ▶ Ontwerp

Introductie

- ▶ Afstudeerproject hittestress
- ▶ Hoofgebouw Haagse Hogeschool
- ▶ Biomimicry design thinking
- ▶ Hoofdvraag: Welke oplossing kan ontworpen worden voor de gevel van het hoofgebouw van de Haagse Hogeschool, gebaseerd op biomimicry, dat kan bijdragen aan het verminderen in energiegebruik tijdens het koelen van het gebouw tijdens warme maanden?



Wat is biomimicry?

- ▶ Nabootsen van de natuur voor technische en duurzame innovaties
- ▶ Inspiratie uit structuren, processen en ecosystemen



Eastgate building, Zimbabwe

- ▶ **Waarom biomimicry?**
- ▶ Natuur heeft miljoenen jaren geëvolueerd om efficiënte oplossingen te vinden
- ▶ Duurzaamheid: minder verspilling, energiezuinig
- ▶ Innovatie: nieuwe technologieën gebaseerd op bewezen natuurlijke principes



Klittenband



Bullet train, Japan

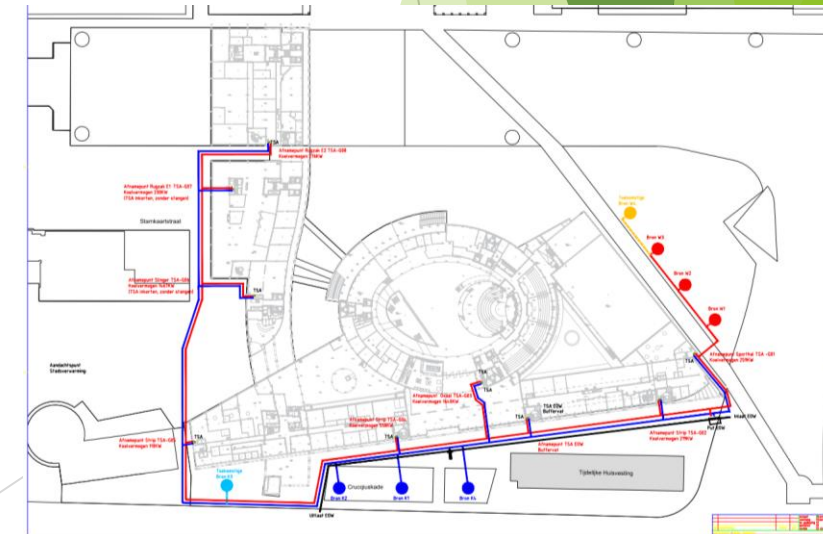
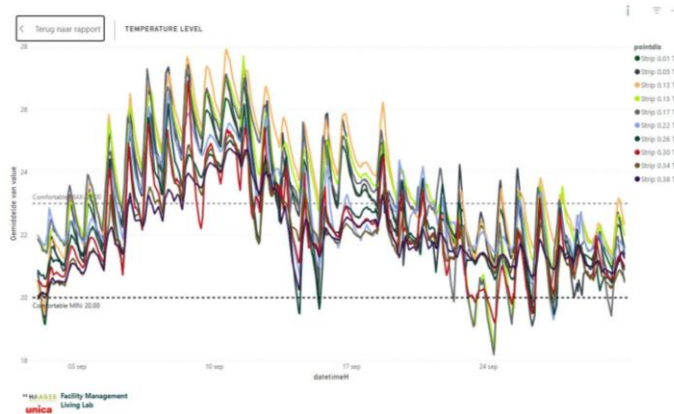
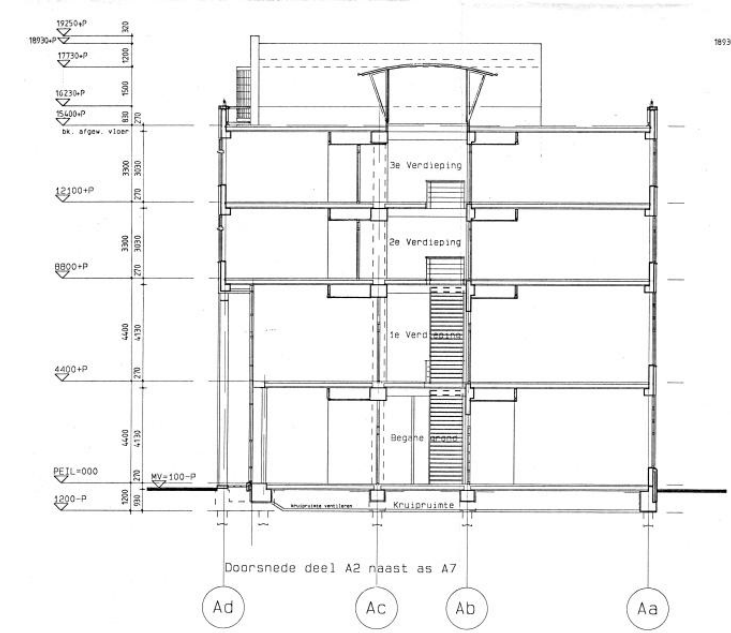


