

Spijeken

Biomimicry als model, mentor en maatstaf



Colophon

This exhibition was developed in close collaboration with Foundation Biomimicry NL. BiomimicryNL encourages and facilitates learning and mimicking forms, processes and ecosystems inspired by nature in order to create sustainable and healthy technology, processes and design.

More information: www.biomimicrynl.org

“Copycat” Nature

P1: Peeking into Nature

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P2: 3.8 Billion years R&D

We are so young!

We humans are a young species on Earth. In the 3.8 billion years of life on earth humans appeared at the last moment. If we would represent those 3.8 billion years as one year Amphibien would appear at the beginning of March. The anthropoid apes (walking on 2 limbs) would appear the last day around 4 PM (afternoon) and humans only in the last 5 minutes. Nature has much more experience than we have in dealing with earth's operating conditions.. Biomimicry is learning from nature and emulating nature's successful strategies.



P3: Lots of inspiration from nature

Gecko tape

Geckos can walk on smooth surfaces like glass. They can even hang upside down on ceilings. They are able to 'stick' due to the unique construction of their toes. On these toes are millions of tiny hairs that each act as a kind of 'magnet'. Sticking without glue! Based on the gecko foot, there is now a glueless tape that adheres very well but is also easy to detach.

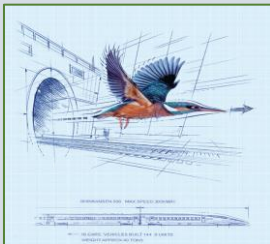


Kingfisher train

It is perhaps the best known example of biomimicry: the Shinkansen train. This Japanese high-speed train initially had a snub nose. As a consequence when the train ran through a tunnel, air was pushed out in front of it. When exiting the tunnel there was a big bang to be heard similar to the sound of a plane as it passes through the sound barrier. The kingfisher dives for fish without causing a ripple in the water. The 'secret' lies in the construction of the beak. By applying this form on the train, the sound problem was solved.

Kingfisher

example for design high-speed trains



The shape of the nose of this high-speed train is mirrored by the beak of the kingfisher. The kingfisher's beak is very much streamlined. Because of this, there are no ripples on the water when the bird dives to catch a fish from the water. As the nose of the train is just as streamlined as the kingfisher's beak, the train is quieter and uses less energy.

Our surroundings (Spaarnwoude) forms the breeding ground of several kingfisher pairs. They are regularly seen here.

The Barn owl

An example of how to reduce noise pollution of wind turbines



Some owls are nocturnal animals. They hunt at night looking for their prey. They need to hunt without being noticed, so therefore without making a sound. The special construction of the feathers of the wings allows them to fly silently. The edges of the feathers are serrated and they are covered with a kind of velvet. This construction reduces the sound while flying.

Wind turbines cause a lot of noise pollution. When you cover the blades with plastic "Owl feathers" the noise is significantly reduced.

At our farm Zorgvrij, a barn owl breeds in the every year. When the farmer comes to the barn at night to check on his cattle he is often startled when the owl suddenly flies over his head.

Waste equals food

In the Netherlands 80.000 tonnes of coffee residu is thrown away each year. This residue (dregs) still contains many valuable substances. The company GRO Holland use this organic waste material for the cultivation of mushrooms. That way waste is again used as food. GRO Holland has developed a partnership with restaurant chain La Place. La Place delivers the coffee dregs and they sell the mushrooms that GRO cultivate, as do other restaurant chains and catering businesses.

Mushroom

waste is food



Mushrooms are the 'cleaners' of nature. With their underground mycelium (mold wires) they extract food from decaying material and dead wood. There are still quite a few nutrients in it. Coffee grounds, horse manure and sometimes chicken and cow manure also form a good breeding ground for mushroom. Mushroom growers like to make use of them.

In the deep litter stall of our farm the cow manure is 'repotted'. A number of times a year the barn is fertilised. The manure is spread over the meadows. This 'waste' still contains many nutrients for the grass. Also you often see mushrooms on this manure. The manure forms a good breeding ground for grass, mushrooms and soil animals.

Shark hygiene

Sharks have a unique skin, because hardly any bacteria attach to it. No bacteria means no infections and no algae growth, which makes for better aerodynamics. The shark accomplishes this all without the use of disinfectants. The structure of the shark skin is therefore a source of inspiration for both the shipping industry as materials in hospitals and in the operating room.

P4: Biomimicry & productdesign

Armadillo bag

Lots of smart solutions are to be found in nature for product design. How about a bag that is sturdy and protects the content and is also foldable? See the model on the base. This bag is copied from the armadillo. All types of armadillo possess an armor made of plates of dermal bone which are movable relative to each other. This makes it a well protected animal, who is still flexible enough to move and roll.

Armadillo

safe and yet movable



Armadillos protect themselves by an armor. This armor is made up of bony skin flares. It consists of several disks and therefore offers not only protection but is also movable. This principle is used in back protectors during snowboarding. They offer protection, comfort and are ergonomically responsible. See also this special bag.

