



Biomimetic Principles in Product Design



Nottingham Spirk Innovation Center

Located at the intersection of Technology and Design



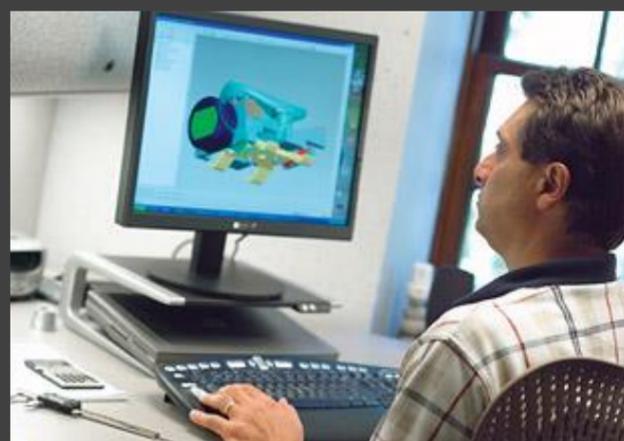
The Business Innovation Firm

the team



Nottingham Spirk Associates' average tenure is 15 years and average 24 professional years

Nottingham Spirk Innovation Center



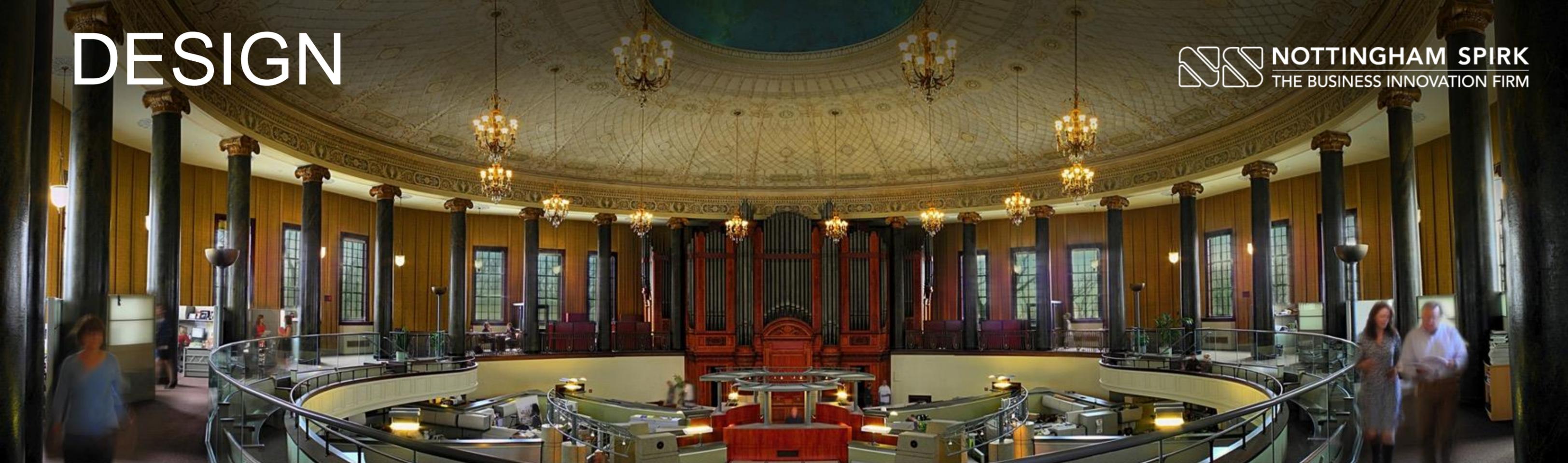
Combine facilities for Vertical Innovation™

Insights
Branding
Design
Engineering
Prototyping
Sourcing



DESIGN

 **NOTTINGHAM SPIRK**
THE BUSINESS INNOVATION FIRM



DEVELOP



Over 1,000 commercialized patents



Expanding our
innovation process





How would nature solve this?
biomimicry

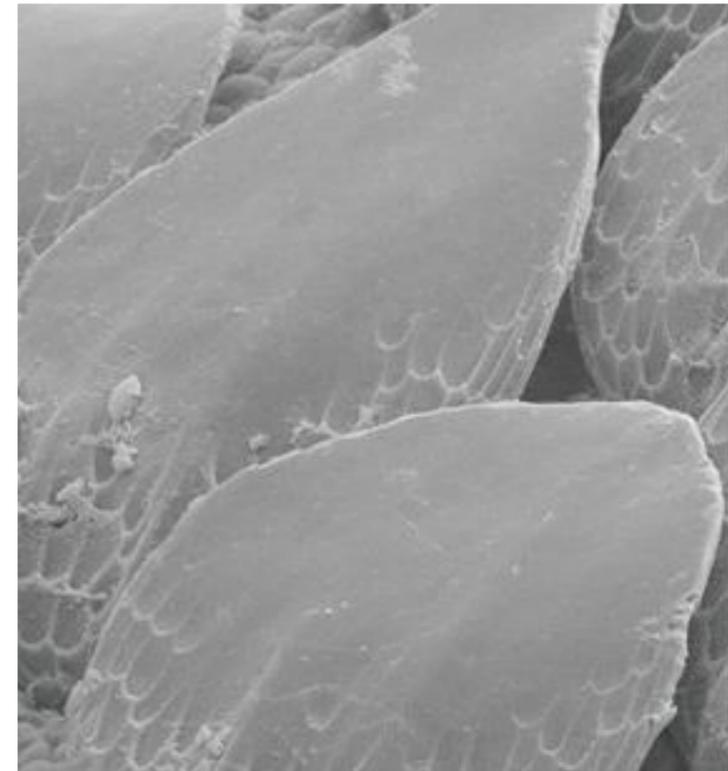


Sparking innovations with Biomimicry

Through biomimicry, we can borrow from the solutions nature has developed over 3.8 billion years.



With its large head and extra-long beak, the kingfisher became the model for the nose cone of Japan's 500 Series Shinkansen bullet train. This eliminated the shockwave when exiting tunnels.



Shark skin is covered with microscopic patterns which help reduce drag and inspiration for sailboat "Stars and Stripes" to win at the Olympics and America's Cup.



Biological Models

How does nature
insulate?



Flowers of Snow Lotus plants have a thick, furry structure that insulate them from the cold

How does nature
color?



Butterfly wings have nanostructures that reflect light which creates color

How does nature
block moisture?

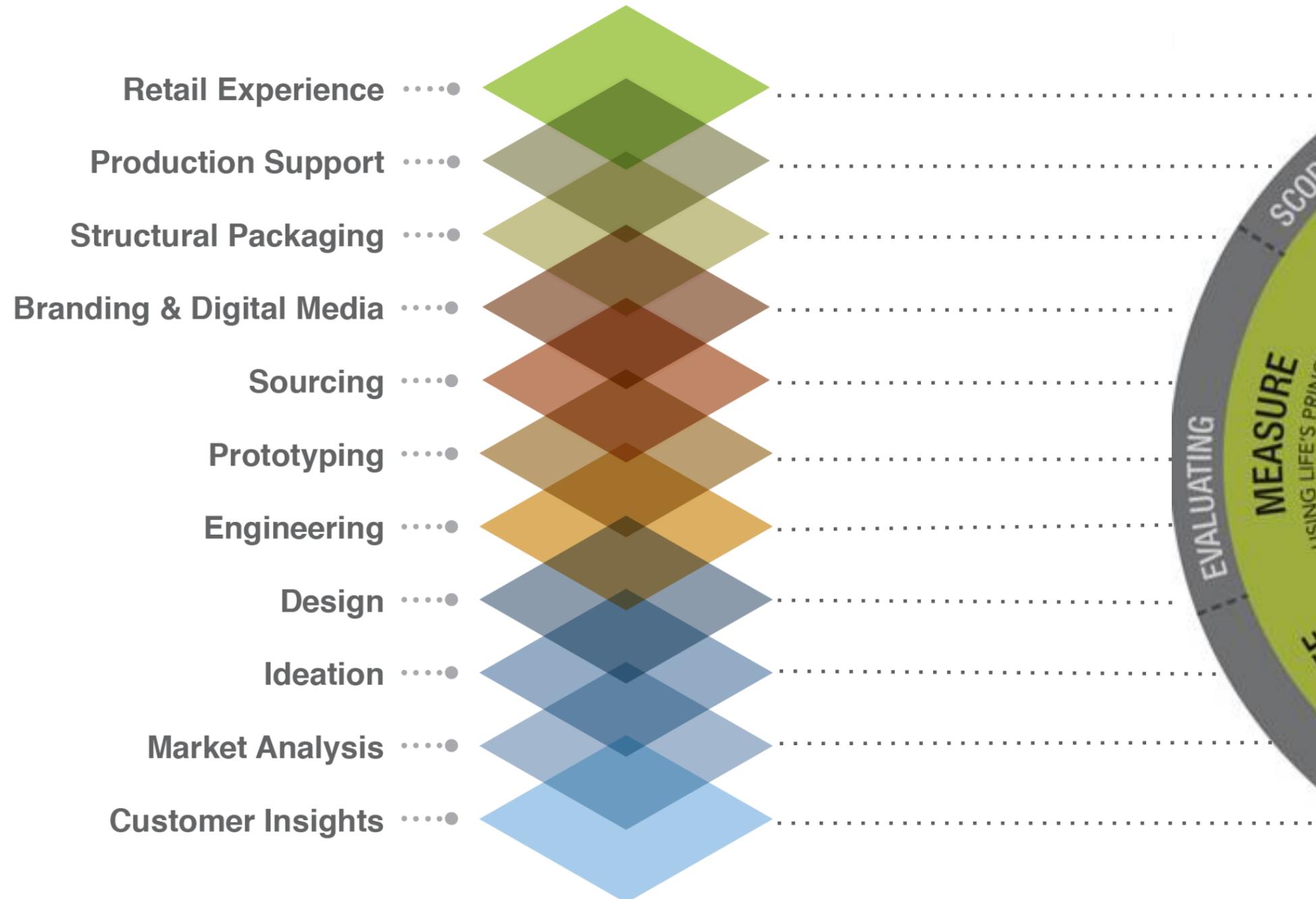


The Crane Fly has tiny hairs on its legs, wings, and body that repel water

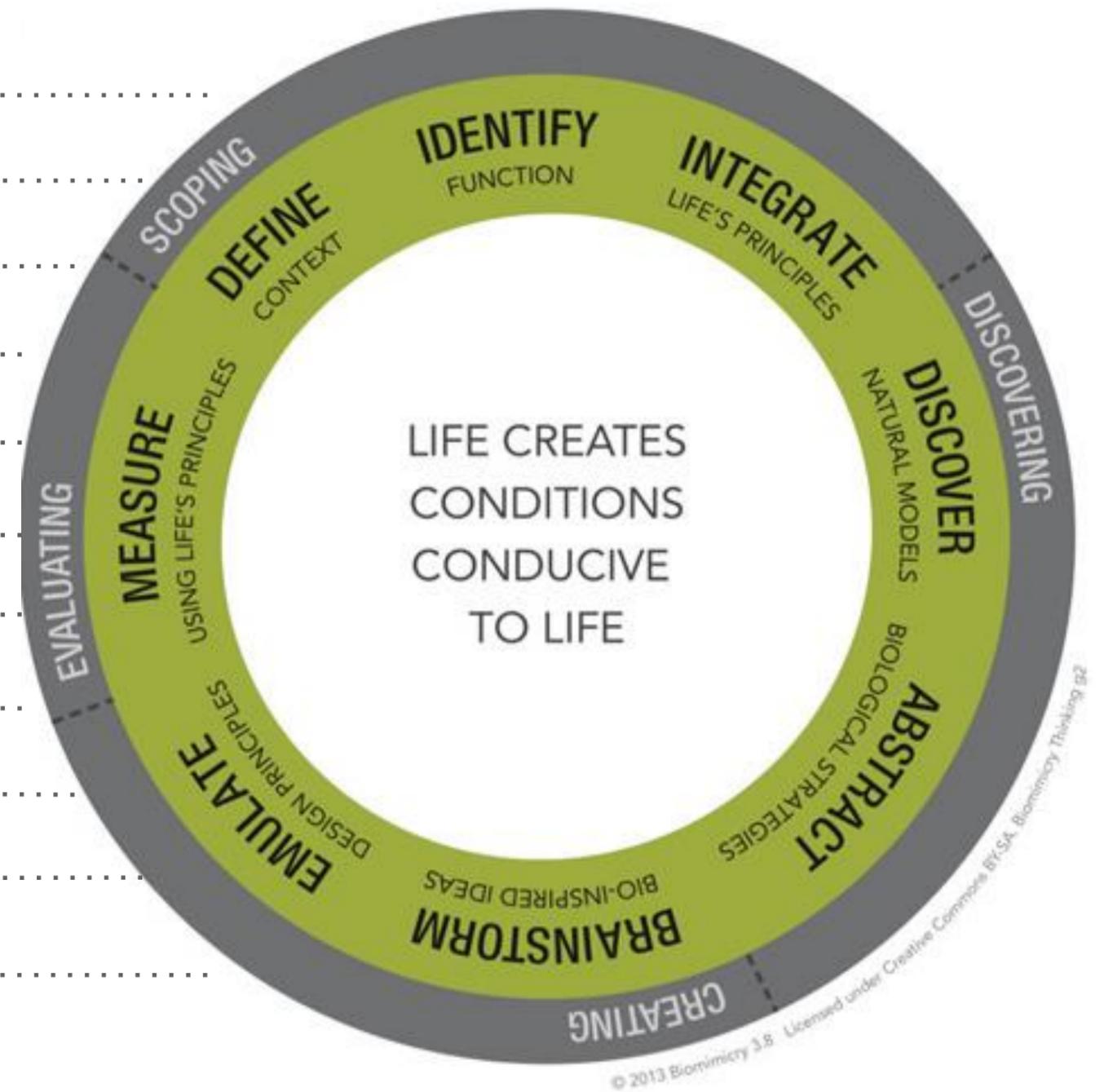
Vertical Innovation™

Vertical Innovation Development

Streamlined. Transparent. Unified.



