

MASTER MEDIO AMBIENTE SOSTENIBILIDAD Y ODS


Universidad
del País Vasco


Euskal Herriko
Unibertsitatea


Organización
de las Naciones Unidas
para la Educación,
la Ciencia y la Cultura

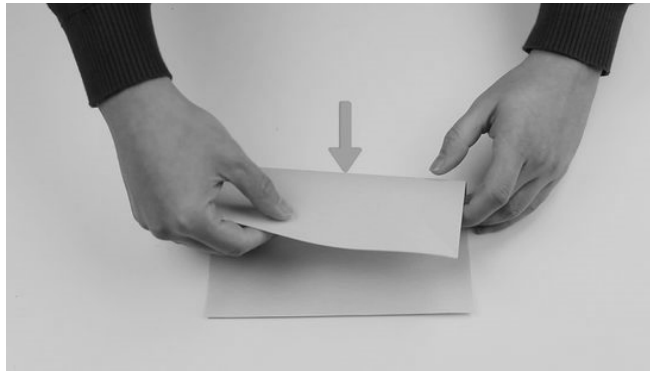

un twin
Iniciativa de la
Unión Europea
para la
cooperación
entre las
universidades
de Europa

INTRODUCCIÓN a la **BIOMIMESIS**

Dr. Manuel Quirós



origami”



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Conociéndonos + Plan

Porque ahora?

Biomimesis: Definición, Filosofía y Fundamentos

Casos de éxito

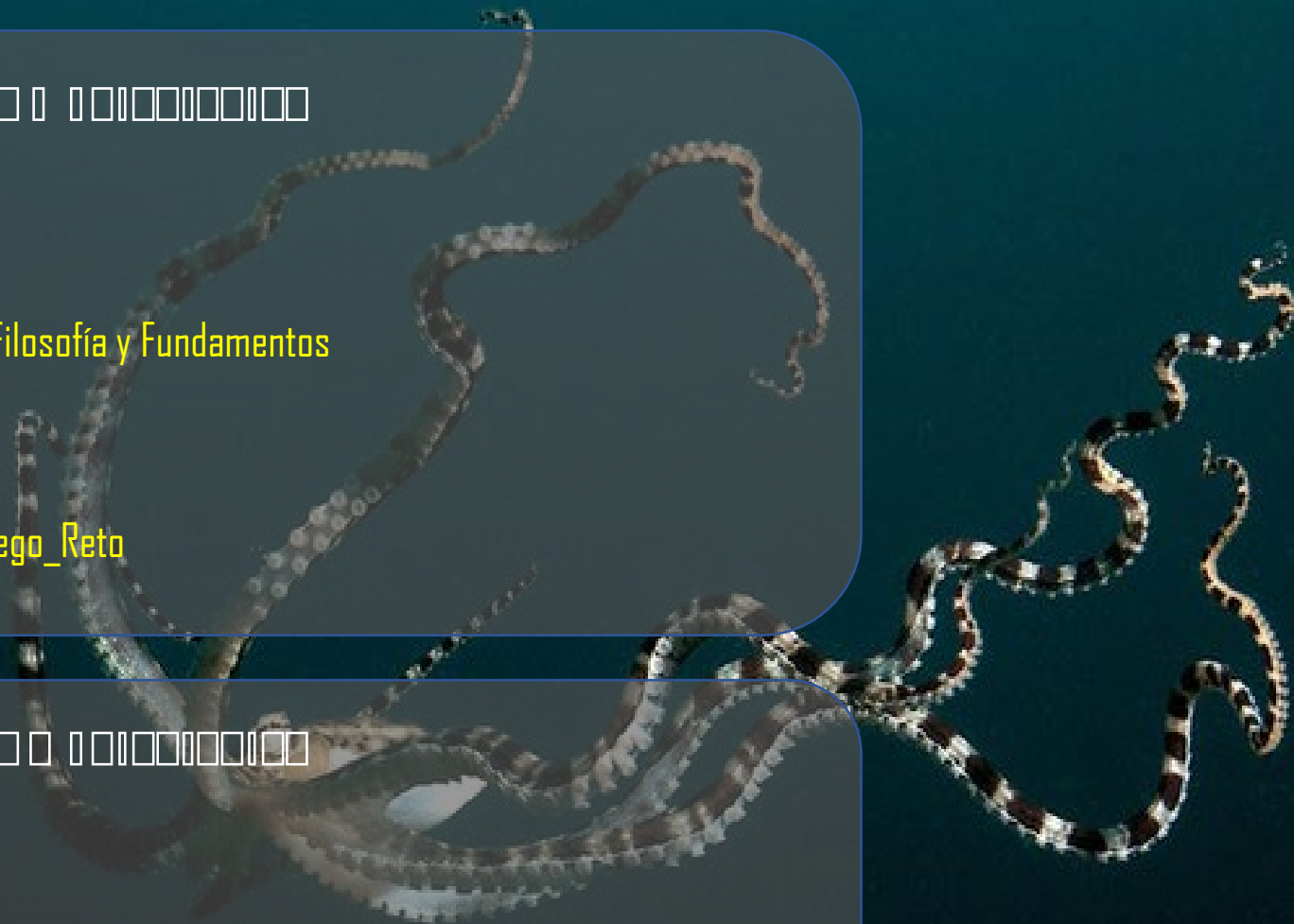
Q+A mini descanso + Juego_Reto

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Principios de Vida

Recursos

Despedida



Manuel Quirós

natureinspireus.com

• BSc, MSc, PhD Biology
postdoc + 10 years



• Professor: ExS + Biomimicry
Innovation, CSR...



• Founder

BIA & RI³ biomimicry



BiomimicryIberia

RI³ BIOMIMESIS

• Consultant natureinspireus

• Blog author



REGENERATIVE
AGRICULTURE



NATURAL
CAPITAL

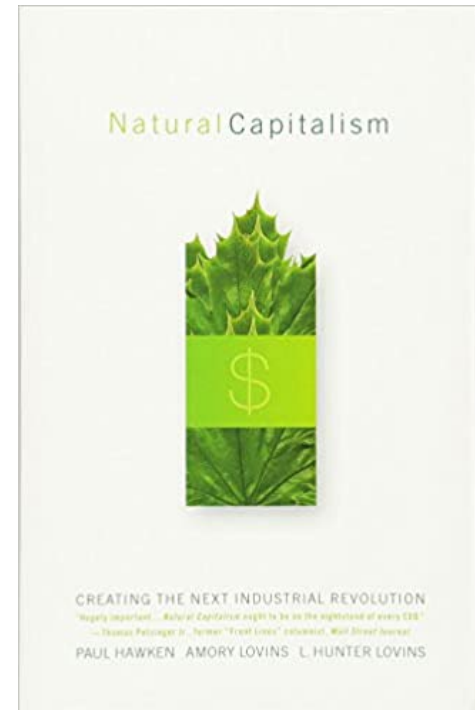
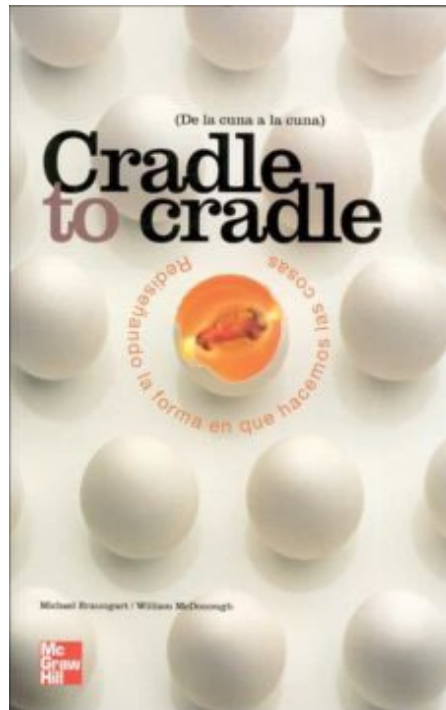
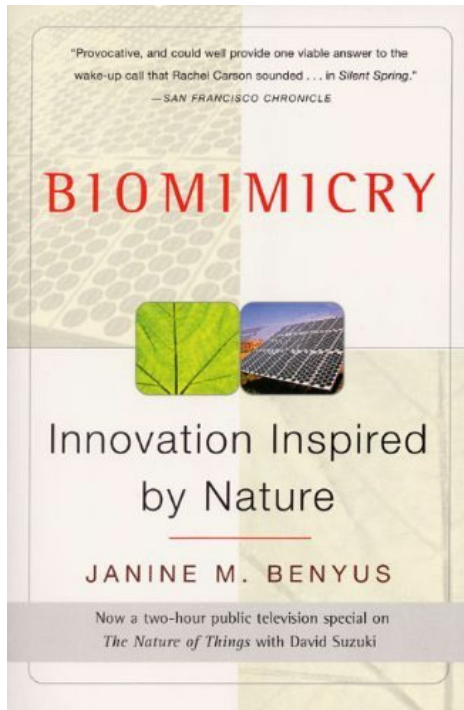


• Zygote Quarterly Journal

ZQ

• + 140 publications (scientific, divulgation, summits, media)







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Conociéndonos + Plan + Retos

Porque ahora?