Armadillos are only located in North and South America. But the smaller isopod (insect) actually has such a similar kind of armor. Protective and movable, which also allows a isopod to roll up to protect itself from enemies.



Koffervis auto

Deze 'boxfish' auto van Mercedes-Benz lijkt soms aan de boxfish. De boxfish lijkt een van nature af, maar hij heeft in zichzelf een soort van beschermende doos. De auto is gemaakt van een soort van beschermende doos. De auto is gemaakt van een soort van beschermende doos. De auto is gemaakt van een soort van beschermende doos.

Natuur als model

Gordeldier tas



Draaikolk schroef



Boxfish car

This 'bionic car' from Mercedes owes its shape to the boxfish. This fish is angular in shape and has an armor of bone plates that acts as a strong protective box. The box fish seems far from streamlined, but testing in wind tunnels showed that this form can glide through water or wind very well. That's why the car manufacturer imitated the shape of the fish for their car. This leads to a 40% stronger body than regular cars and 30% less weight, says the manufacturer. A streamlined and lightweight car saves a lot of fuel!

Swirl screw

Moving water is necessary for example if you want to mix liquids. The Pax impeller screw has the shape of a

vortex like in a lily flower or some snail shells. This turns out to be an effective form because this small screw can move large amounts of water with much less energy than traditional screws. The screw is for example used in water storage tanks. The impeller 'pulls' water inside, creating a vortex that bounces off the walls and keeps the water moving. Traditional screws push water away. This takes a lot more energy.

By keeping the water in motion, no chemicals are required to keep the water free of bacteria.

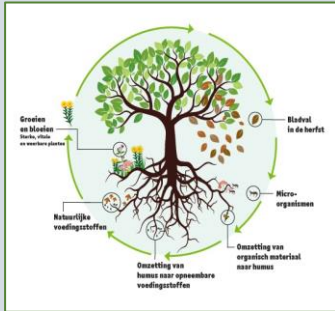
P5: Biomimicry & fashion

Lease jeans

In nature there is no waste because almost all materials are recycled. The philosophy of the Dutch company Mudjeans is to make a world without waste. Instead of buying you lease a Mudjeans jeans. When you don't wear your jeans anymore Mudjeans uses them to make new denim items.

Re-use

waste is not natural



Nature does not have waste. Waste from one organism is again food for the other. There is much to learn from that. Most of our waste is now separated. Plastic, compost and paper are used in new products. Clothing is collected for re-use. But what to do with worn clothes? Give your jeans a second life too.

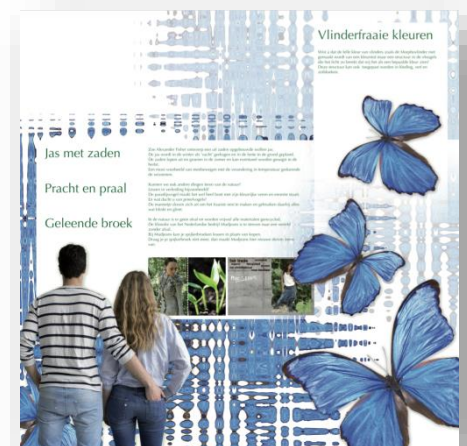
This farm is a station for children's books that move around. You take a book home and let it roam again. In this way, books also have a second life. Ask at the reception!

Butterfly colour beauty

And did you know that the bright color of butterflies like the Morpho butterfly is not caused by pigment but by light-interacting structures? These layered structures in the wings produce color by reflecting only certain light wavelengths. These structures can also be used in clothing, paint and canvas.

Seed jacket

Zoe Alexander Fisher designed a wool jacket made from seeds. Worn in winter to stay warm, the garment can be disposed of by planting it in the spring. The wool acts as a fertilizer for the embedded seeds, which grow into food-producing plants throughout the summer. In the fall they are ready for harvest. A wonderful example of adapting to changing in temperature over the seasons.



The power of seduction

What else can we learn from nature? Maybe lessons in seduction? Males of the bird-of-paradise have very colorful feathers and a long, striking tail. That way they can seduce the ladies. And what about the bower bird? The males wear themselves out to make the most beautiful nest using everything that glitters and shines.

P6: Biomimicry & Architecture

Termite conditioning

How to create a building that remains cool without a power consuming airo? That is a challenge for many architects in African countries. The designers of the East Gate Centre in Harare (Zimbabwe) looked at termite mounds for inspiration. Despite the great temperature fluctuations outside, the temperature inside the termite mound remains relatively constant. That is why the designers based their ventilation system on the termite mound.



Bird friendly glass

Each year thousands of birds fly against a window. That's because they can't see the glass. A German company developed special glass which birds can see: ORNILUX glass. This glass is inspired by spiderwebs. The strands of the web have a special coating that reflects UV light. Because the birds can see this they will not accidentally destroy the web by flying through it. ORNILUX glass has the same kind of coating. We can hardly see it, but birds very well!

Strong honeycomb structure

This carton is based on the structure of a honeycomb. The honeycomb shape is very efficient. To make it you don't need a lot of material so it is lightweight but also very sturdy. You find a likewise efficient form in stems of plants and in bones (hollow yet sturdy). We humans have imitated this, for example in U-profiles and tubes.