Biomimicry Thinking



Can biomimicry
help us innovate?



What We Are Currently Doing

- JN serving on GLBio Board of Directors
- NS member of Biomimicry Corporate Innovation Council
- NS sponsoring PhD Fellow from University of Akron
- NS sponsoring joint Cleveland Institute of Art and U of A biomimicry projects
- NS participating in biomimicry education workshops
- NS integrating biomimicry into our innovation process

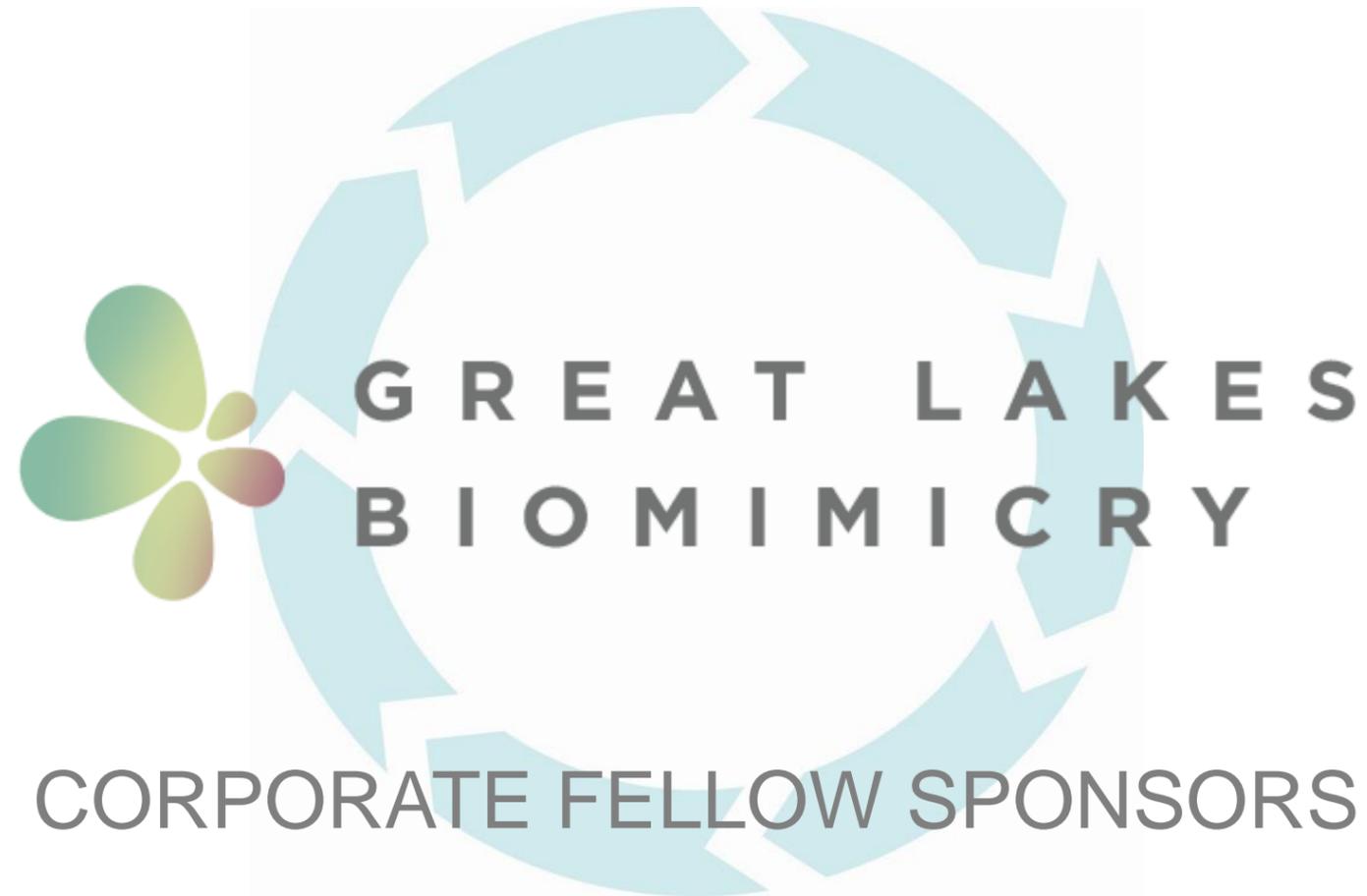
Partnership & Fellowship Program



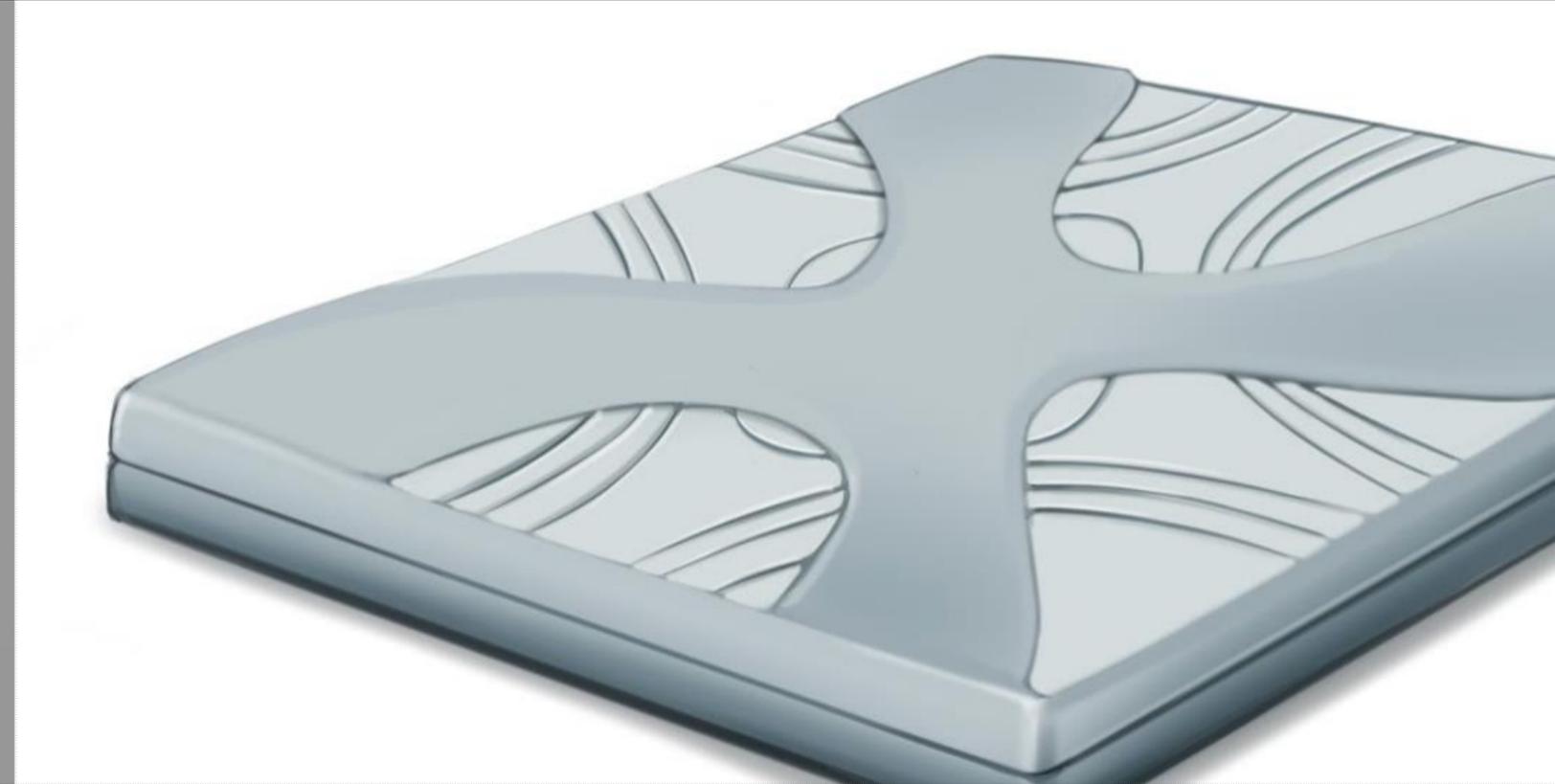
Ariana Rupp



Partnerships

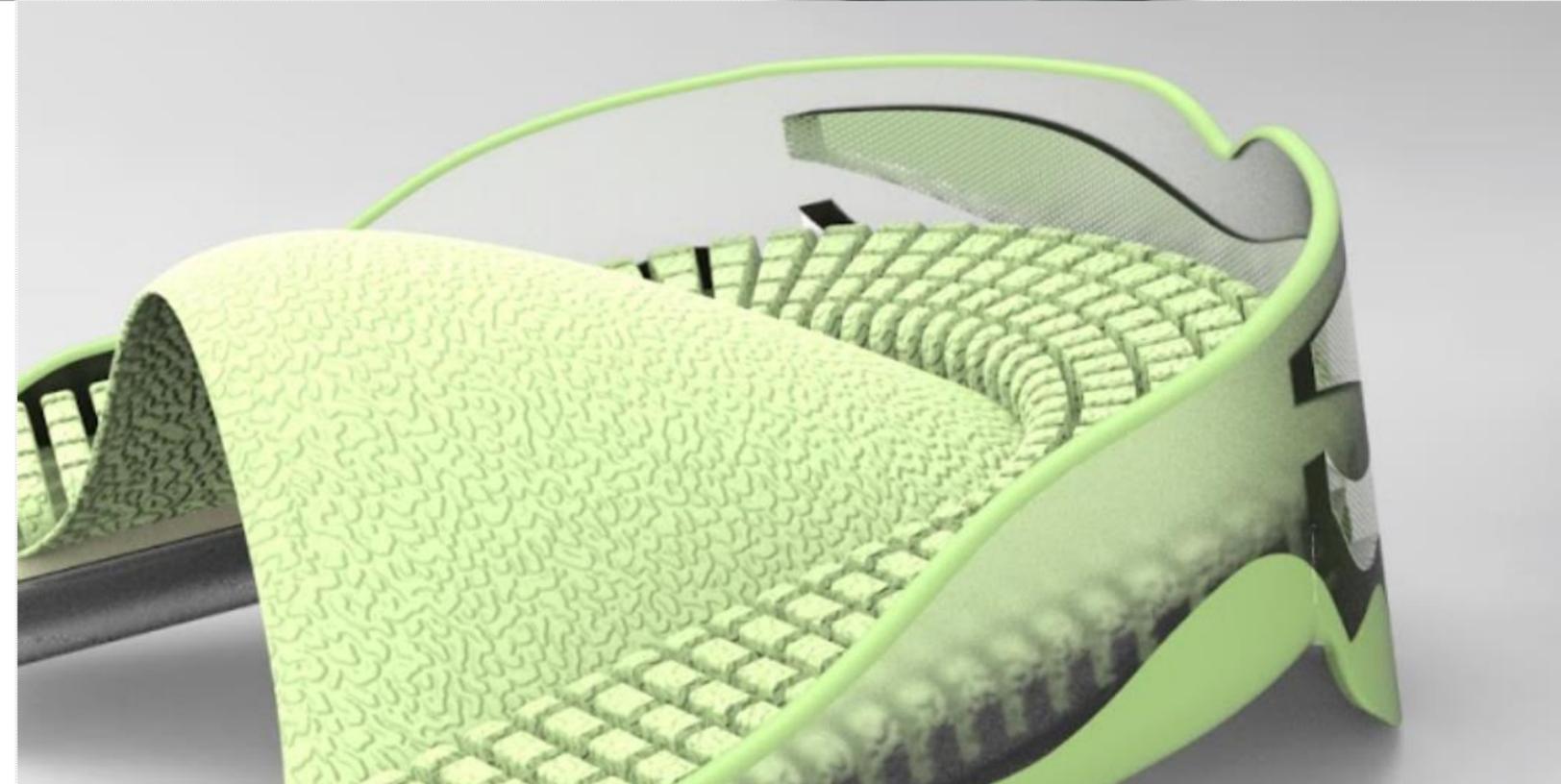


Projects

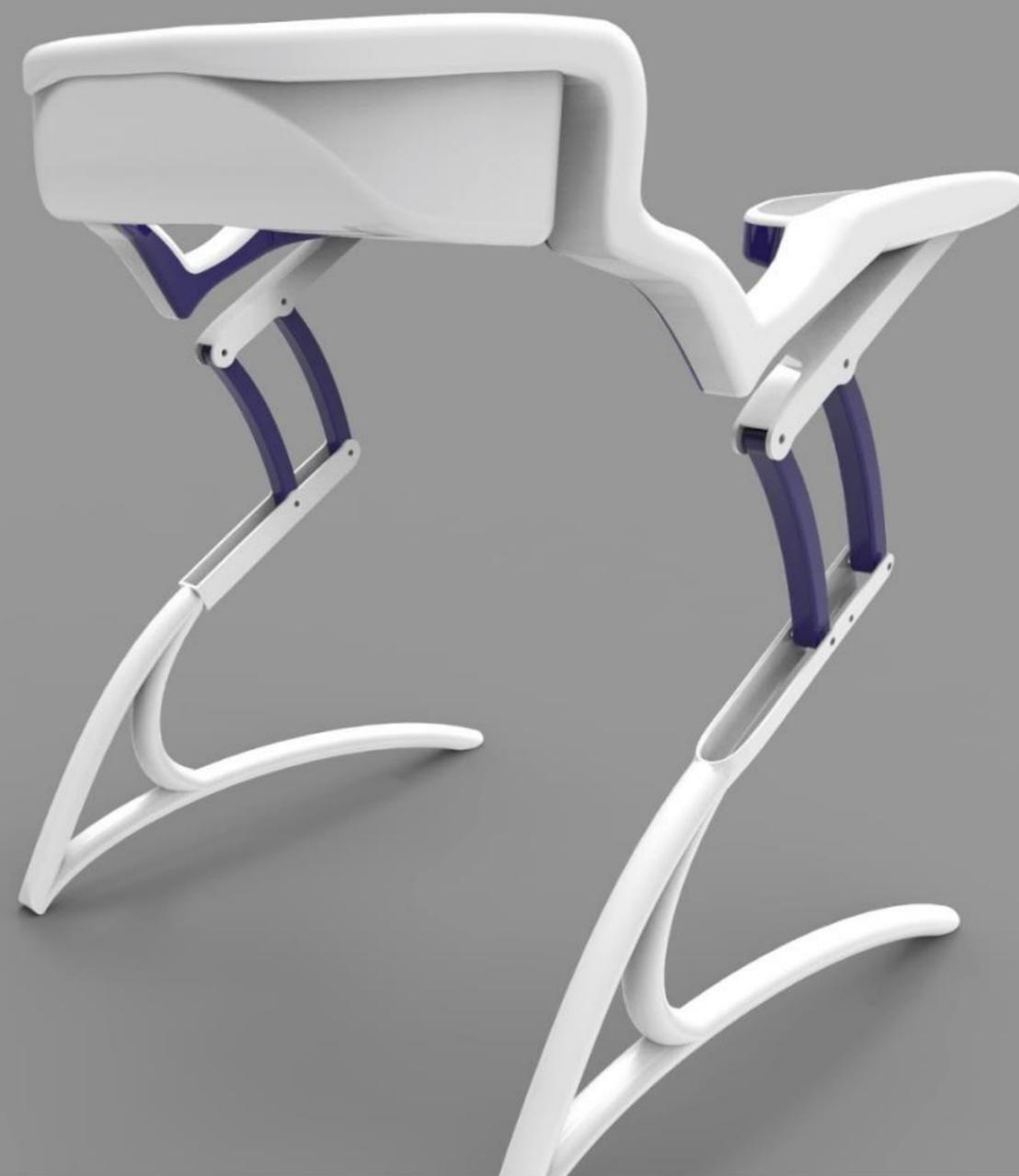
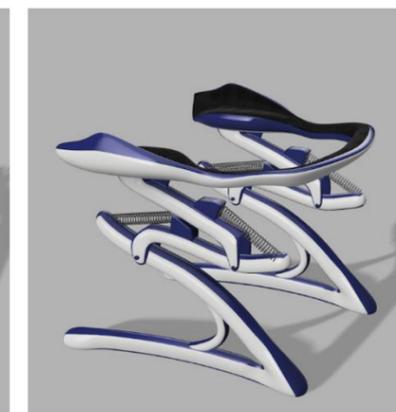
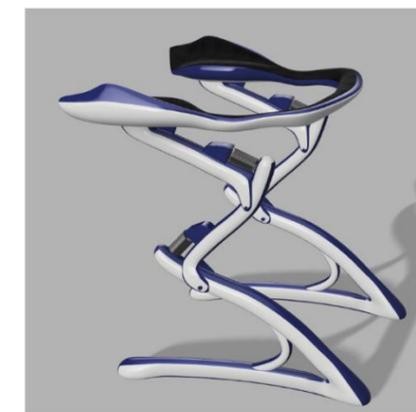