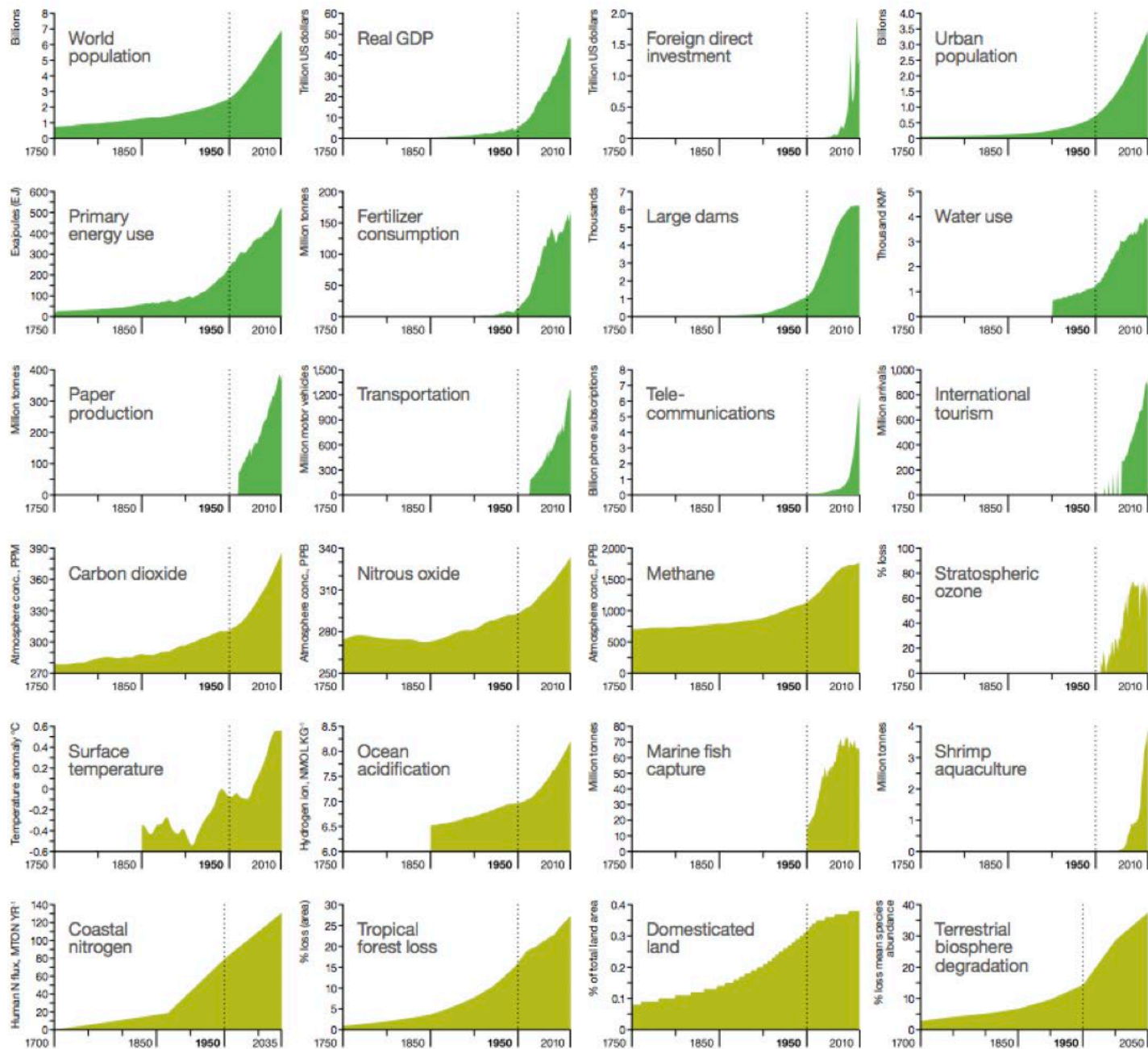
Biomimesis: Definición, Filosofía y Fundamentos