Onderzoek

Bouwkunde





- ▶ Bouwtechnisch en bouwfysisch
- ▶ WKO
- ▶ Vliesgevel
- ▶ Sensoren data Unica/Facility Management

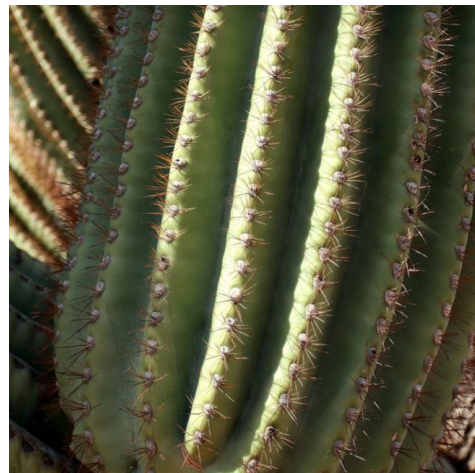
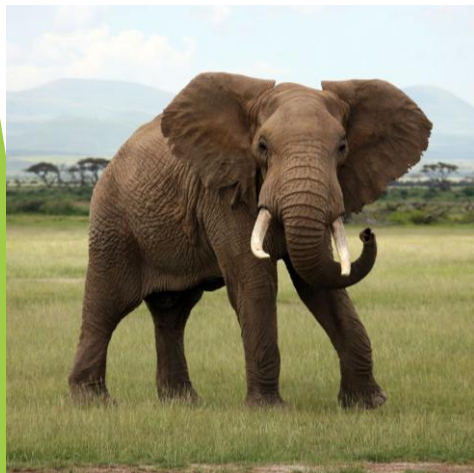


Onderzoek Biologie



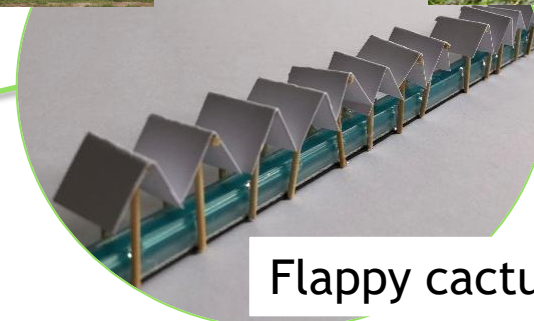
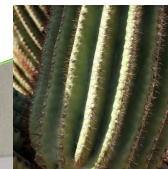
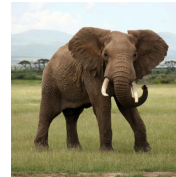
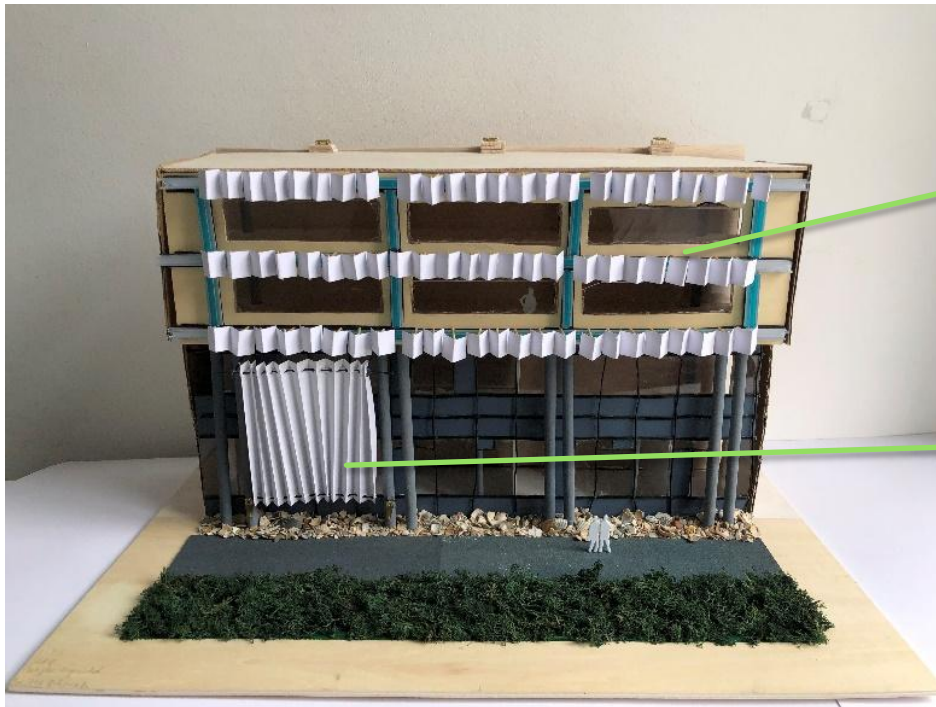
Discovering Biological Models Matrix											
Primary Function: Protect from temperature/reduce temperature											
Number	Function	Organism common name	Organism Scientific name	Strategy (how the organism meets the function)	Mechanism	Abstracted Design Principle text	Quoted excerpt from literature (with link)	Photo organism	Sources of information (links)	Main category of the strategy	Water/liquid involved?
26	Protect from temperature	Gila monster	Heterodermis suspectum	The Gila monster cools down by evaporative cooling and use urinary bladder as a "water reservoir"			[The steep rise in cloacal EWL coincided with an increasing suppression of body temperature relative to ambient temperature. Dehydration to 50% of initial body mass led to a delay in the onset and an attenuation of the dramatic increase in cloacal EWL. These results emphasize the potential value of EWL for thermoregulation in ectotherms and demonstrate for the first time the role of the cloaca in this process. Gila monsters reduce cloacal EWL rates when dehydrated by increasing the minimum temperature at which significant cloacal EWL occurs.]			6 10	yes
27	Protect from light/UV	Hippopotamus	Hippopotamus amphibius	The Hippopotamus protects from light by creating a sunscreen with two acids and mucus.	Blocks the acids from secretory ducts under the skin, as well as mucus. Both are light opaque, one stained with dark carotenoid rings scatters light to block the sun and acts as a sunscreen and absorbs UV light. The other reduces the viscosity so the mixture can spread more easily over the hippo's surface. They absorb light in both the		...one red, which they named hipposudoric acid, and one orange, which they named nonhipposudoric acid. Although the two chemical pigments are unstable on their own, when they dry on the animal's skin in the presence of mucus, they harden and stick around for hours. Thus, the thick, sticky mixture is tough enough to survive the hippo's daylong soaks, all the while absorbing sunlight in both the				no