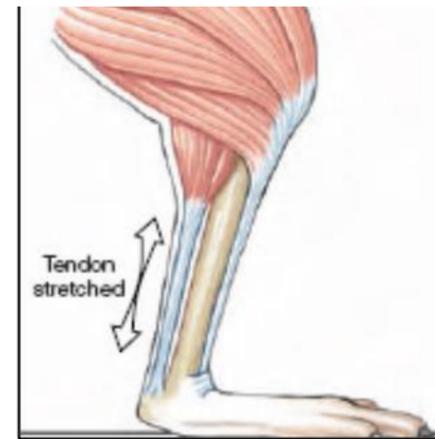


CIA
Cleveland Institute of Art

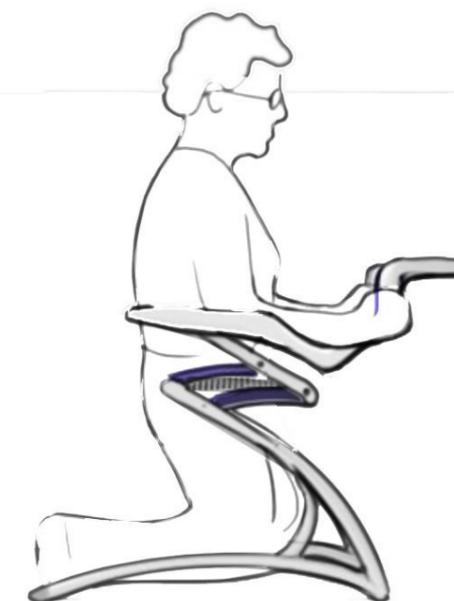
**The University
of Akron**



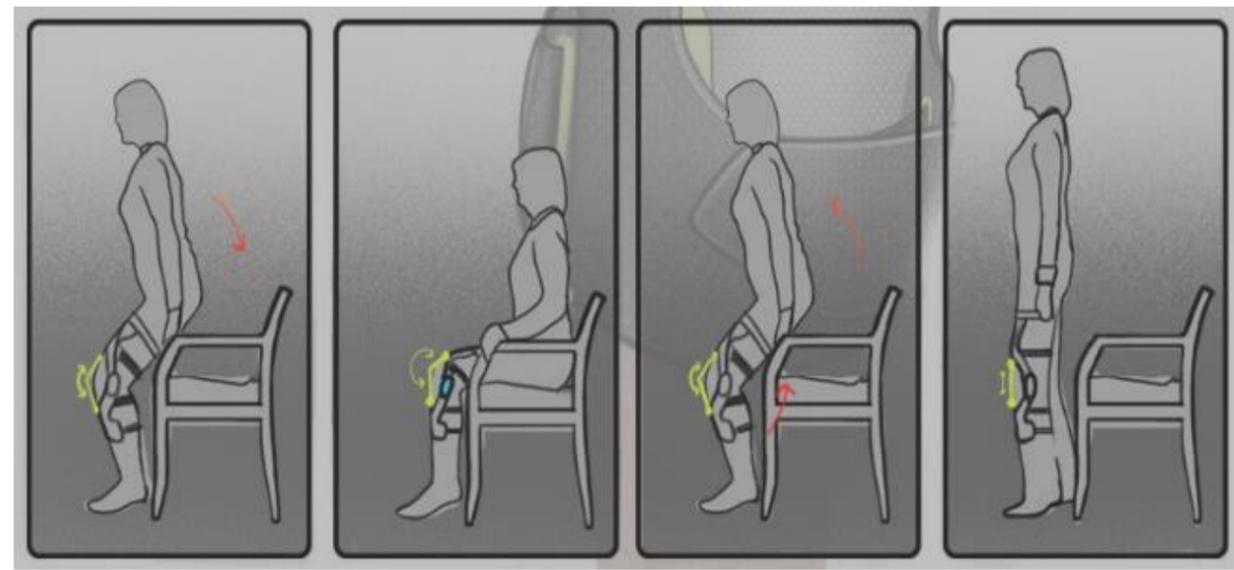
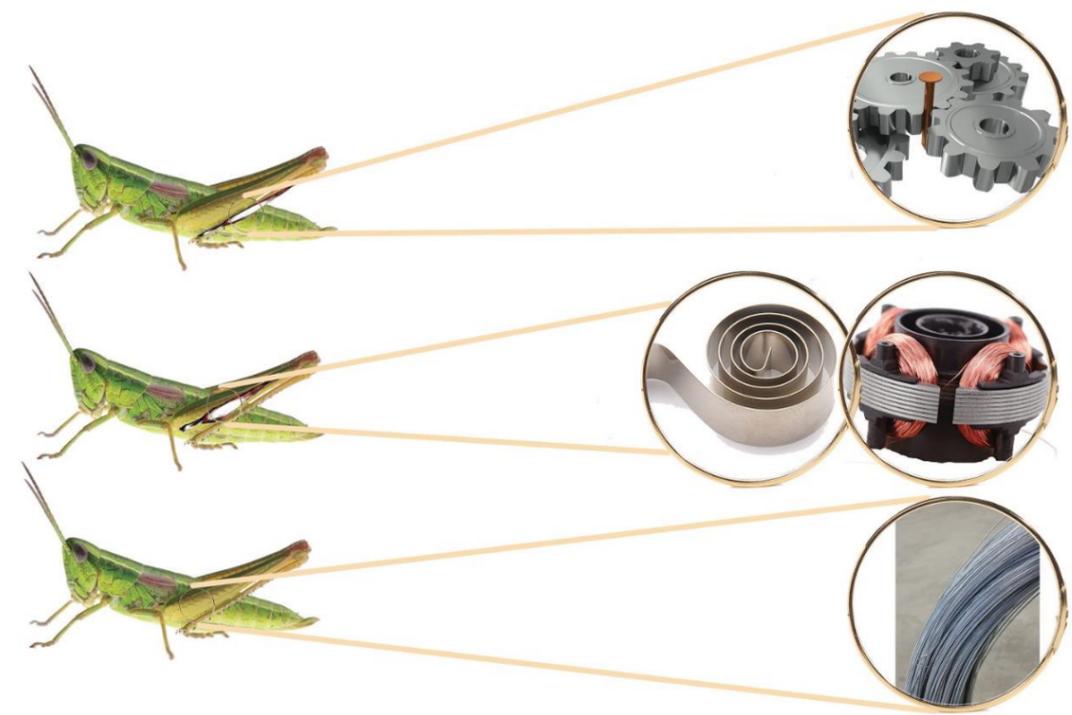
A Better Walker inspired by kangaroo tendons



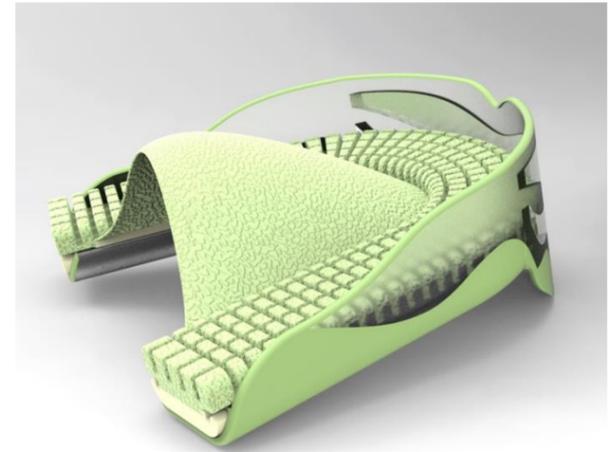
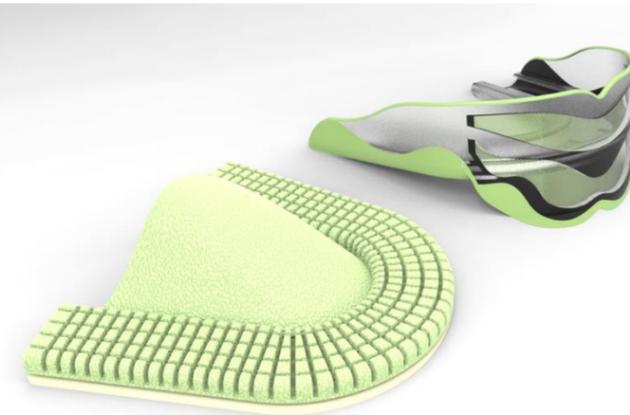
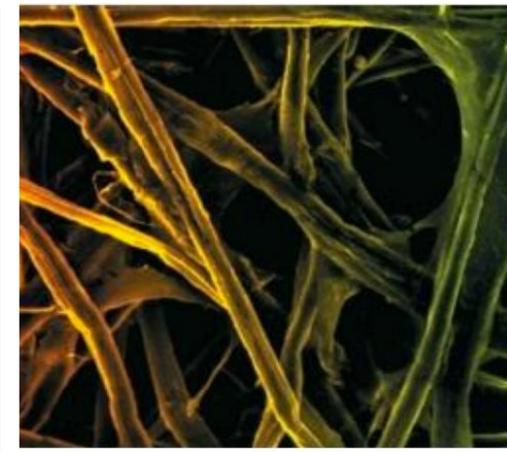
Weight supported by
elbows



Sit-To-Stand Knee Brace incorporating the spring action of the grasshopper



OraFresh Night Guard for Dry Mouth utilize moisture like cellulose and cactus

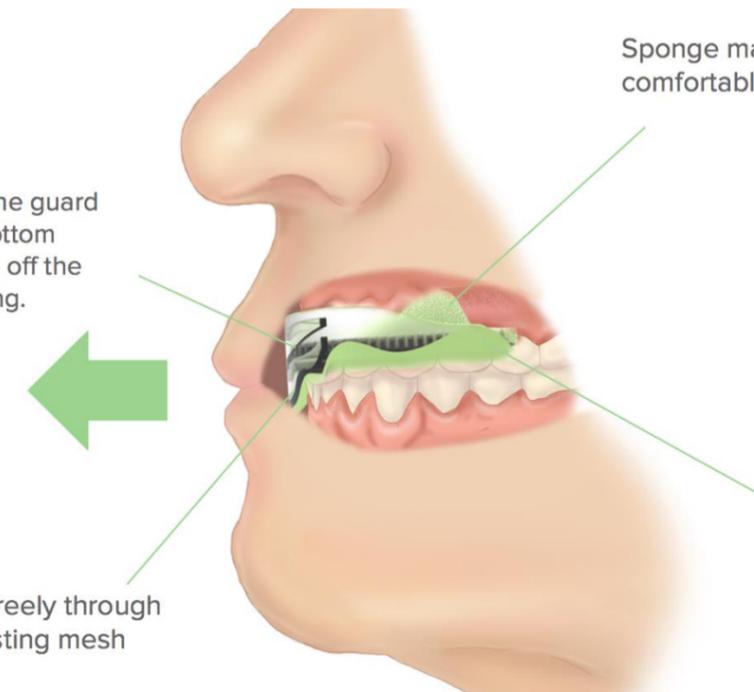


The front of the guard covers the bottom teeth, sealing off the mouth opening.