Casos de éxito + Reto I

Q+A mini descanso

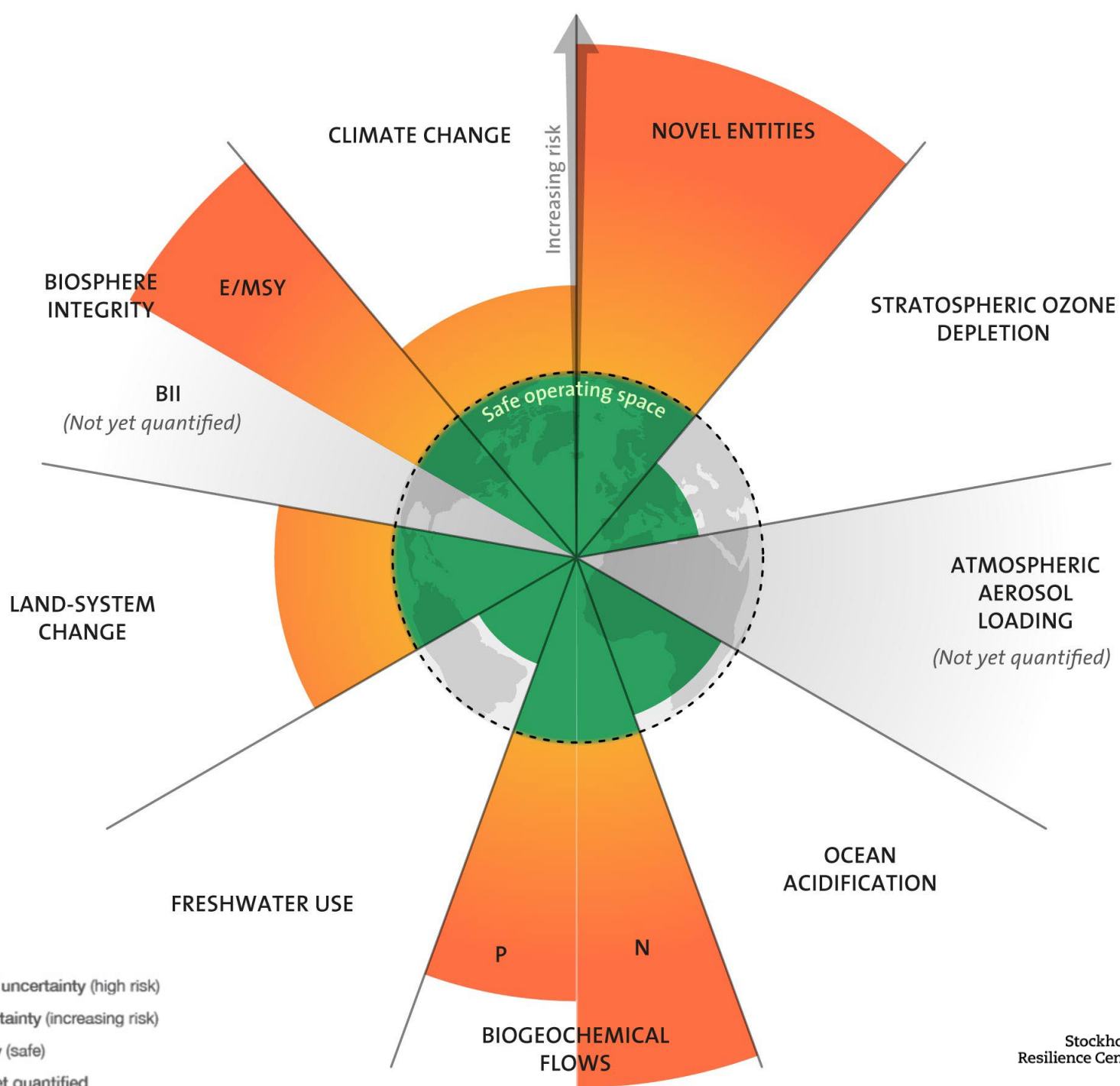
... algo del CONTEXTO DEL SIGLO XXI

La gran aceleración

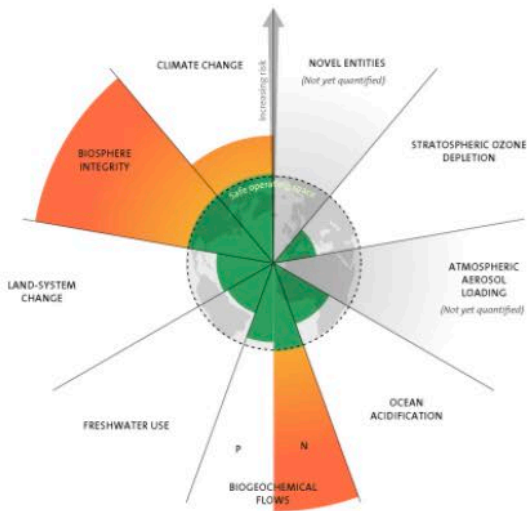


GLOBAL
IGBP International
CHANGE Geosphere-Biosphere
 Programme

■ Socio-economic trends ■ Earth system trends

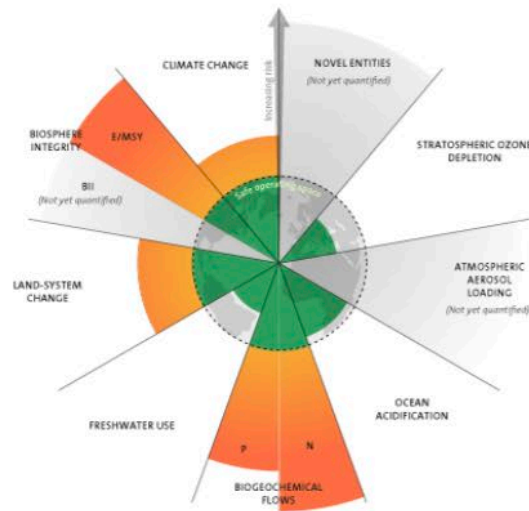


2009



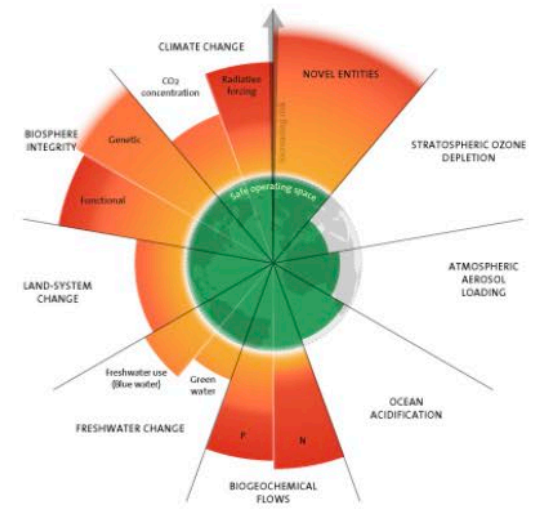
3 boundaries crossed

2015

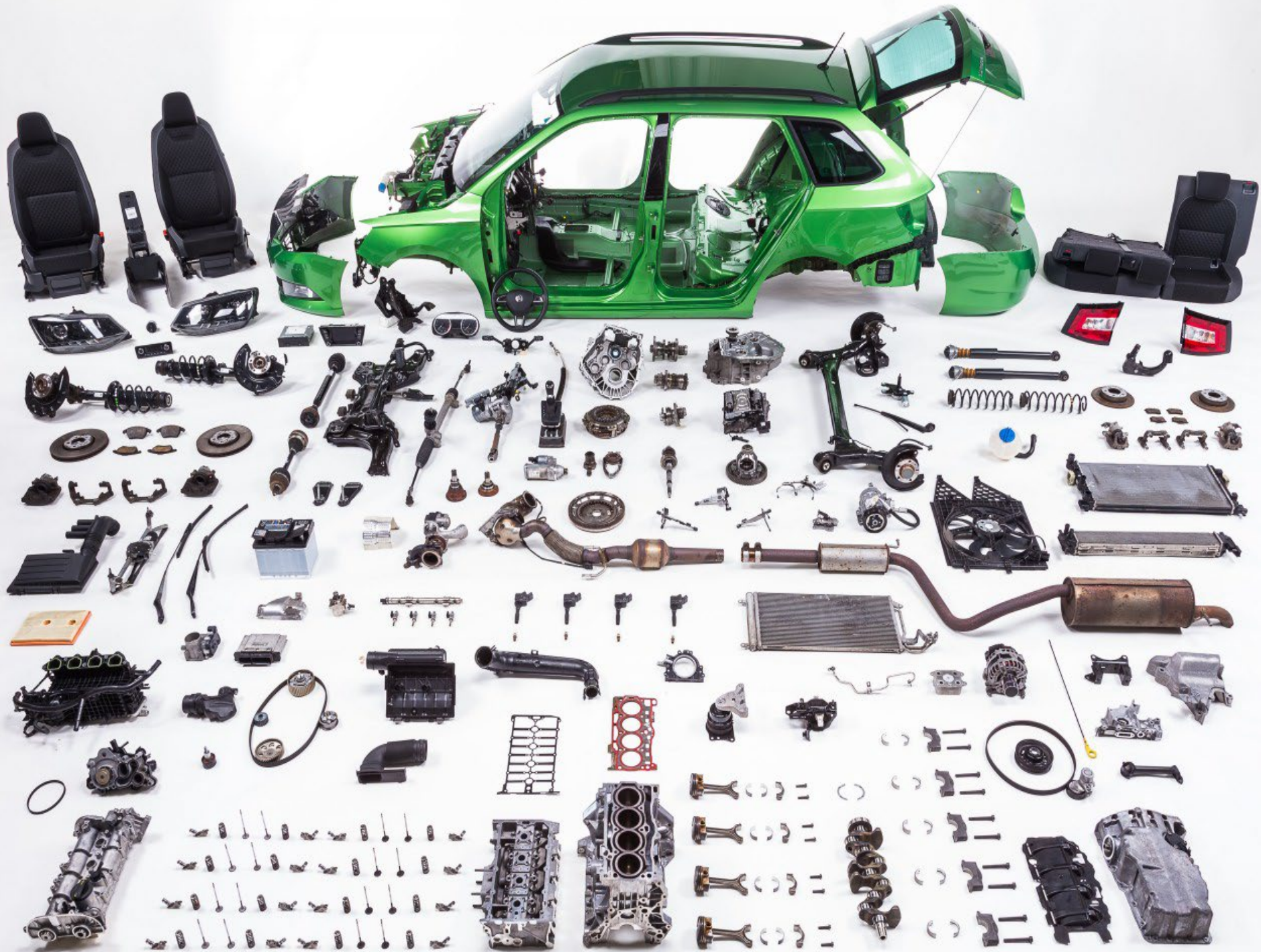


4 boundaries crossed

2023



6 boundaries crossed





OBJETIVOS DE DESARROLLO SOSTENIBLE

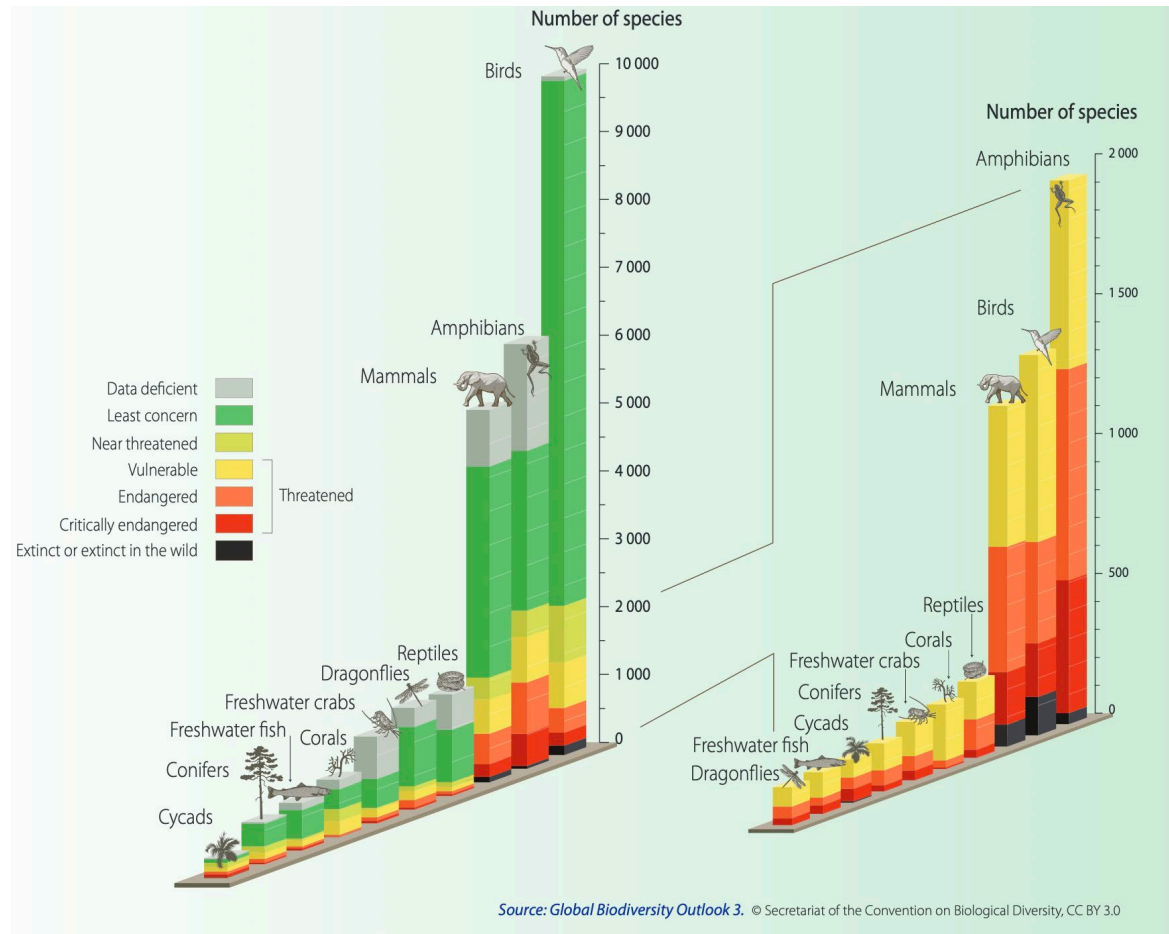






Las actividades humanas están aumentando el índice de extinción de especies.

El 40% de las especies no están amenazadas



Convention on
Biological Diversity

Top 10 Risks

“Please estimate the likely impact (severity) of the following risks over a 2-year and 10-year period”

2 years

1	Cost of living crisis
2	Natural disasters and extreme weather events
3	Geoeconomic confrontation
4	Failure to mitigate climate change
5	Erosion of social cohesion and societal polarization
6	Large-scale environmental damage incidents
7	Failure of climate-change adaption
8	Widespread cybercrime and cyber insecurity
9	Natural resource crises
10	Large-scale involuntary migration

10 years

1	Failure to mitigate climate change
2	Failure of climate-change adaption
3	Natural disasters and extreme weather events
4	Biodiversity loss and ecosystem collapse
5	Large-scale involuntary migration
6	Natural resource crises
7	Erosion of social cohesion and societal polarization
8	Widespread cybercrime and cyber insecurity
9	Geoeconomic confrontation
10	Large-scale environmental damage incidents