- ▶ Savanneolifant (Luchtstroom creëren)
- ▶ Cactus (Schaduw)
- ▶ Dromedaris (Verdamping en isolatie)
- ▶ Woestijnslak (Beschermen tegen (UV) licht en isolatie)
- ▶ Zeester (Verzamelen en opslaan van water)



Ontwerp

Maquette met prototype



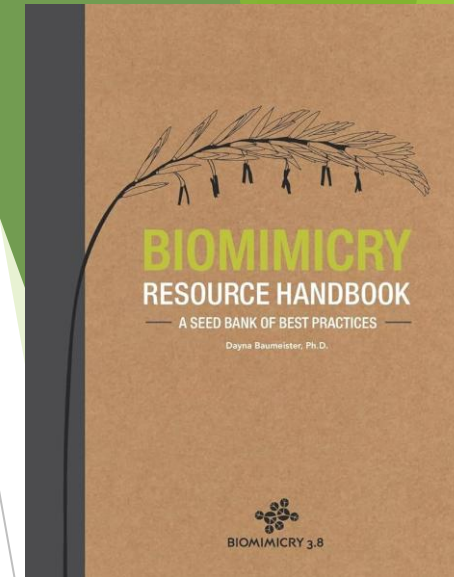
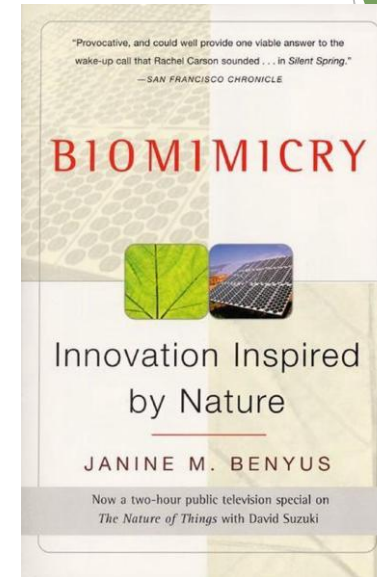
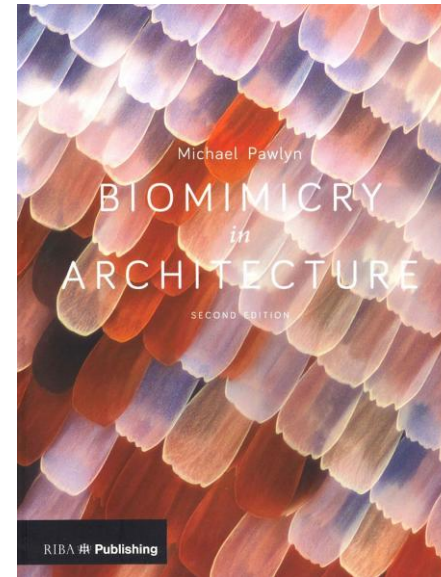
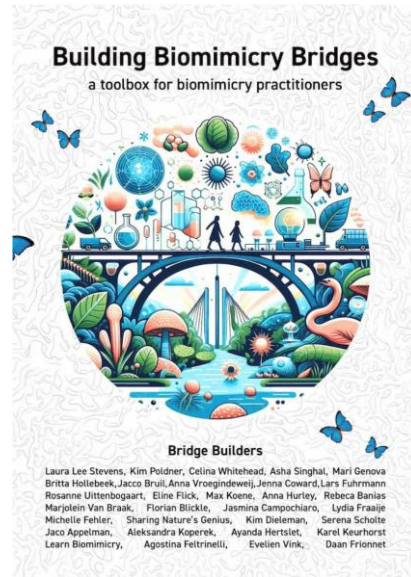
Flappy cactus



Tilted solar screen



Bedankt



Linkedin



Building Biomimicry Bridges