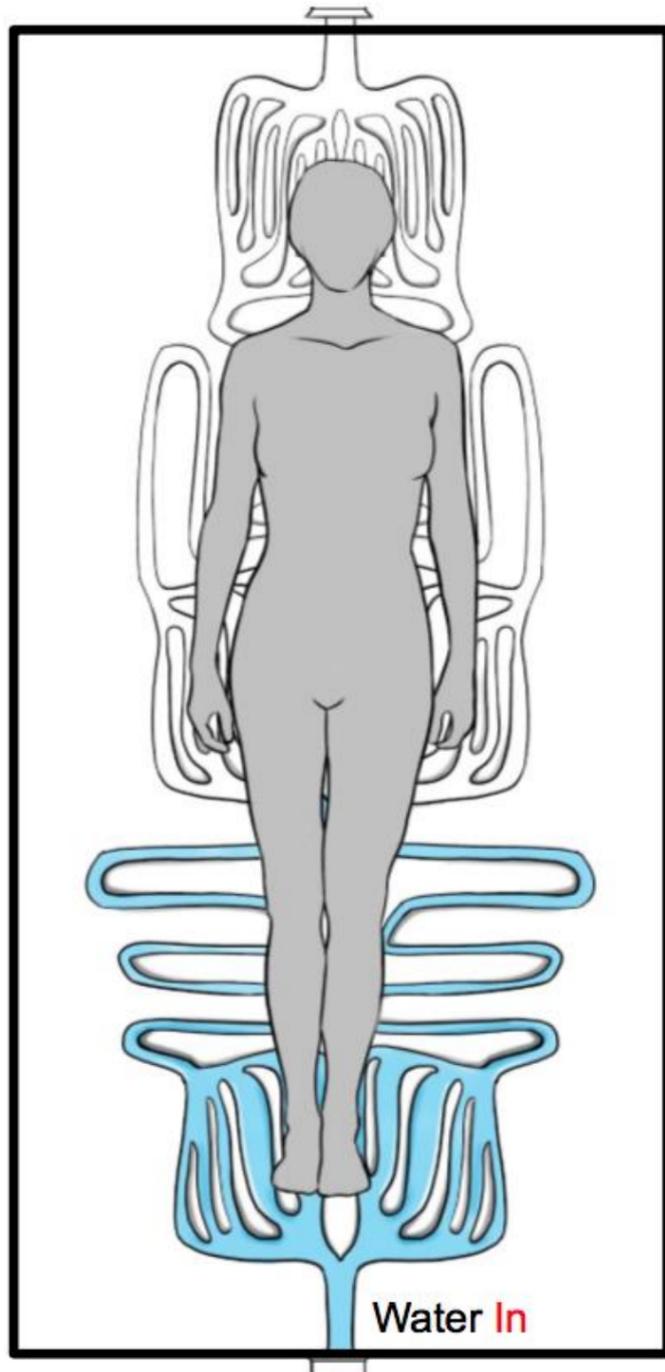
Air flows freely through fog harvesting mesh

Sponge material fits comfortably over tongue

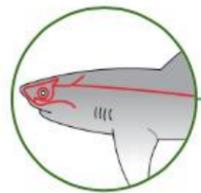
Flavor sections fit next to the saliva glands preventing dry mouth



Preventing Bed Sores using nature's heat and information exchange principles



Increased surface area to increase heat exchange

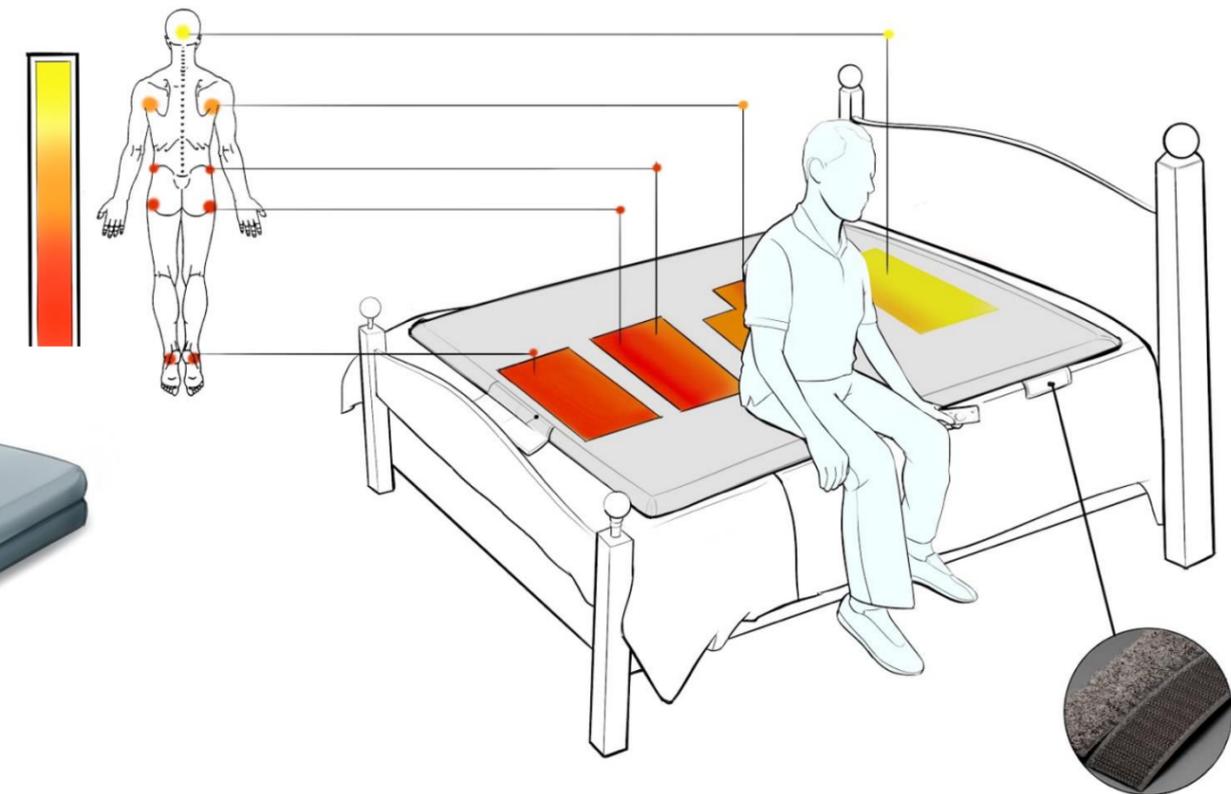
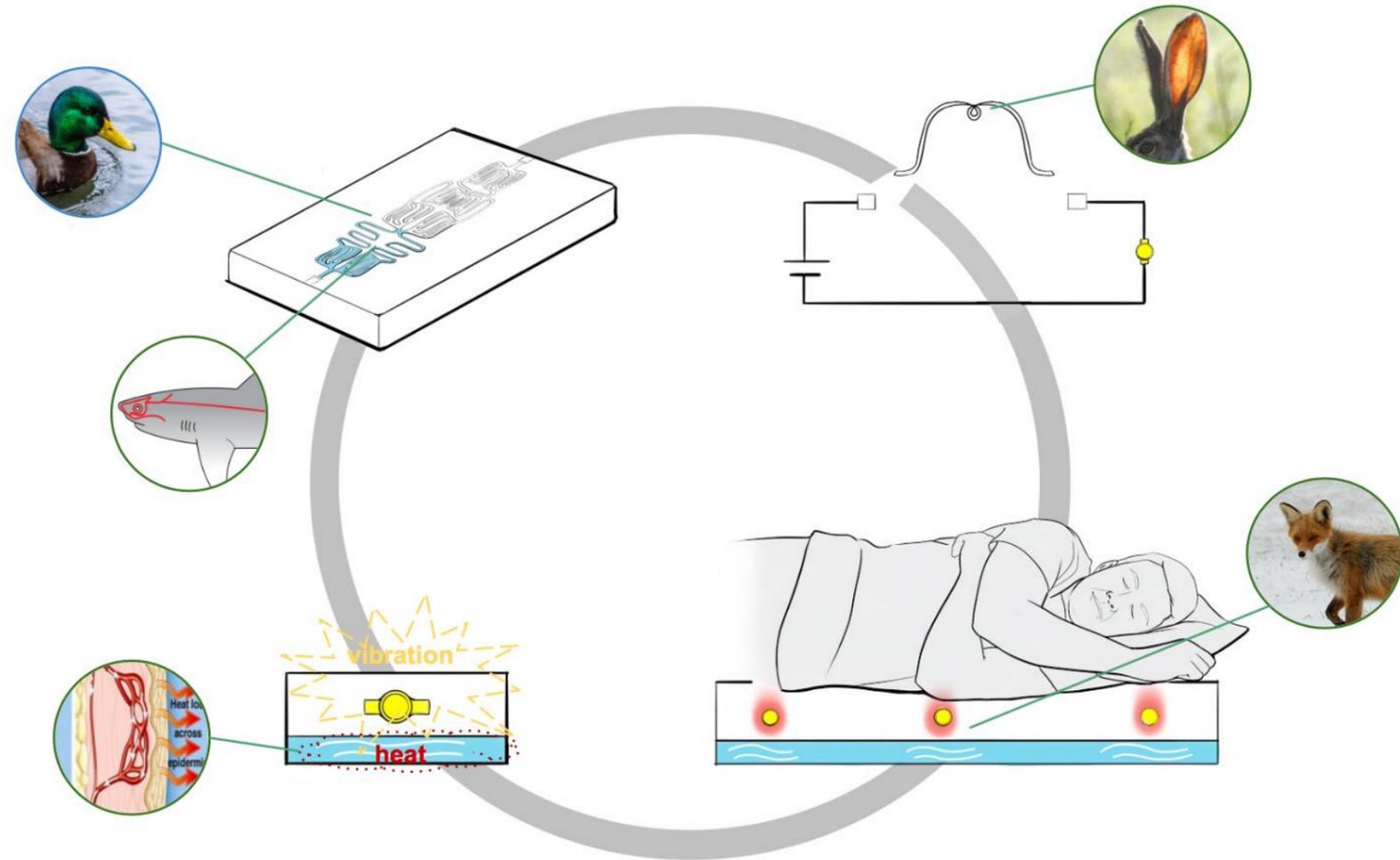


Detection in strategic places

Clustering for sensitive detection



Heat exchange from liquid channels



Can nature
validate our results?



How could nature inspire
a drip-free pour?