Risk categories

■ Economic
 ■ Environmental
 ■ Geopolitical
 ■ Societal
 ■ Technological

#EUDataCrunch

1 MILLION species at risk of **EXTINCTION**

Humans have
radically changed
3/4 of the
Earth's surface

If we don't
change track,
all of **humanity**
will be put at risk

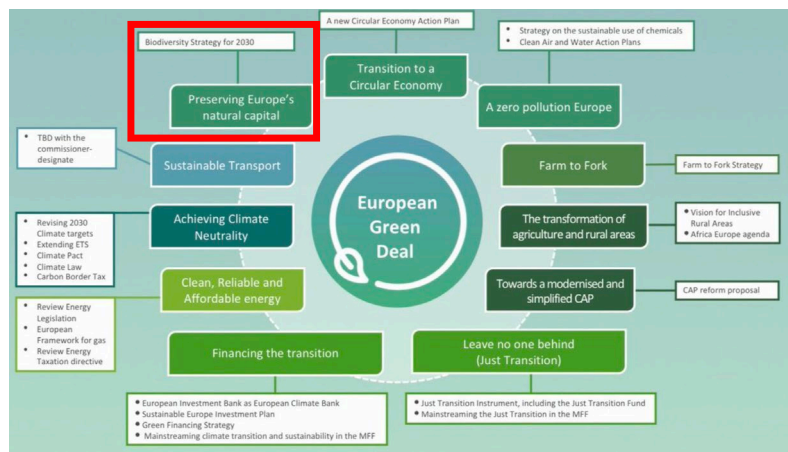
**6ª EXTINCIÓN
MASIVA DE ESPECIES**





Environment

Home > Nature and biodiversity



Nature and biodiversity

Biodiversity Strategy

Nature and biodiversity law

Natural Capital Accounting

In a nutshell

2022

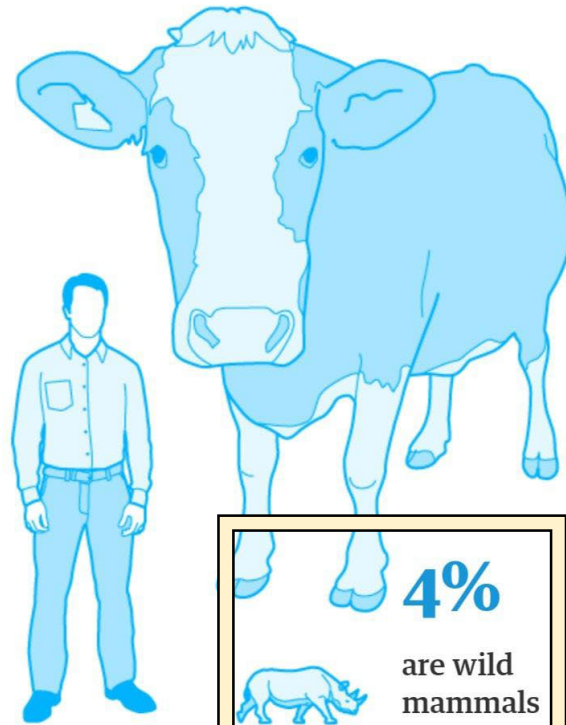
Newsflash: Accounting for ecosystems and their services in the European Union

60%

are livestock

36%

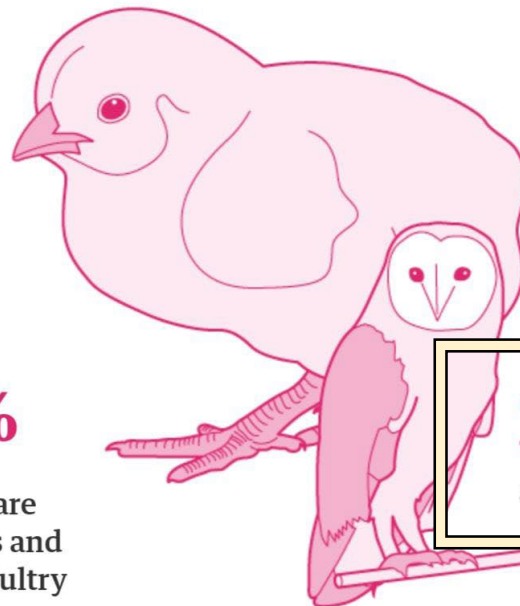
are humans



La **Naturaleza** es
resiliente y diversa
pero...

70%

of birds are
chickens and
other poultry



30%

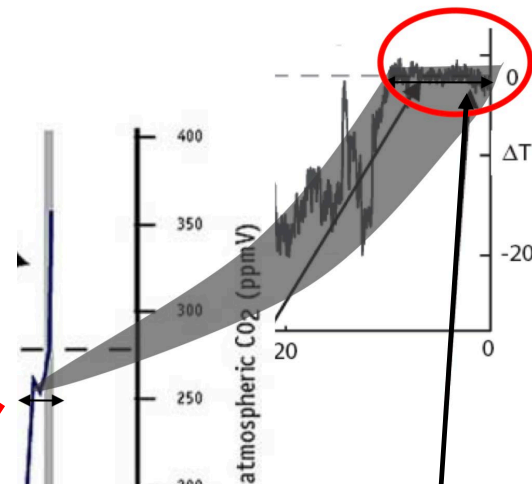
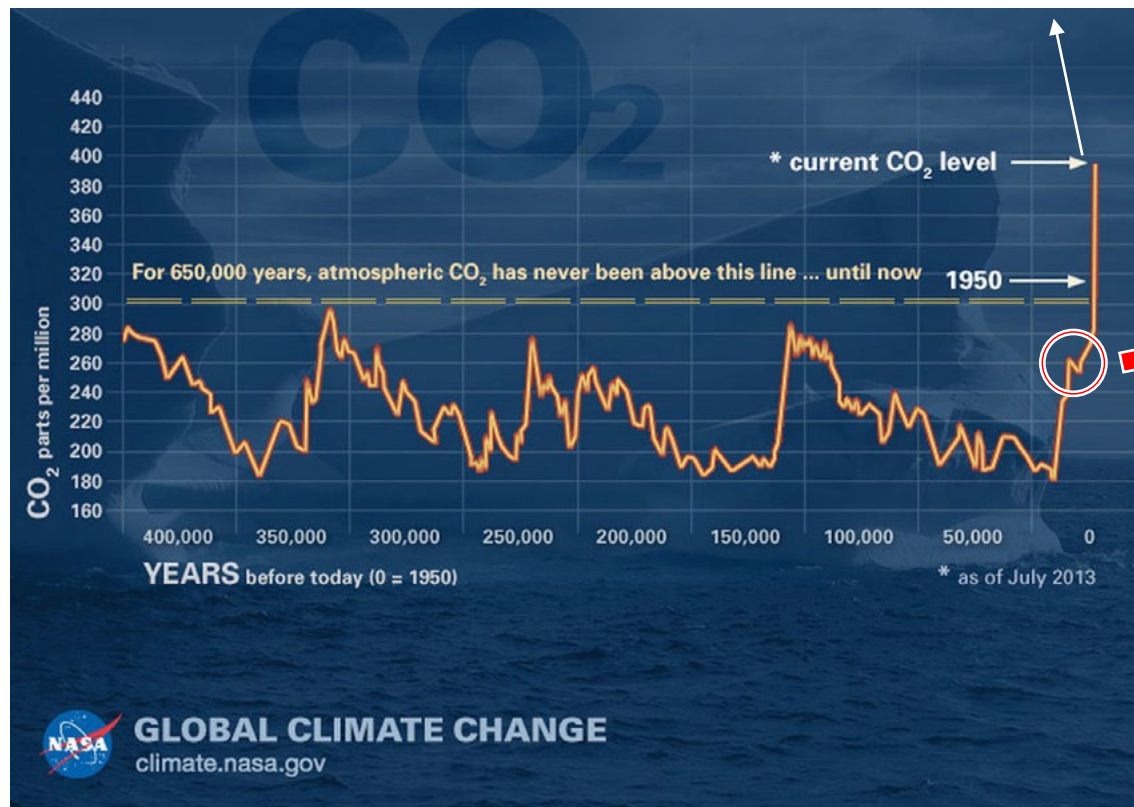
are wild



ANTROPOCENO

419

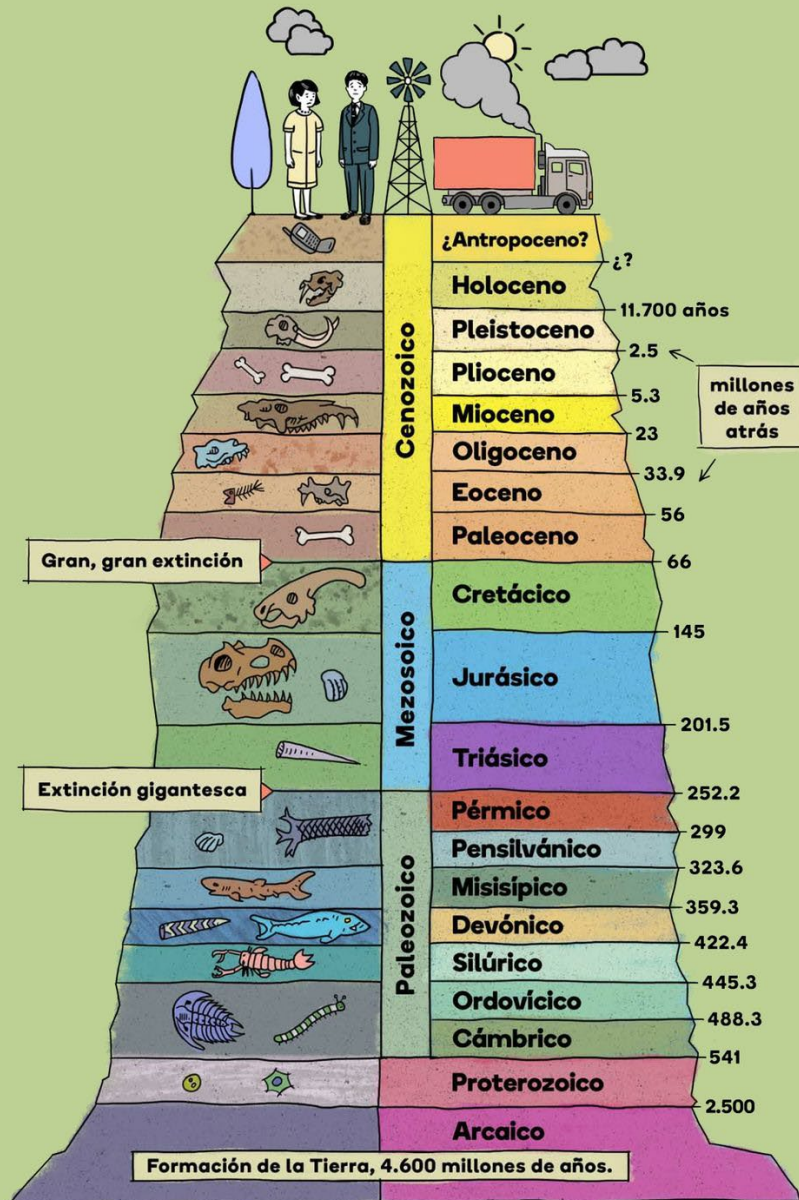
ppm CO₂



HOLOCENO
10.000 años

Estabilidad climática = desarrollo agrícola
Asentamiento de las ciudades
La cultura que conocemos

...