Bees

the honeycomb as source of inspiration



Honeycombs consisted of wax. Bees make this wax out of pollen and nectar. To make 100 gram beeswax they visit 6 million flowers. The bees must therefore built very efficient . Therefore, the combs consist of hexagonal cells. Hexagons are also very strong and there is less material needed than for squares. Even airplane wings owe their firmness to hexagonal structures. Light yet strong. Do you recognise the hexagon in the picture on the right?

Do you want to see how the bees build these combs? Check out the bee cabinet on first floor of our building.

P7: Biomimicry & organisations

Busy bees without a boss

A beehive consists of millions of bees. They work together very well with no real control. The queen bee is not a leader, she just lays the eggs. Bees are extremely task-oriented and there is a lot of self-direction in a hive. That is why bees are a source of inspiration for self-management in organizations. Companies such as the Dutch organization Buurtzorg are experimenting with self-direction and more freedom for employees.



Giant cooperation

In the California coastal forests grow the giant Redwood trees. They can be well over 100 meters high. Not only the size of these trees are impressive, but also the way in which they cooperate. Via the roots the trees are connected to an intricate network of hyphae. The trees have an intensive cooperation with the fungus (mycorrhiza) for obtaining minerals and water and delivering glucose. The pursuit of 'partnerships' is characteristic for ecosystems such as a forest. There is even more cooperation than competition. Companies could learn something from this!

Life's Principles (tree)

Peek into the holes in the 'Life's Principle tree and find out more!!



Evolve to survive

Smart use of mistakes

The wrinkled skin of the African Elephant is a result of a genetic 'mistake'. This mistake appeared to be very profitable for the Elephant. Wrinkles means more skin surface meaning more ability to cool down. Due to the process of natural selection nowadays all African elephants have those skins.

By trying to produce a super strong new glue the scientists of glue producer 3M make a mistake. This resulted in a not so strong glue that was very easy to remove. 3M didn't toss out this idea but kept it for later. Then the well-known post-it was born!

Be locally attuned and responsive

Like all plants do Dandelions are using local available materials and minerals to grow on. They use the wind to spread their fluffy seeds.

There are stairs and dancefloors that produce energy by using the movement of people dancing or walking on it.

Integrate development with growth

The first weeks after fertilization a mammals embryo is balancing between development and growth. Organs and tissue is development and at the same time the embryo grows bigger. A good example of integrated growth.

Cities and neighbourhoods that allow services to develop at the same time that the city grows bigger have less trouble than new urban areas without services (shops, public transportation).

Use life-friendly chemistry

Biodegradable and edible

Nature in general uses life friendly materials and that is also the case for spiders. Spider silk is not only very strong it is also edible. When a spider wants to get rid of the web or wants to make a new one, the spider simply eats it and starts all over.

More and more products are biodegradable. There is Styrofoam made of potato's. Pens made of corn flour and have you seen those edible coffee cups?

Adapt to changing conditions

Same idea.... other outside

The Arctic fox and Arctic hare have a nice brown 'coat' in summer and change this coat in the winter for a white one. By changing the colour of their furry coats they have the right camouflage for the season.

It's not so long ago that we only used real shops to go to and buy all our products. Since we have internet shop owners adapt to this new situation by setting up online stores.

Stoat

Surviving by adjustment



*Het is niet de sterkste, of
de slimste die overleeft,
maar degene die zich het
beste kan aanpassen aan
veranderende
omstandigheden.*

Charles Darwin

As the days become shorter the coat of a stoat will change colour. In a white winter landscape the animal is less visible and therefore better protected. A chameleon can immediately adjust the colour of his skin. Adjustments increase the likelihood of survival. Companies learn from this. Only organizations that can adapt to new developments survive.

Climate change forces us to make adjustments. Pigs like to take a mud bath at heat. Nice cool, against lice and ticks and it prevents them from burning. Just take a look!

Be resource efficient

Leaves of deciduous trees colour in fall. The reason they colour is because the tree withdraws all chlorophyll into the branches. Chlorophyll is highly valuable and nitrogen-rich so for the tree it's beneficial to store and recycle it.

Taking back and recycling of products like washing machines, cars, bottles and plastic are all good examples of efficient use of resources.

Colors

colouring without pigment



Birds often have brightly colours and specially the males to impress the females and put off other males. Sometimes these striking and bright colours do not contain pigment. They are created by minuscule small plates that reflect the light. The position of these plates determines the colour.

Factories have already developed cloth and cars that do not contain chemical dyes but use this type of reflection. A sustainable solution.

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Scents and colours

signal for friend and enemy



Flowers lure insects with scents and colors. In search of food these insects take (on the side) care for the fertilization of the flower. Strongly smelling plant species will repel animals . Ants, for example, hate garlic, maggi and chives. This prevents the plant from being eaten. The development of pesticides in agriculture looks at what we can learn from it.

Please take a look at our fragranace garden.

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