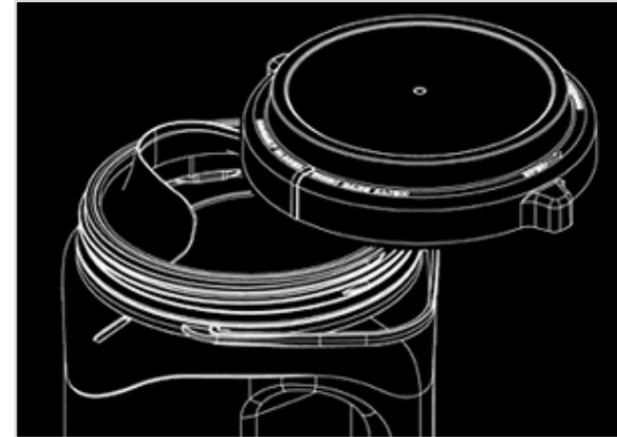
**SHERWIN
WILLIAMS®**

Validated by nature

the fluid funneling effect of a calla lily



Twist & Pour
appeals to the convenience customer



The 10 Best Packages of the Decade

– Published in **BRAND**PACKAGING Magazine



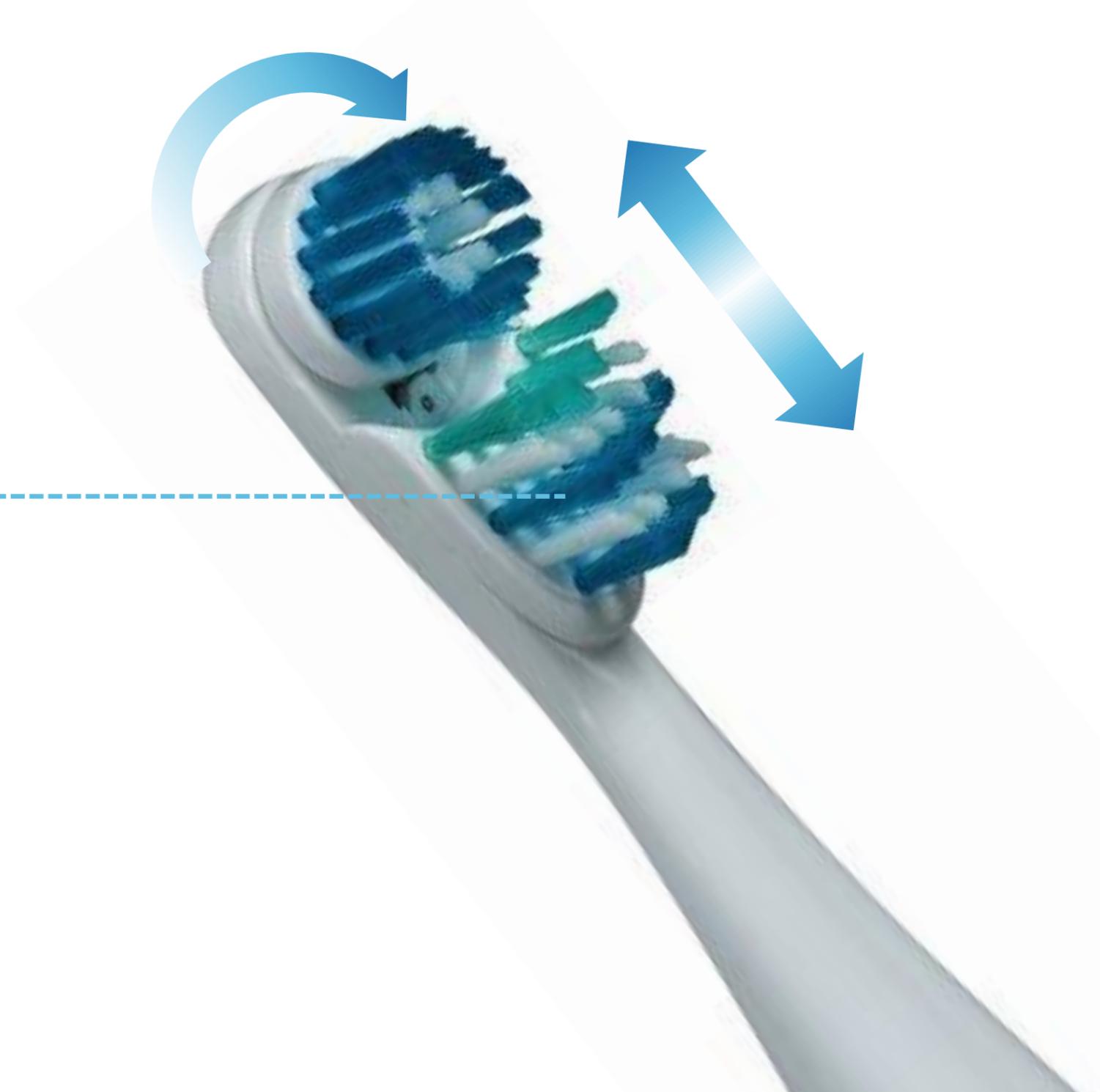
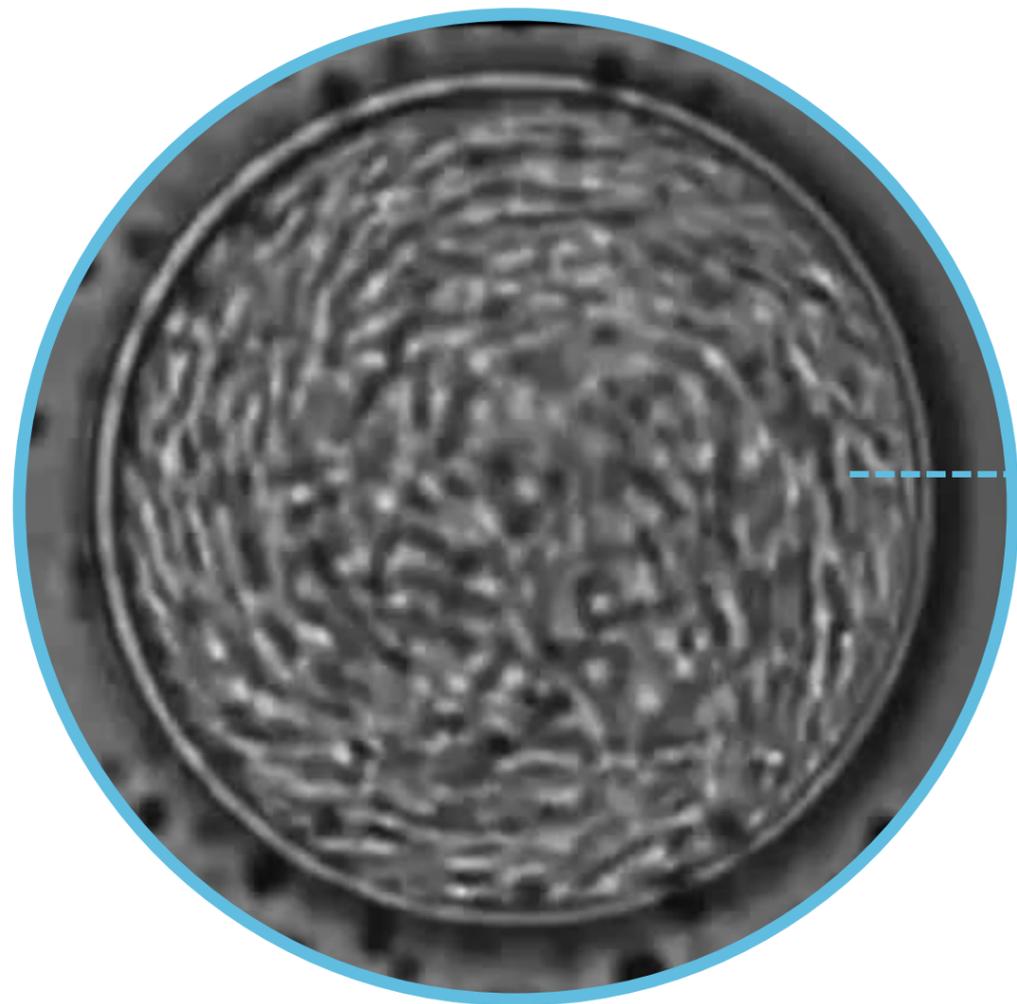
Nottingham Spirk Innovates a Better Paint Can for Sherwin-Williams

How does nature
move multi-directionally?