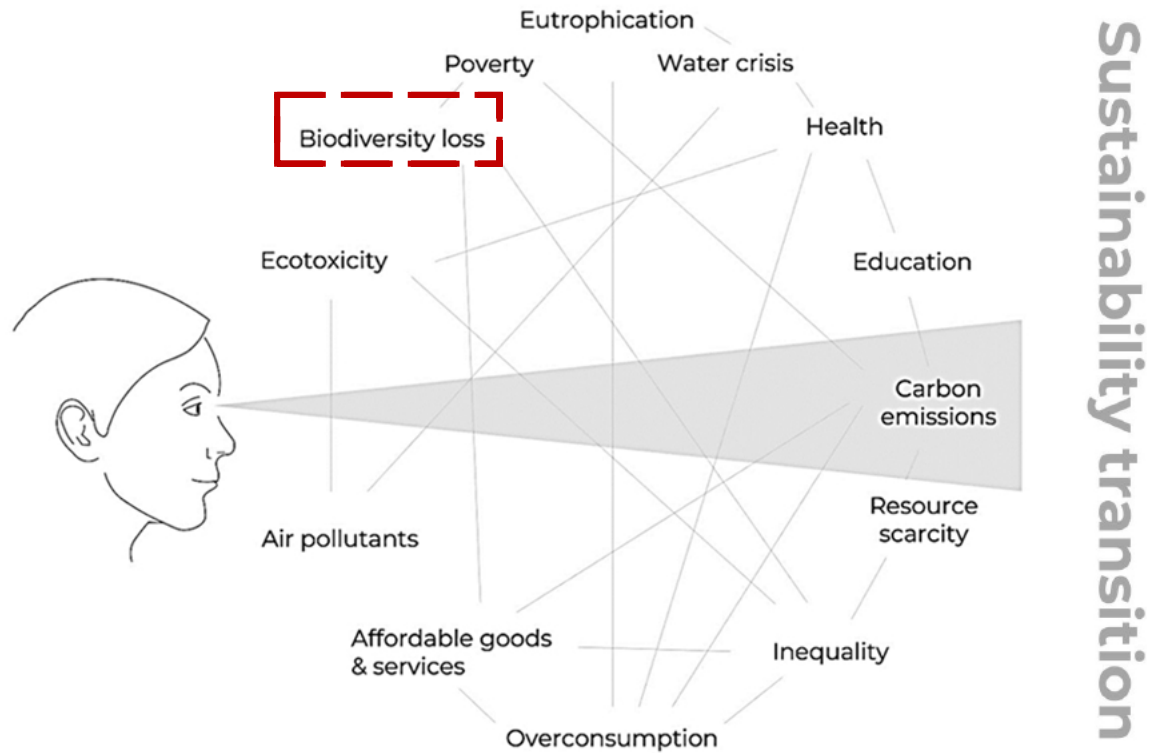
Fuente: Tabla Cronoestratigráfica Internacional 2015. Comisión Internacional de Estratigrafía.

ANTROPOCENO

la especie humana como la mayor fuerza geológica actual



Carbon Tunnel Vision



Sustainability transition

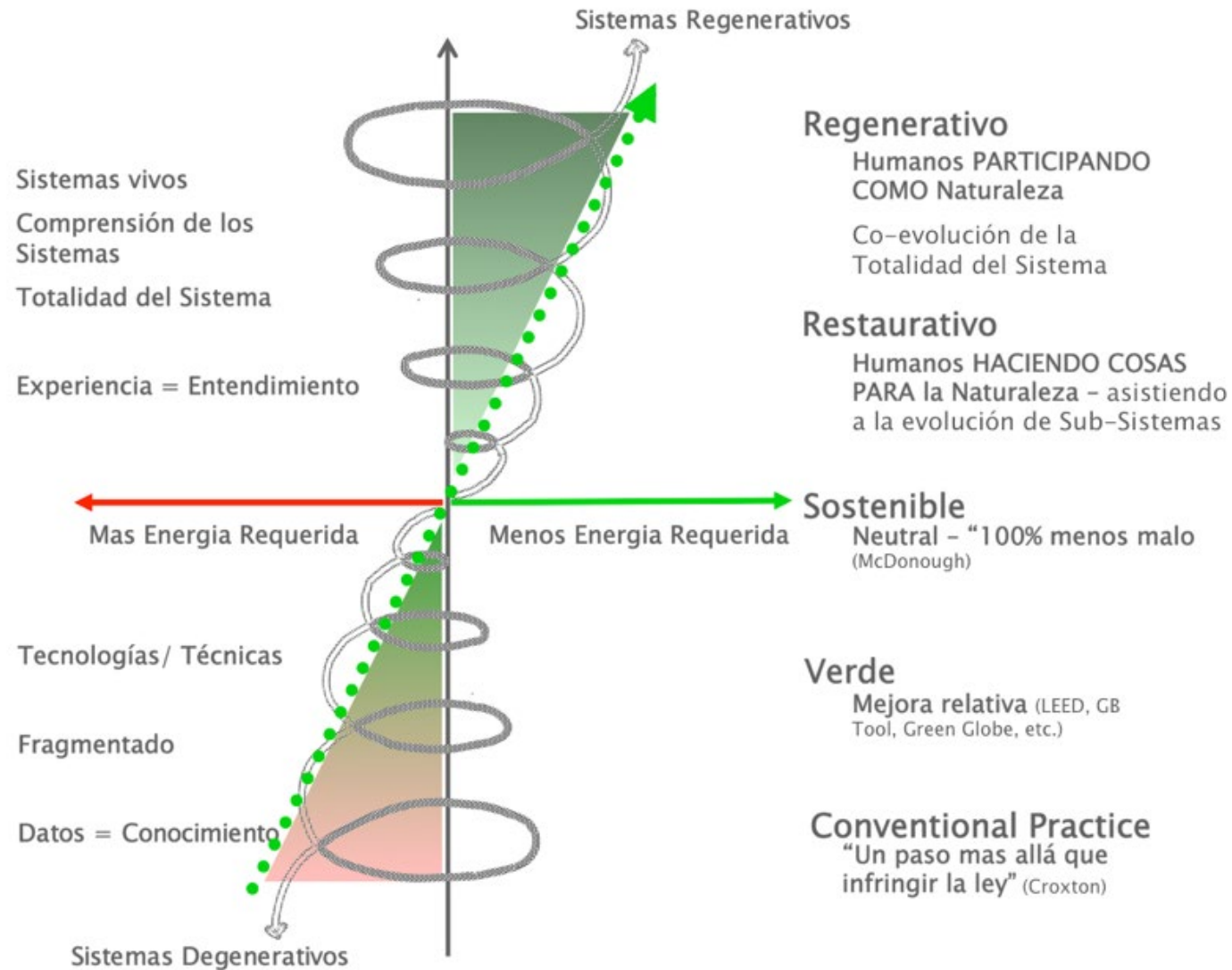
Graphic by Jan Konietzko



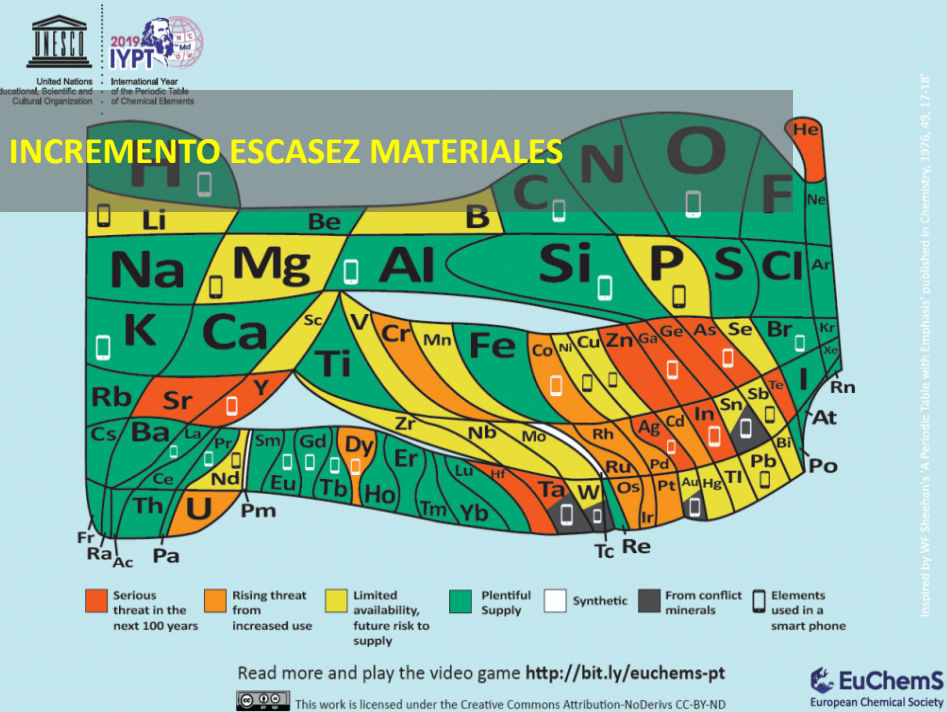
"monocromo"
cambio climático



"policromo"
+ pérdida de biodiversidad



MAS EVENTOS EXTREMOS (+800 EN 2018)



TIEMPOS DE DESCONTENTOS SOCIALES



CRECIMIENTO DE DESIGUALDADES

42 personas mas ricas del planeta
Ganan = 3.7 billones



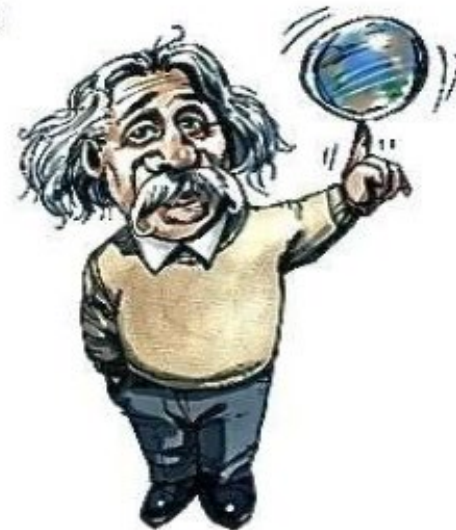
6ª EXTINCIÓN MASIVA



**Business as usual
is
Not an option**



No podemos resolver problemas
con la misma manera de pensar
que los creó...