SpinBrush

Validated by nature
bacteria self-assemble into vortex

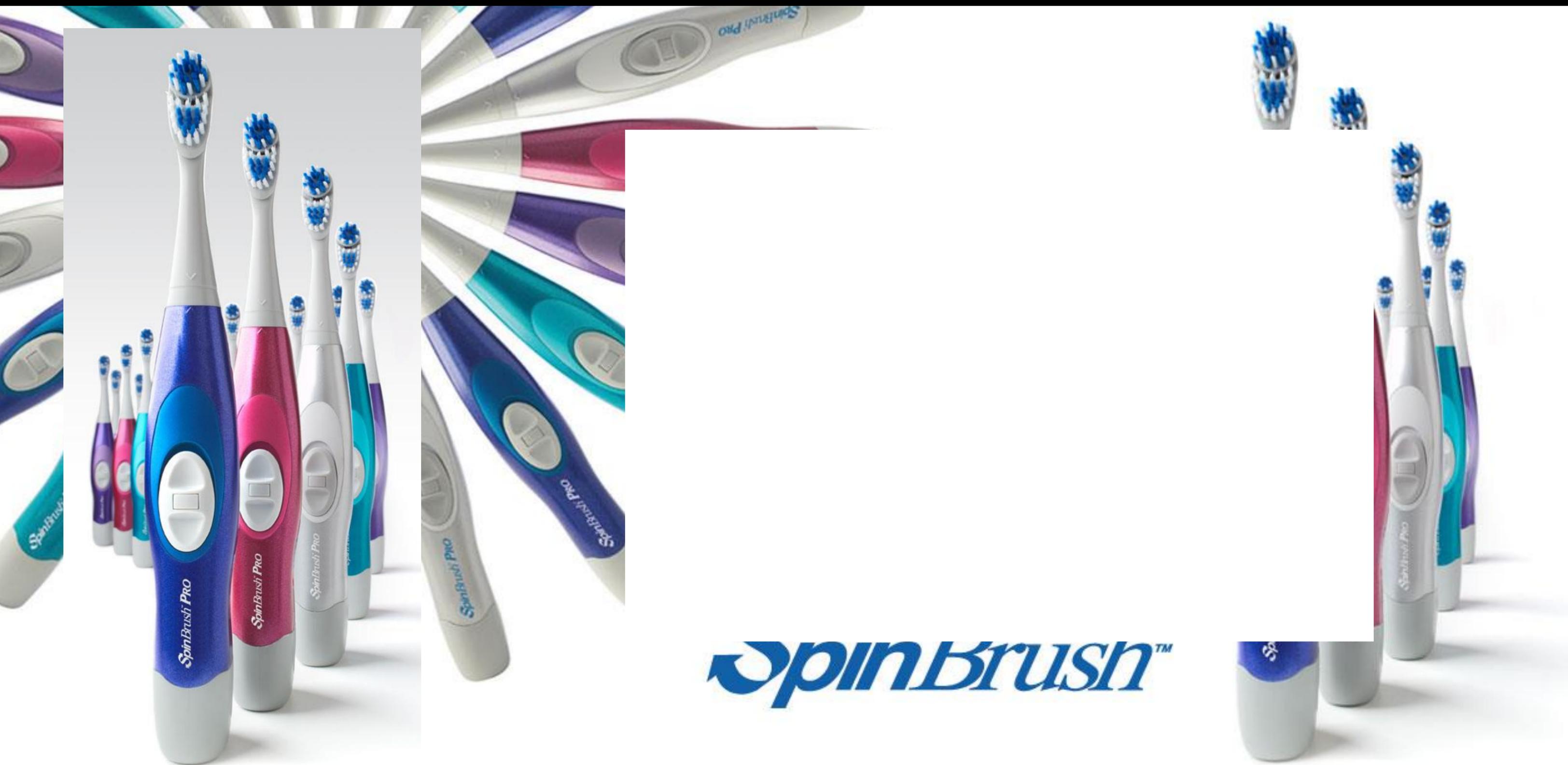


Largest Selling Oral Care Appliance

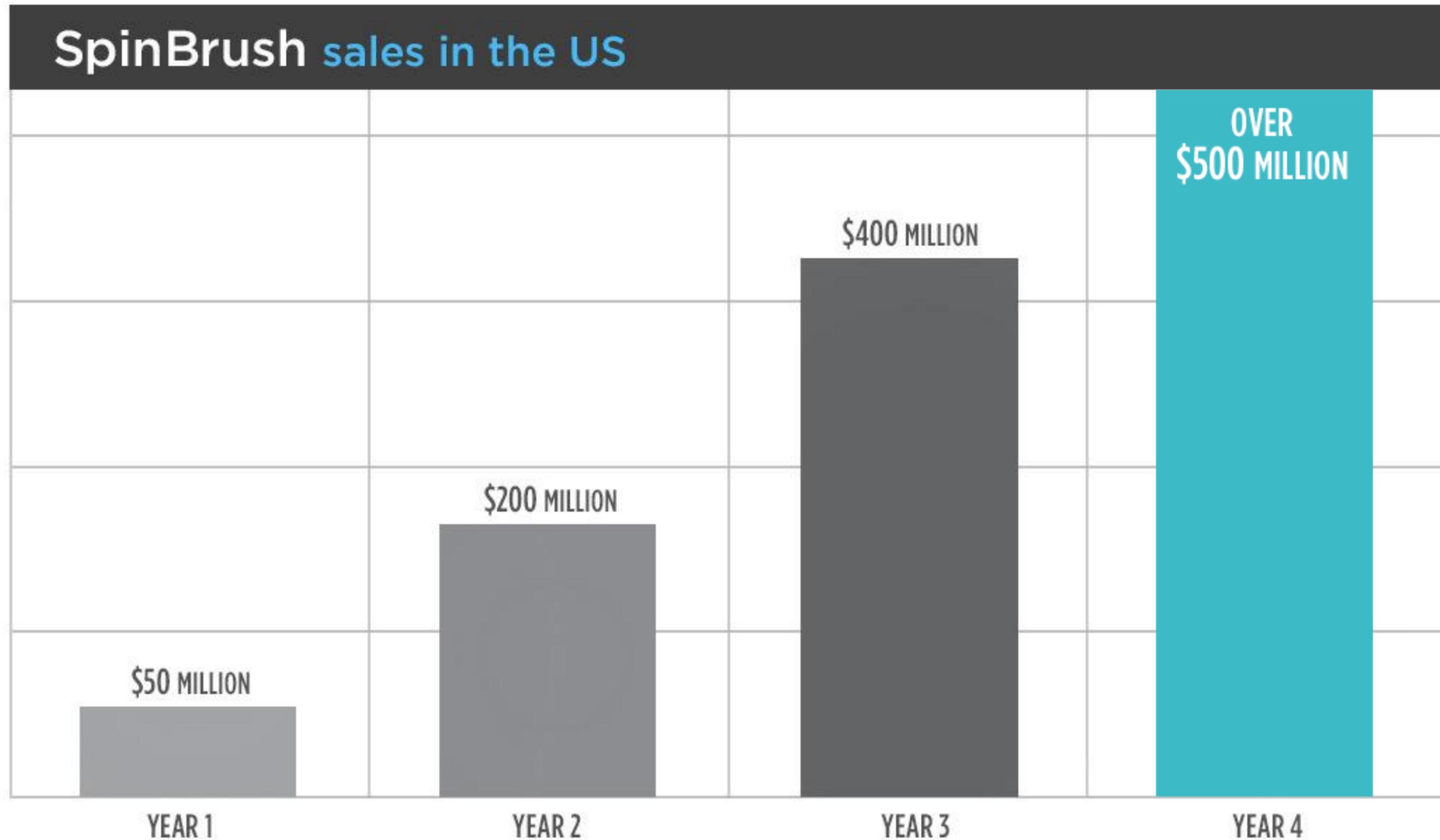


Patented "Try Me" Packaging Design

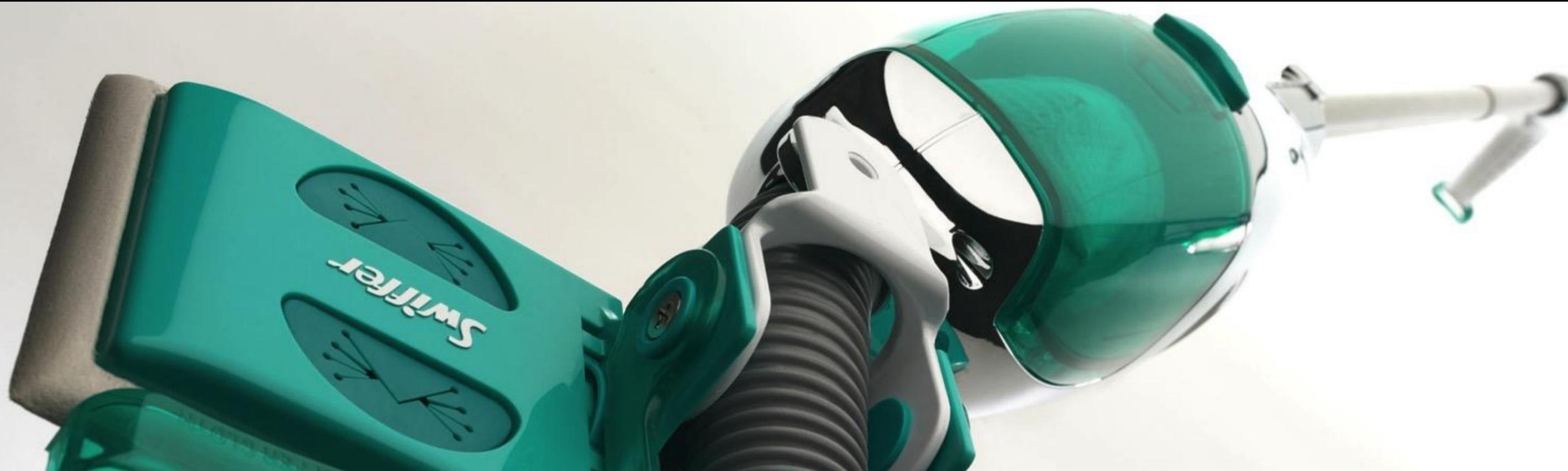
Largest Selling Oral Care Appliance



Innovation Creates Growth



How does nature
collect or attract?



Validated by nature

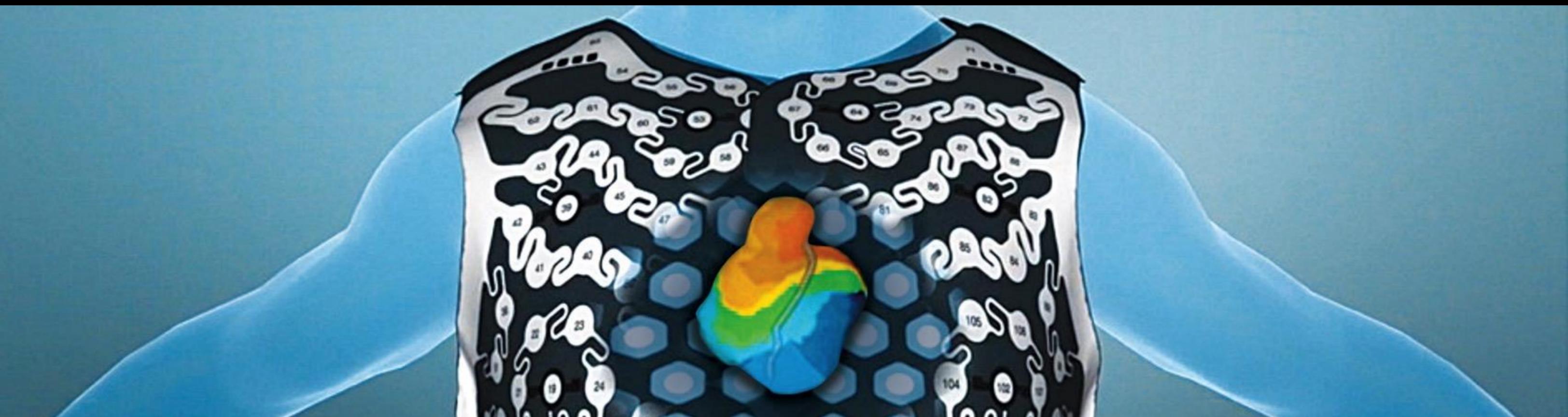
the way spiders electrostatically attract their prey



Swiffer Sweeper Vac

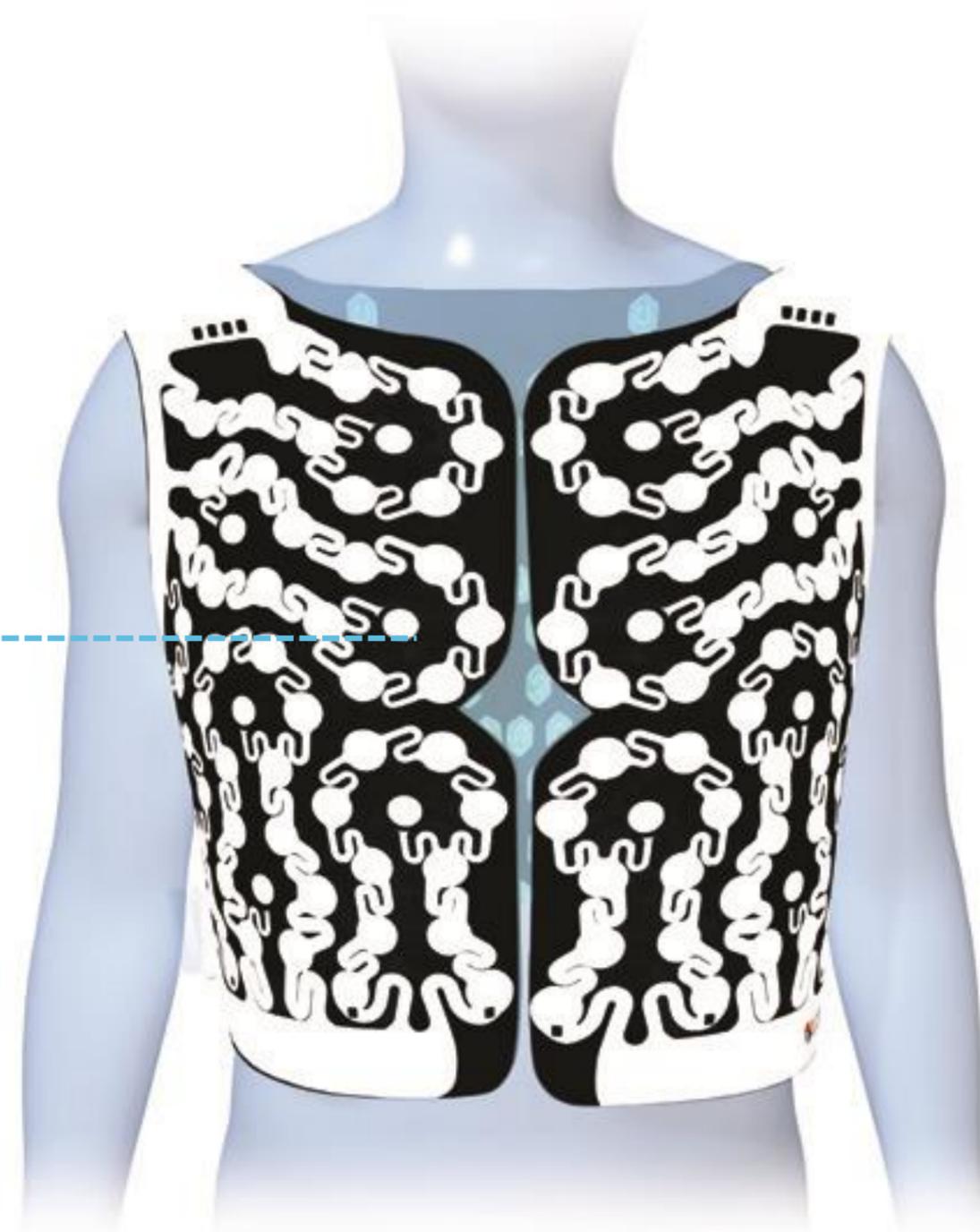


What patterns in nature could inspire
a flexible wearable?