BIOMIMESIS

Bio = Vida

Mimesis = emular, trasladar *“que no copiar”*

Disciplina y filosofía que aplica las lecciones de la naturaleza para hacer una vida más sana, tecnologías más sostenibles y regenerativas e innovación social de un modo **consciente** (intencional), **emulando** las **mejores estrategias** gracias a las innovaciones de los seres vivos

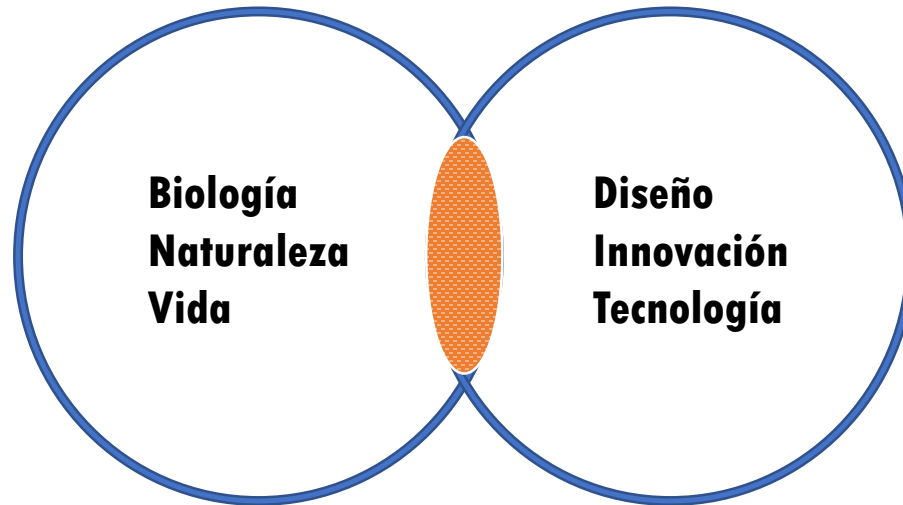
La **Naturaleza** desde la **BIOMIMESIS**

Modelo: La biomimesis es una nueva ciencia que estudia los modelos naturales para emular sus **formas, procesos y sistemas** con el objetivo de resolver problemas humanos de un modo **sostenible y regenerativo**.

Medida: La biomimesis Biomimicry emplea los estándares ecológicos para evaluar la **sostenibilidad** (aspiracional) de nuestras innovaciones. Tras 3,8 billones de evolución, la naturaleza conoce lo que funciona y lo que perdura.

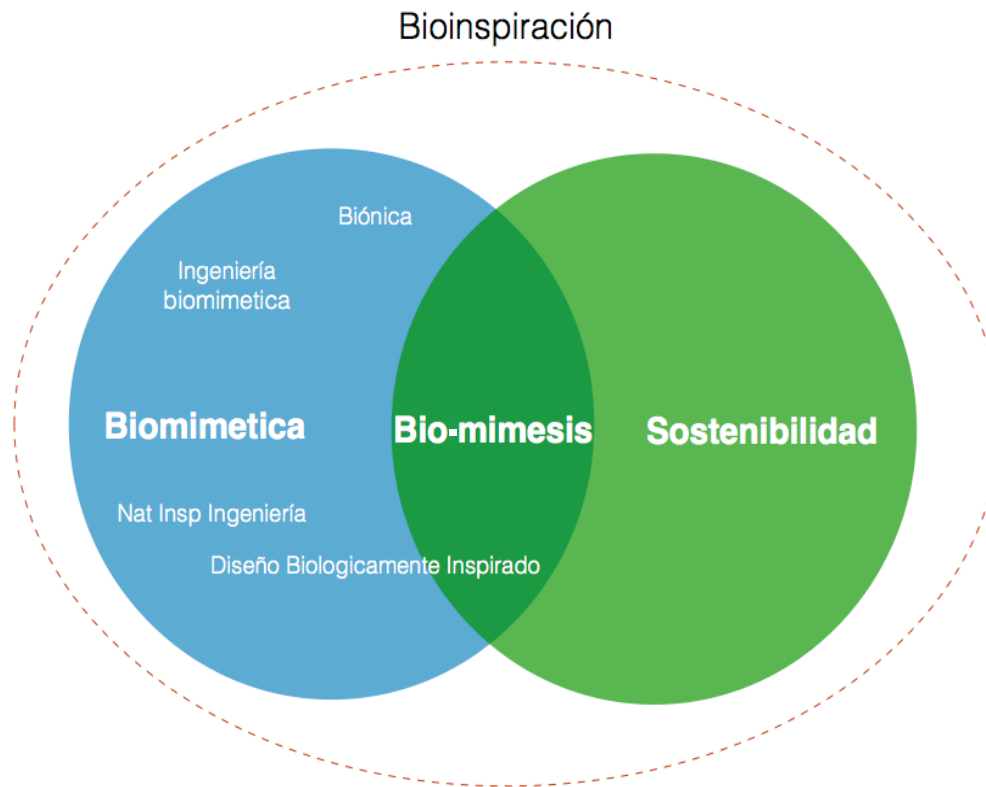
Mentor: La Biomimesis es una nueva manera de ver y valorar la naturaleza. Introduce una Era basada no en lo que extraemos o domesticamos sino en lo que podemos **aprender** de ella.

BIOMIMESIS



BIOMIMESIS

bio vida *mimesis* imitar, emular





English



Search

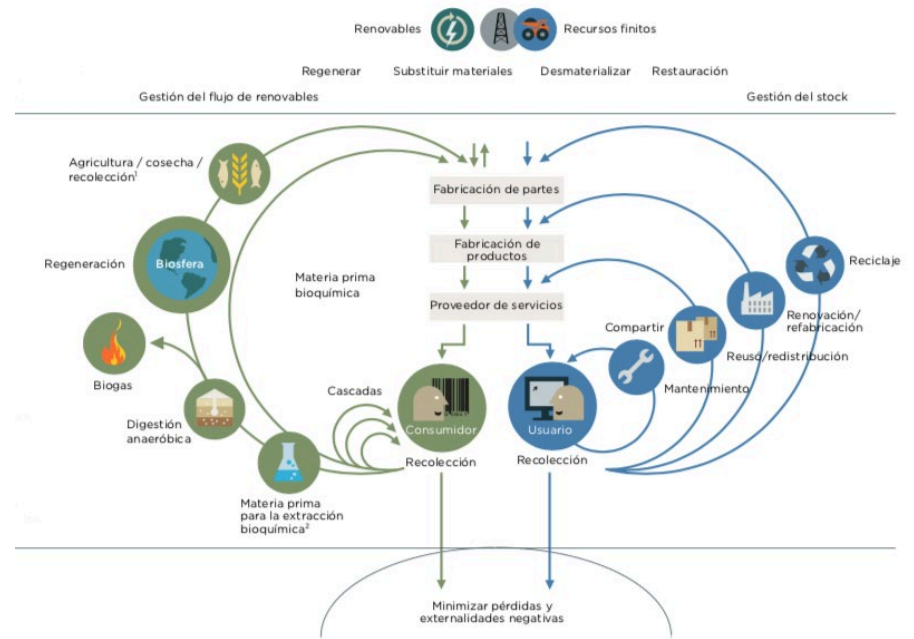
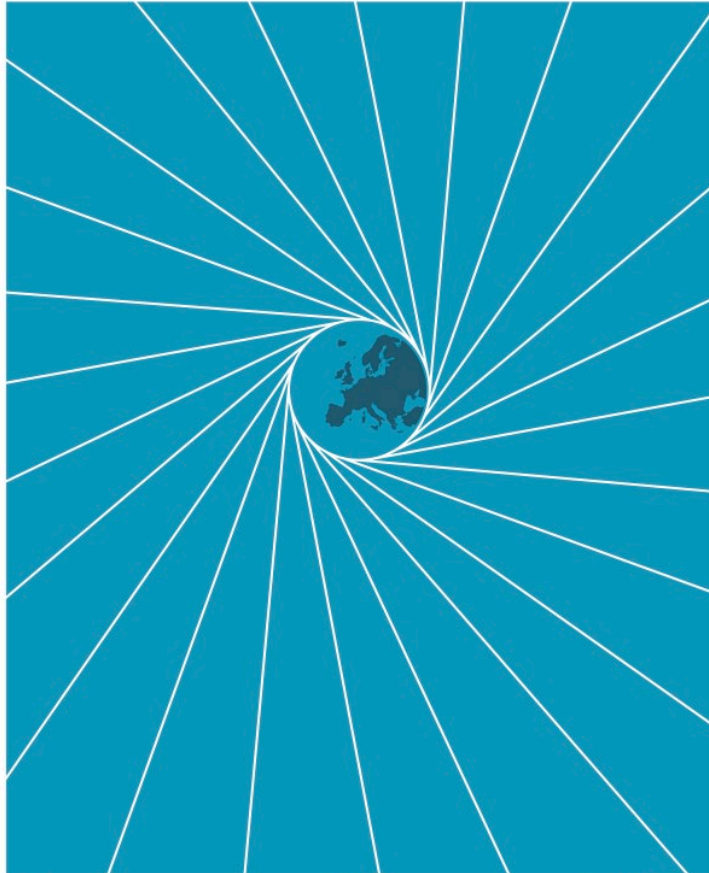
[European Commission](#) > [Research and Innovation](#) > [Research by area](#) > [Environment](#)