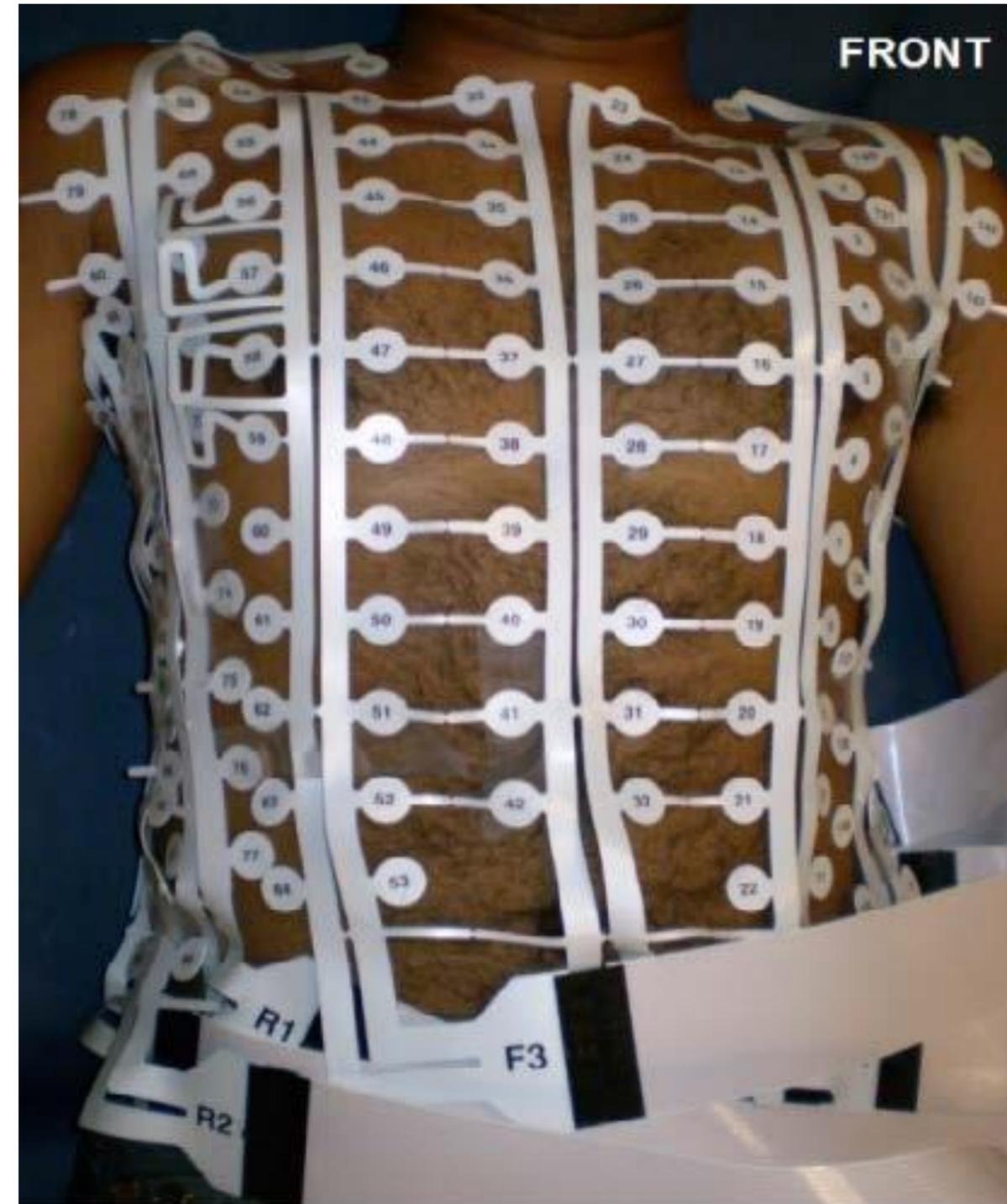


Validated by nature

the serpentine physiology of the human brain



The Original Prototype Vests



CardioInsight^{EC} VUE Vest

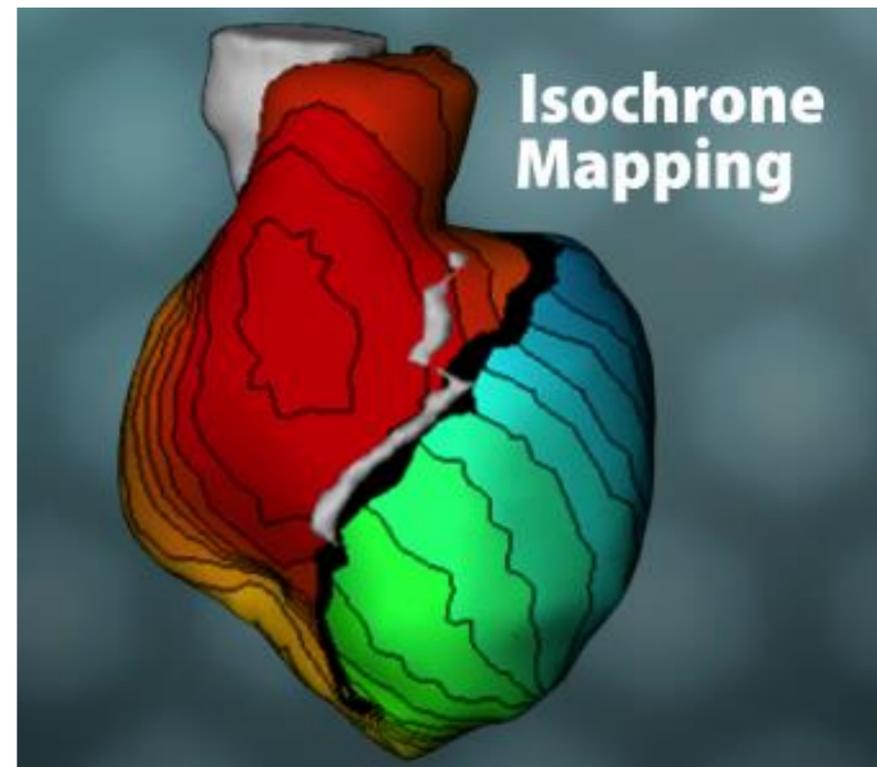
252 ECG Leads

Positive
Conductivity
Gel

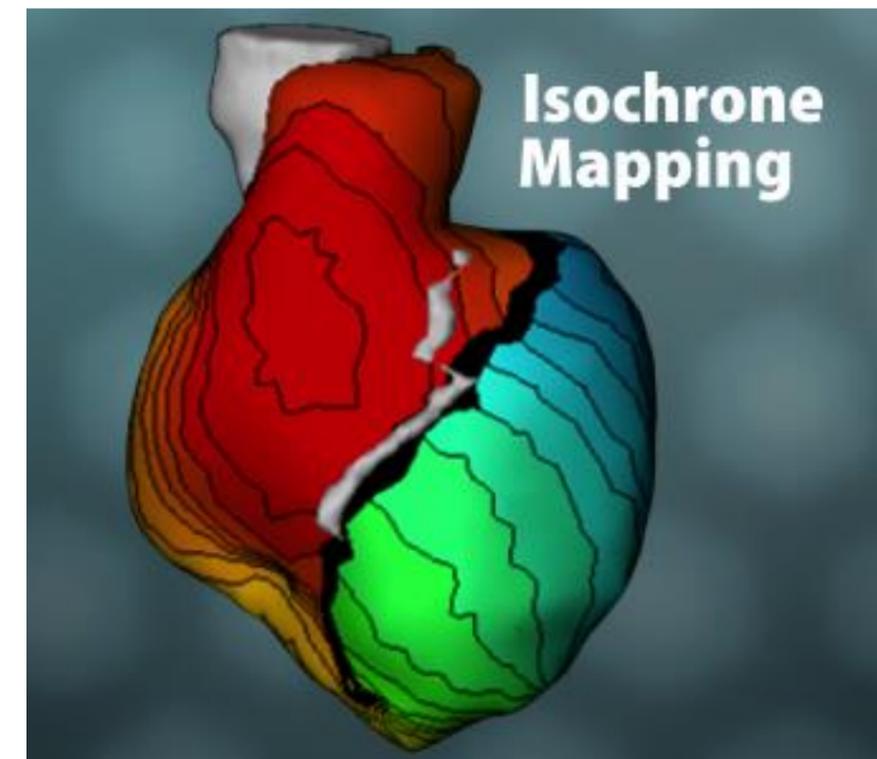
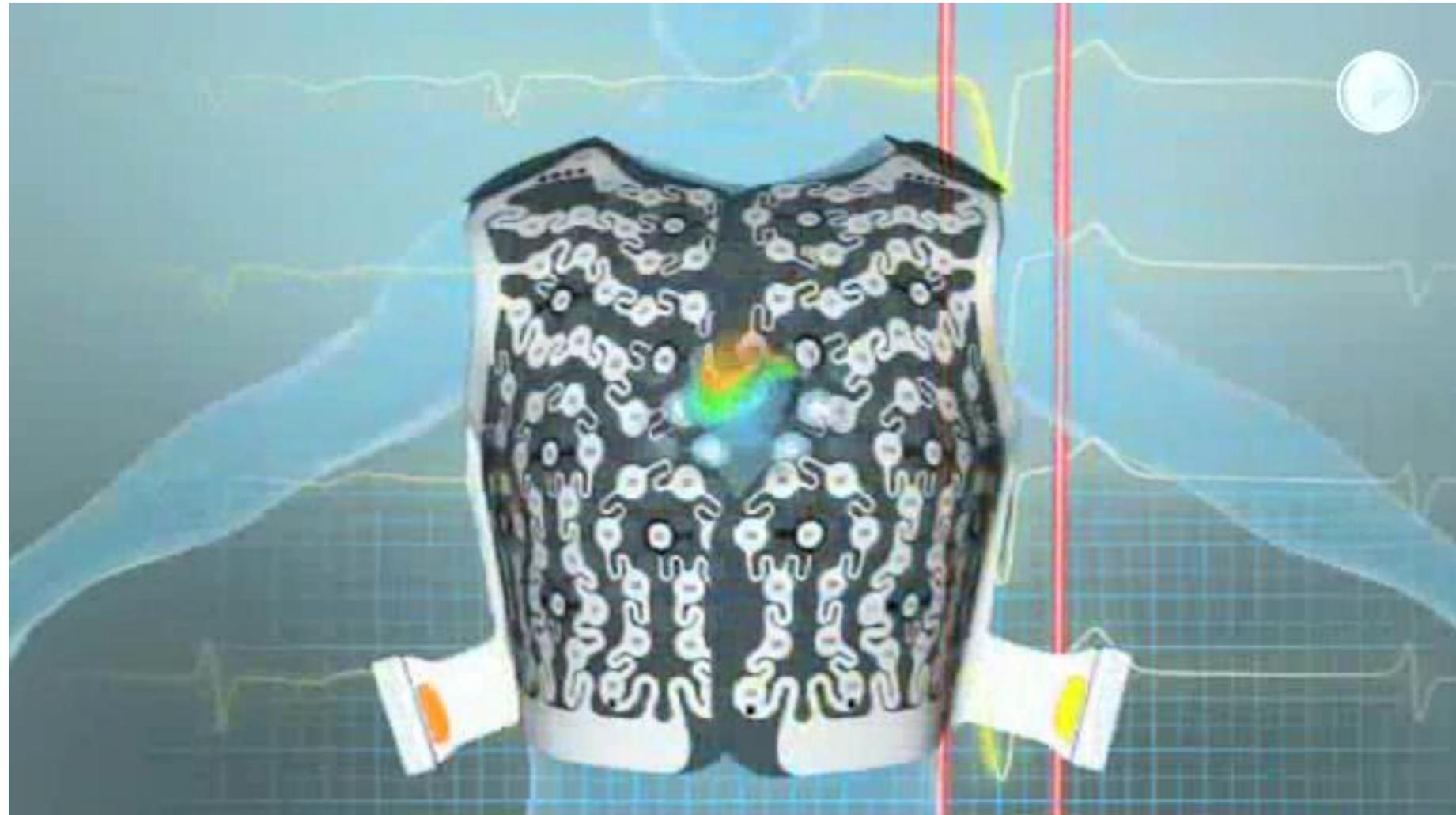
One Cable System

Flexible Fabric
Allows For
Patient Mobility

One Step
Application



CardioInsight^{EC} VUE Vest

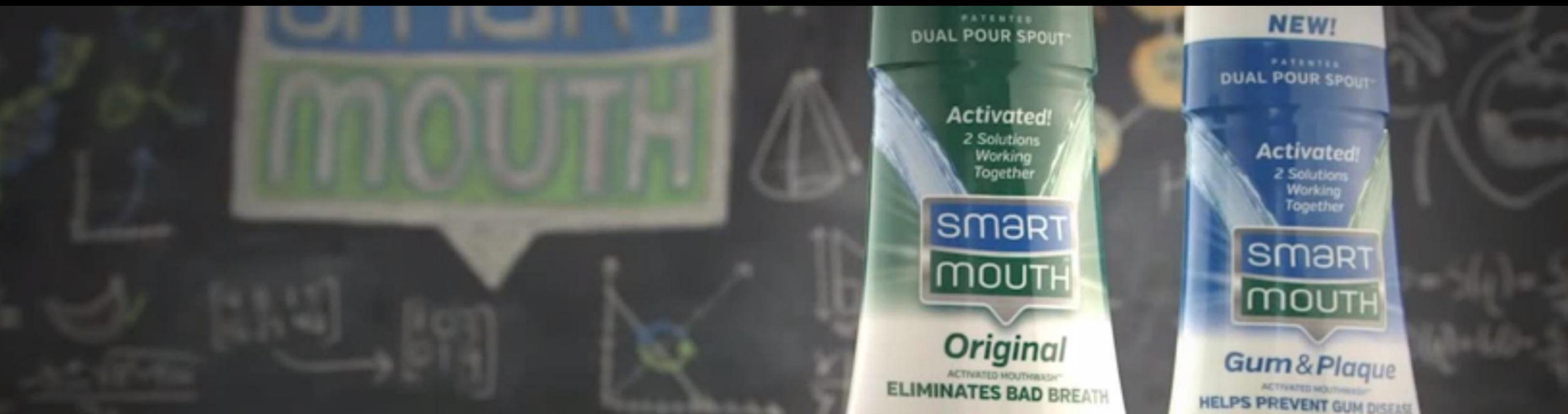


ECVUE Vest

- Replaces an invasive procedure with a low cost, disposable
- CE mark provides successful launch in Europe
- US FDA clearance
- High margin disposable, registered for reimbursement
- Received a gold Edison Award and an IDEA finalist
- Medtronic acquired CardioInsight for \$93 million plus 3-year earnout

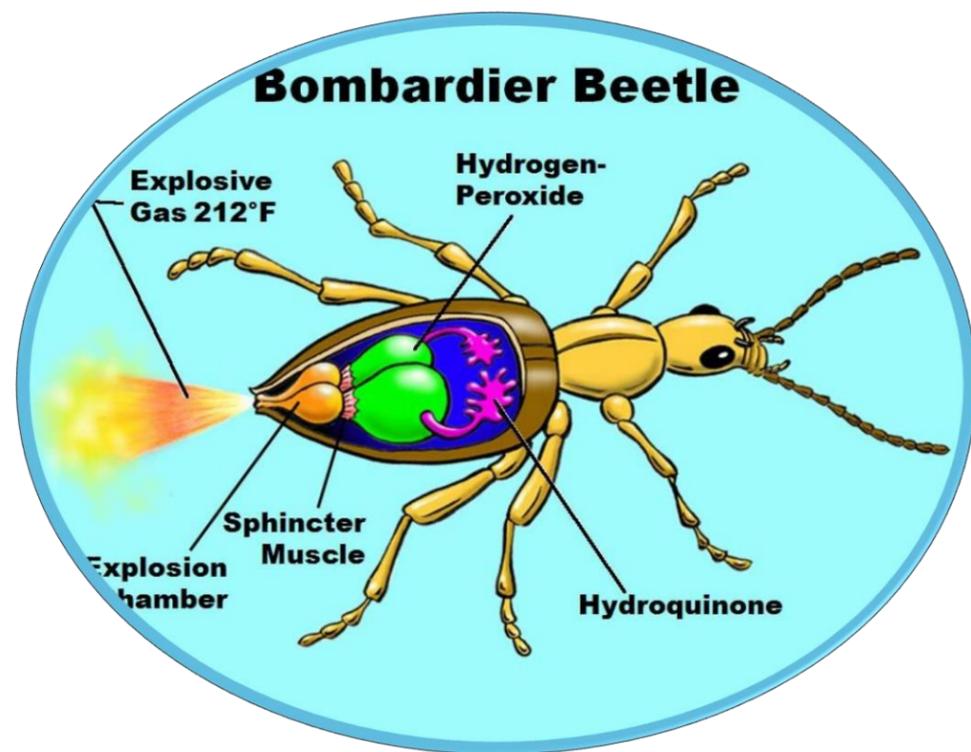


How does nature
keep 2 liquids separate before dispensing?