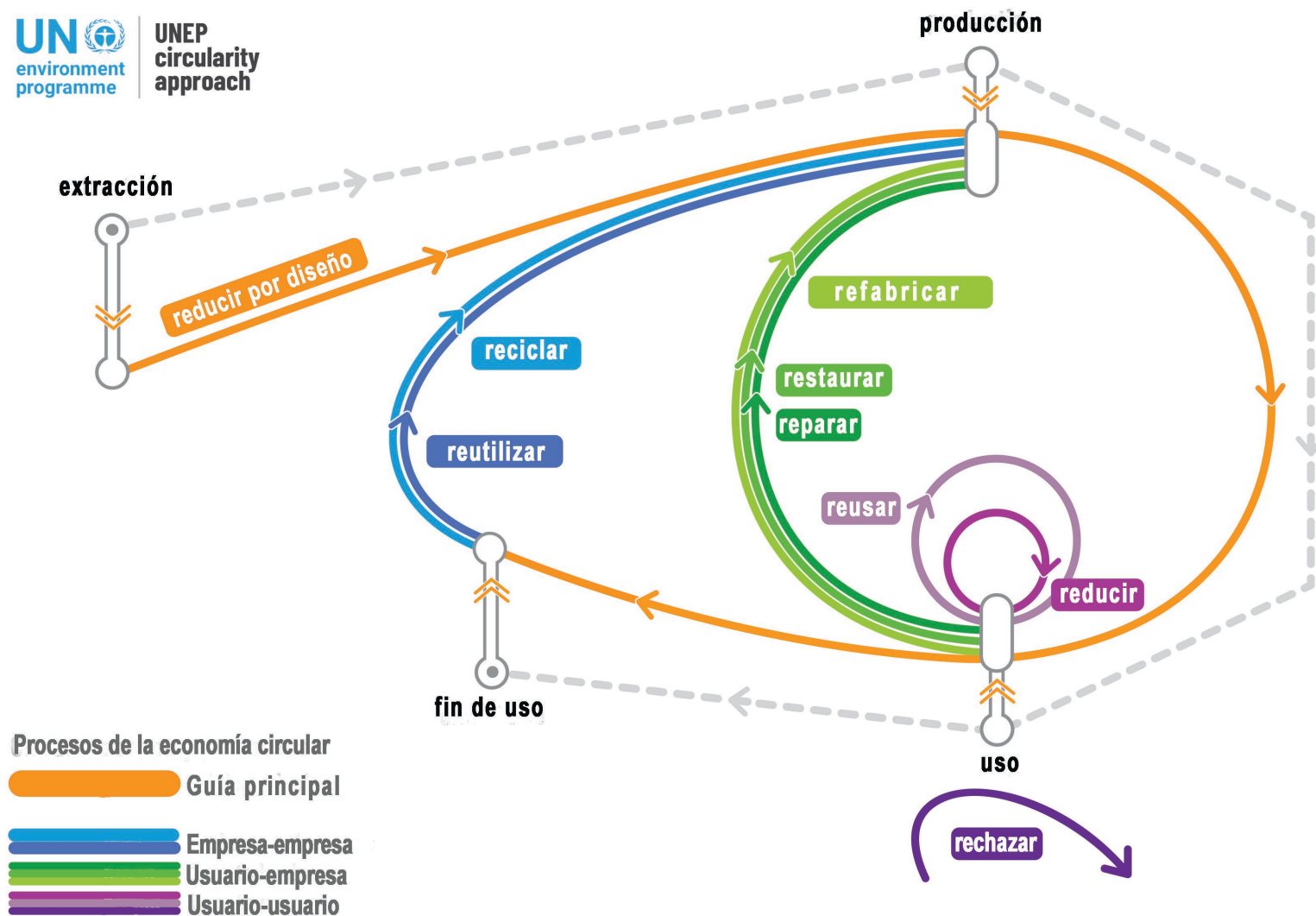
Nature-Based Solutions

This page outline how we can use nature's own resources to tackle environmental challenges

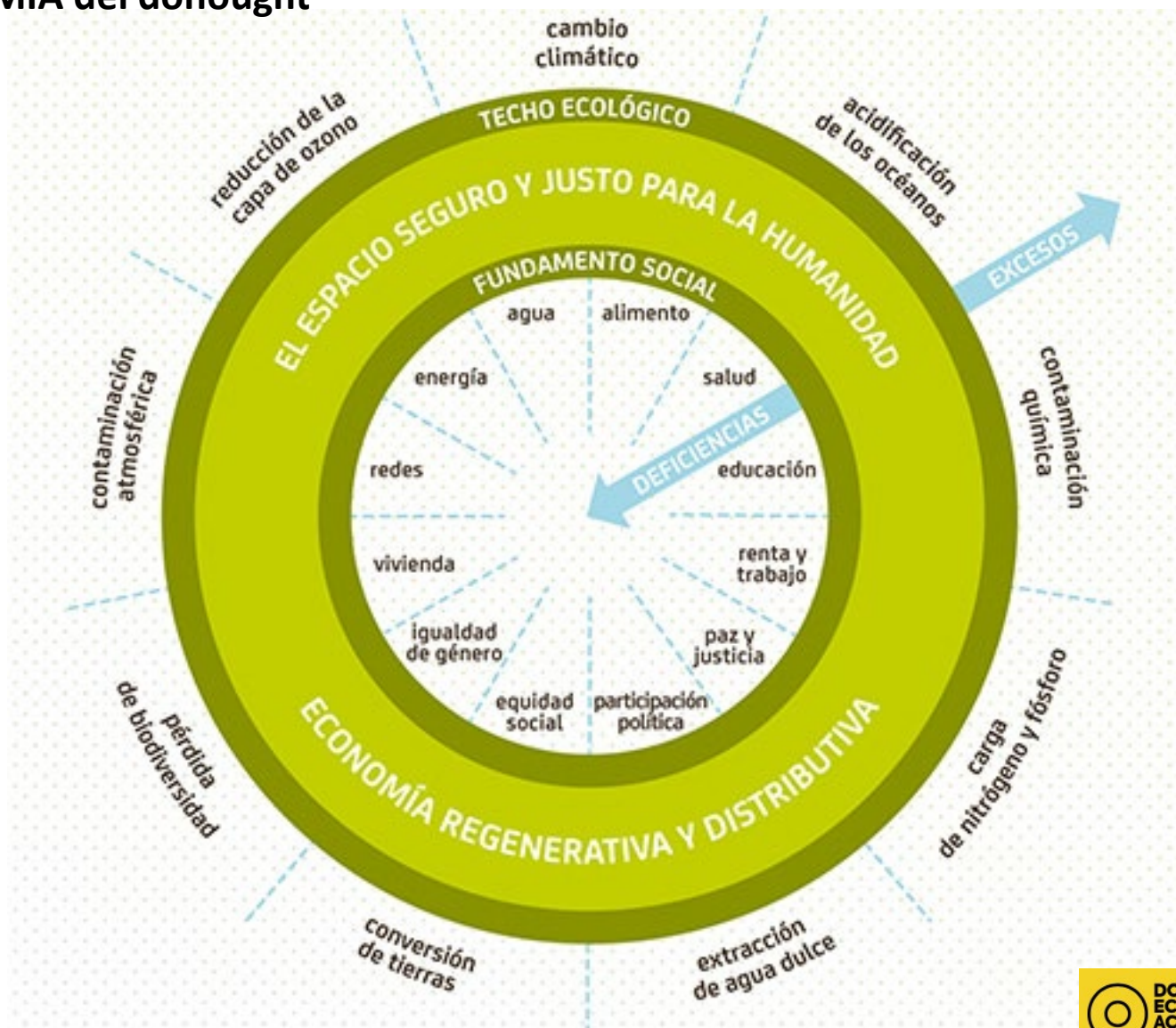
A Research and Innovation policy agenda for Nature-Based Solutions

**GROWTH WITHIN:
A CIRCULAR ECONOMY
VISION FOR A
COMPETITIVE EUROPE**

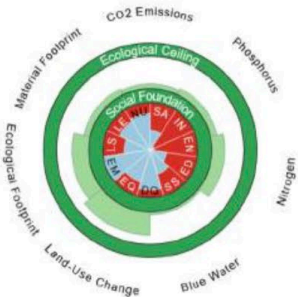




ECONOMIA del donought

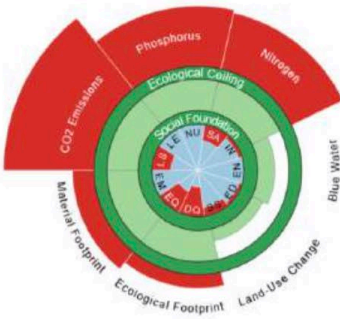


Malawi



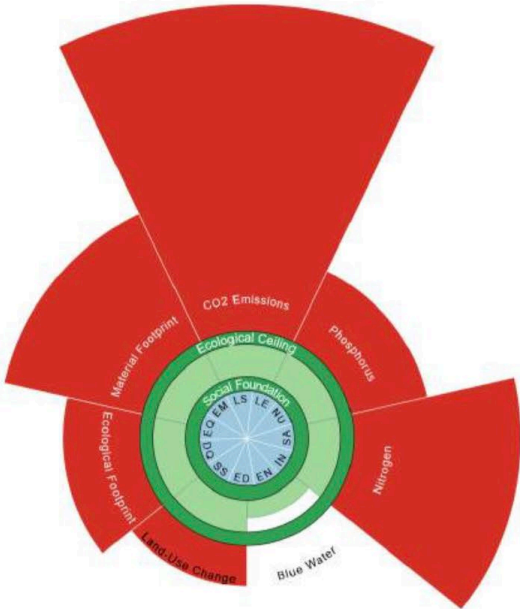
\$1,000 pc

China



\$17,200pc

Norway



\$64,900 pc



V.I.N.E

Virtual Interchange for Nature-Inspired Exploration

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Upcoming Events

[Biocene 2018](#)