Validated by nature

The Bombardier Beetle keeps 2 chemicals separate & combines to activate



How could nature inspire an
easy way to carry water?



Validated by nature

capuchin monkeys carry their babies on their backs



Pack H2O Waterwear Pack



Pack H2O

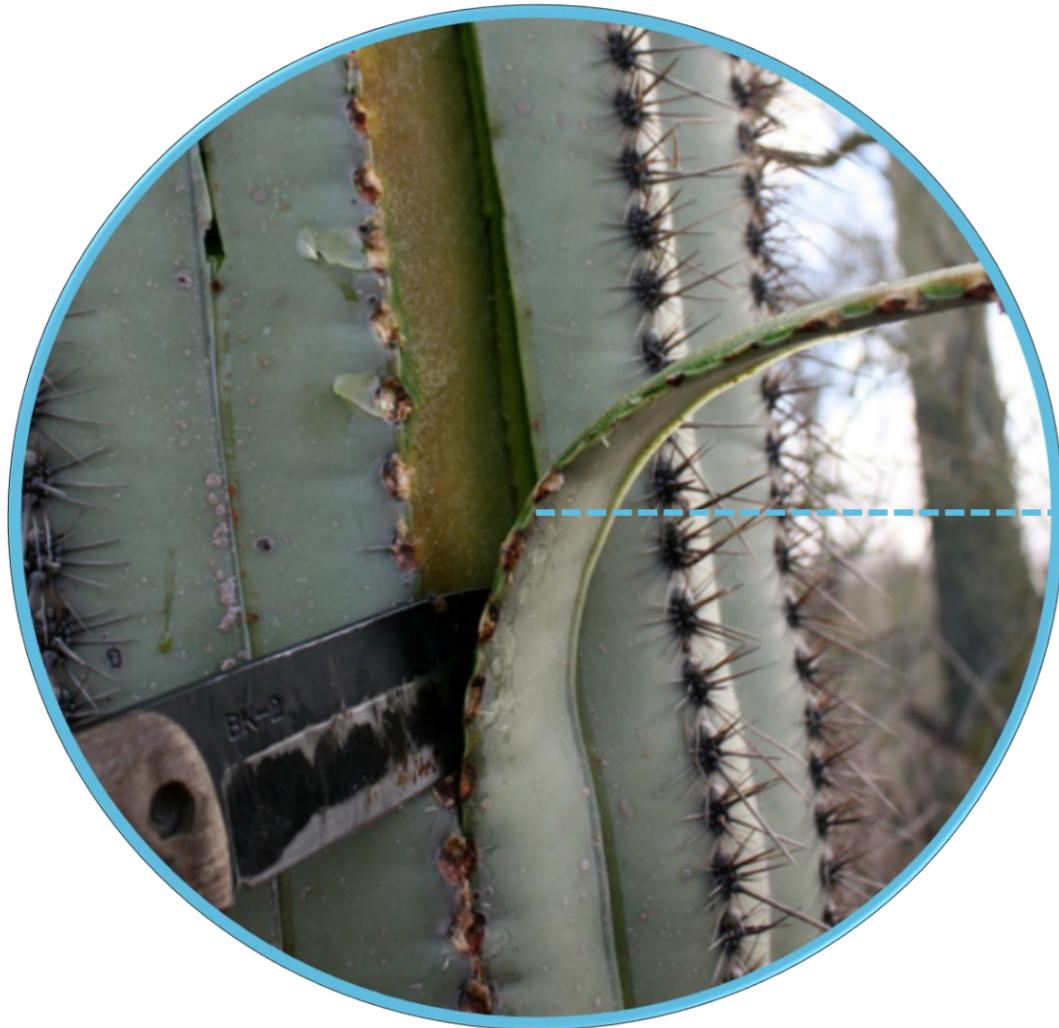
- Eases the burden of water transport for women & children
- A clean, economical alternative to buckets and jerry cans
- Enables fast, high-volume emergency relief
- Provides simple, affordable micro-business opportunities



How does nature
layer?



Validated by nature
the way waxy cuticle outside a cactus rigid skin



Pan Lining Paper Creates New Sales

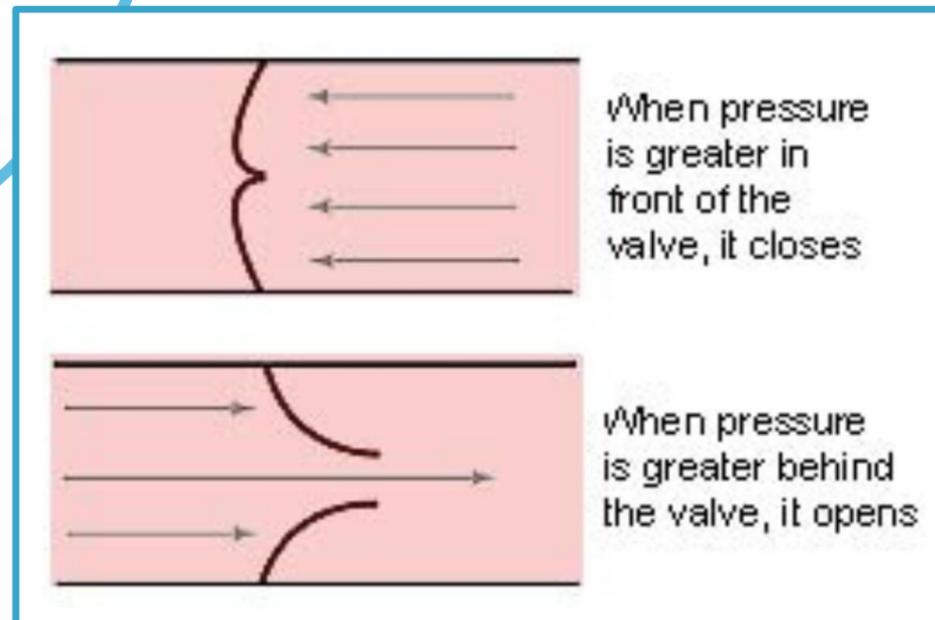
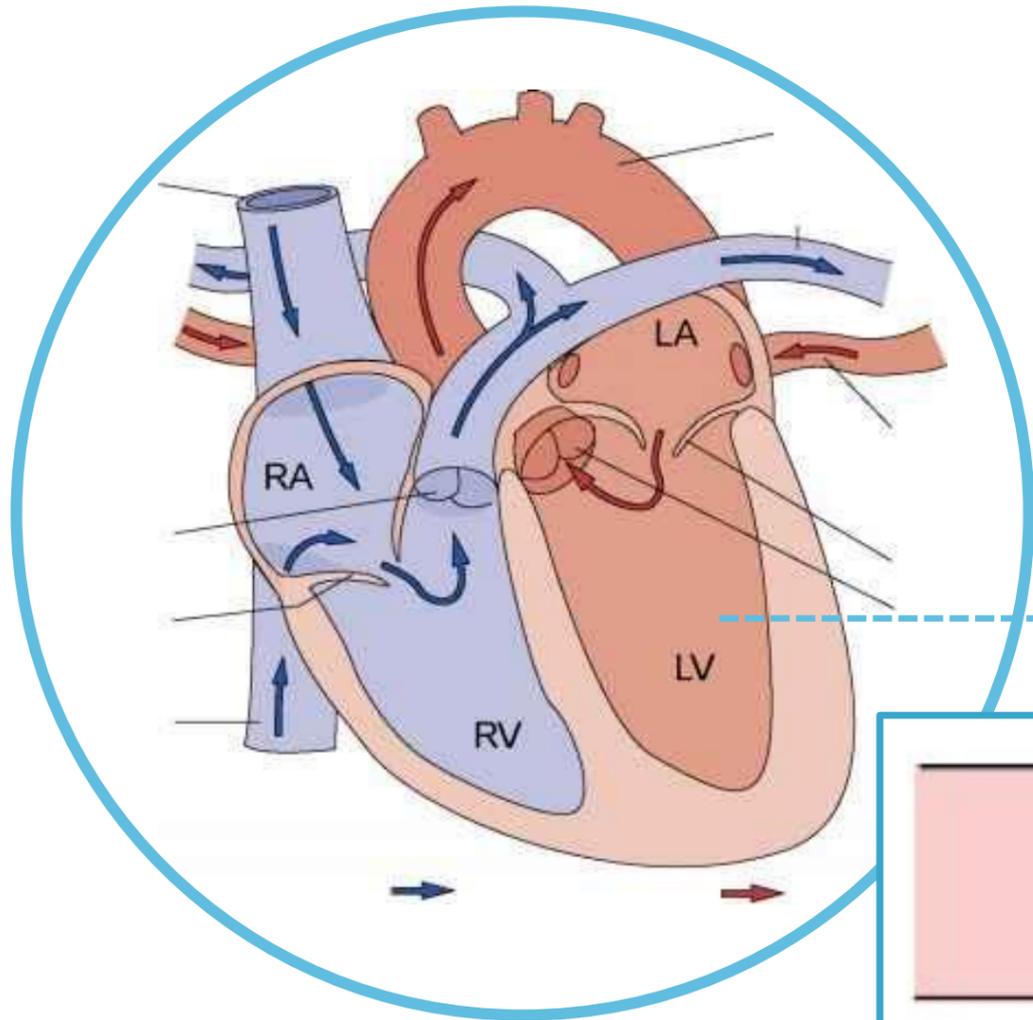


How does nature
open and close valves?



Validated by nature

heart valves open and close through pressure



Tap King home draft beer system



How does nature
move to connect?

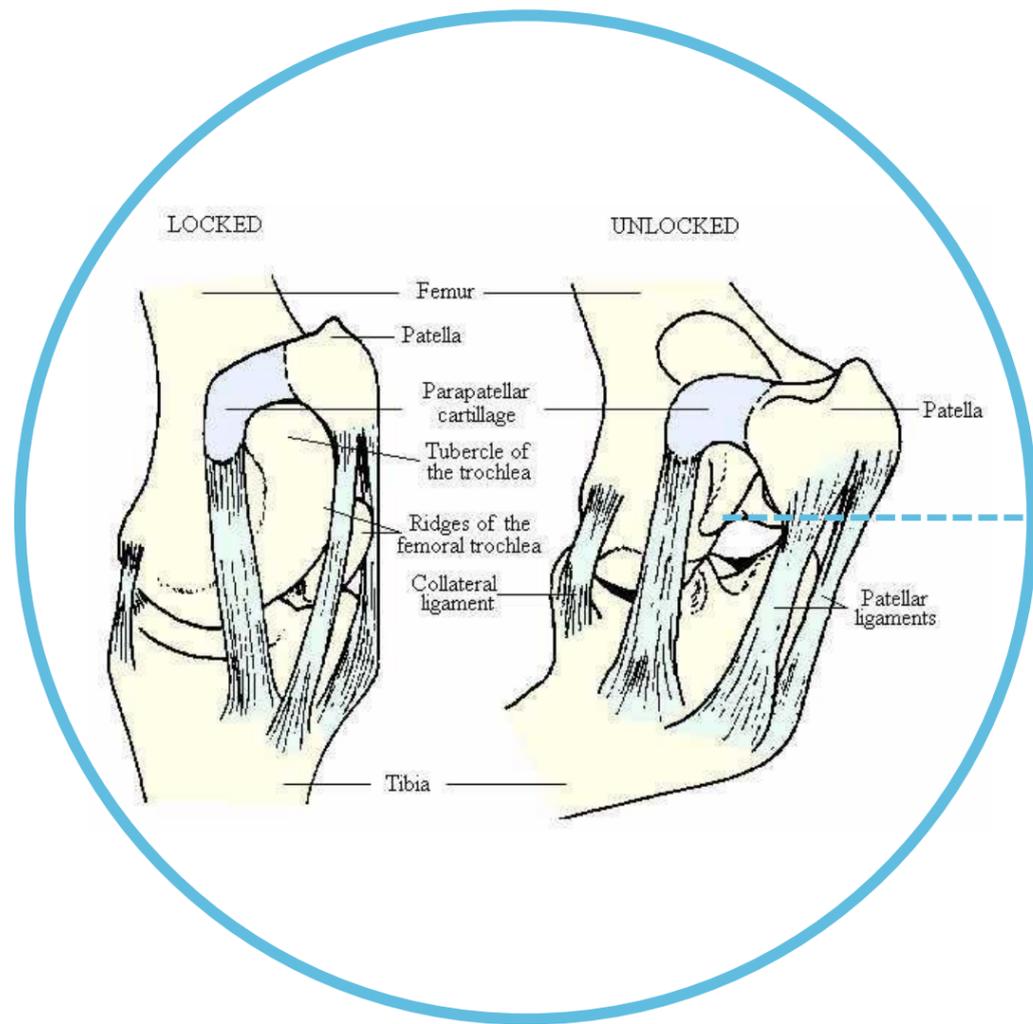


 **TROY-BILT**[®]

MTD[®]
For A Growing World.[™]

Validated by nature

the stay apparatus of a horse's leg can cause "locking"





Biomimetic Principles in Product Design

Quit