08/14/2018 - 08/17/2018

Social Media



- [NASA](#)
- [Great Lakes Biomimicry](#)
- [Zygote Quarterly](#)
- [NASA Glenn GVIS Lab](#)
- [N.I.E.A](#)
- [CMNH](#)



• [N.I.E.A](#)



Education Solicitations and Funding Opportunities

[NASA Fellowship Activity
2018: Deadline](#)

[extended: Friday, March 23,
2018, at 5:50 pm EST](#)

[NASA Research Announcement
\(NRA\) NNNH18ZHA003N: \[NASA
Fellowship Activity 2018\]\(#\) is seeking](#)



For Researchers

- [ABC's "Aerospace, Biomimicry and
Other Cool Things](#)
- [Biomimicry Timeline](#)
- [Nature-Inspired Design and
Engineering \(NIDE\): A New Tool for
the Next Generation of Robotic and
Human Space Missions](#)
- [ROSES-18 Amendment 3: EW](#)
[Step 1 due date delayed: lunar focus](#)



Research Solicitations and Funding Opportunities

- [SBIR/STTR](#) - Research opportunities
to participate in research and
development efforts in key
technology areas. To learn more
about bio-inspired opportunities,
download this [PDF](#).
- [INSPIRES](#) - Search for other





3,8 billones de años

el proceso mas antiguo del planeta



4. 500 millones de años

Edad de la Tierra comprimida en 1 año

144 años = 1 segundo

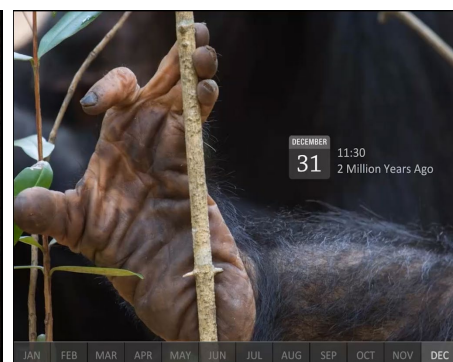
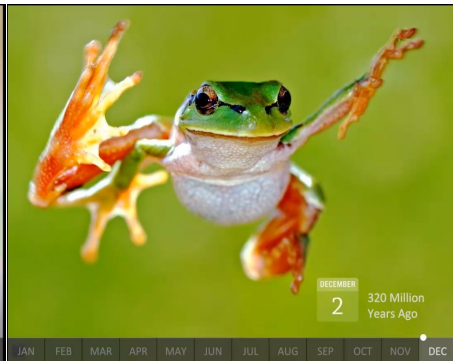
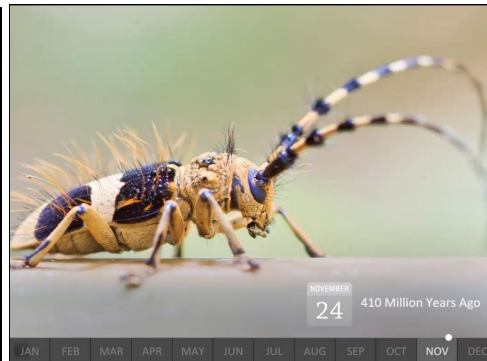
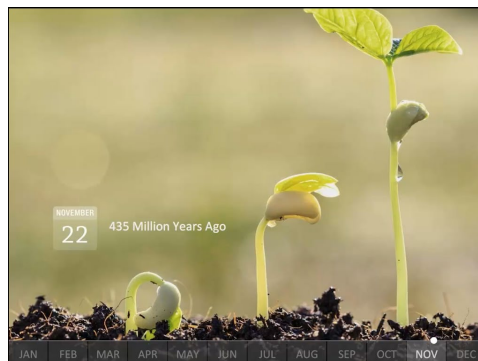
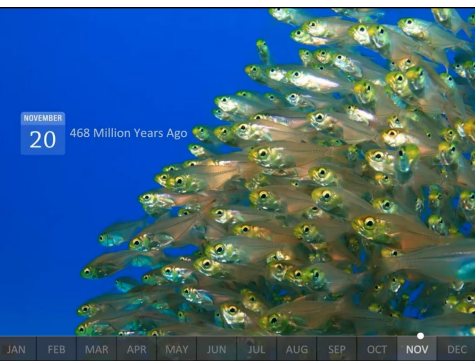
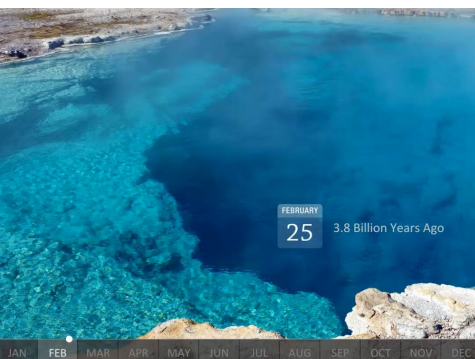


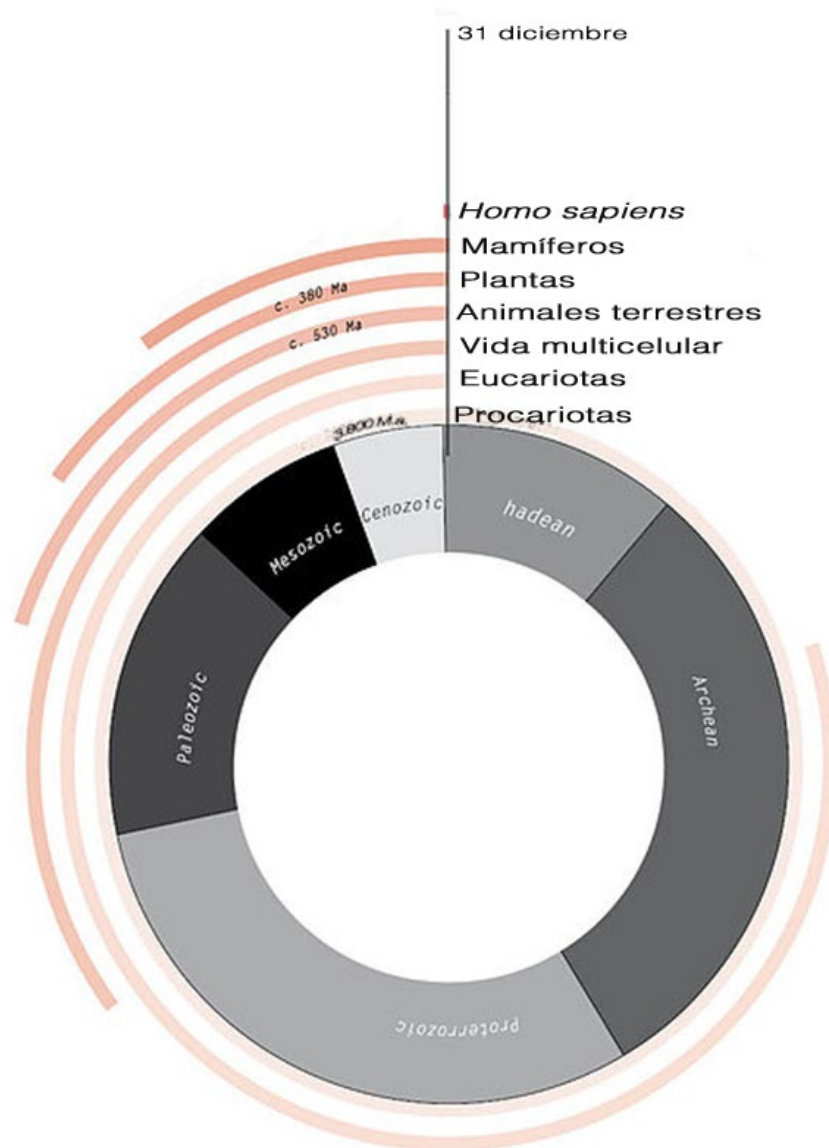
JANUARY

1

00:00:01

4.54 Billion Years Ago







DECEMBER

31

23:36

200,000 Years Ago



DECEMBER

31

23:59:00

10,000 Years Ago

JAN

FEB

MAR

APR

MAY

JUN

JUL

AUG

SEP

OCT

NOV

DEC



6 minutos



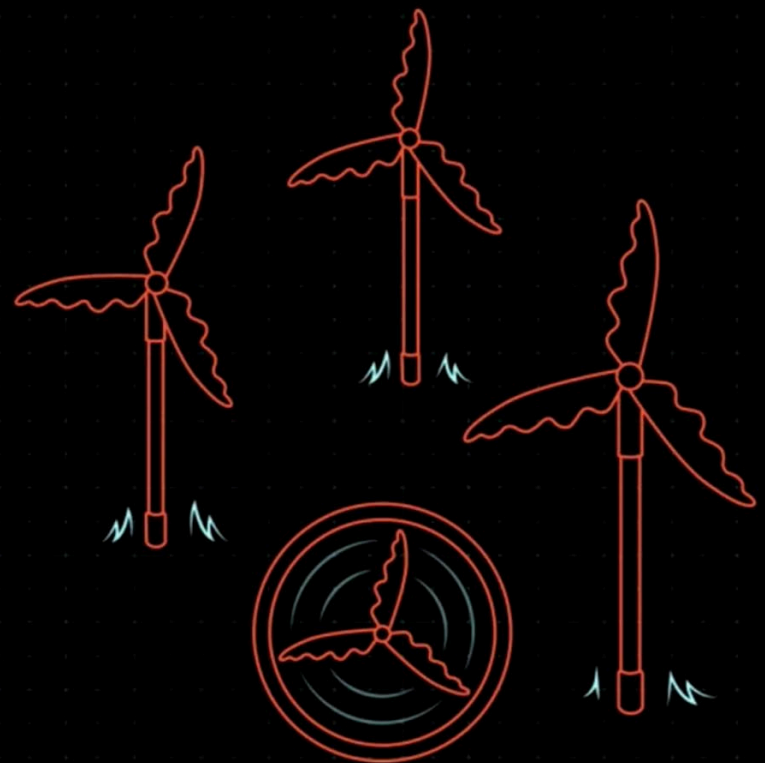
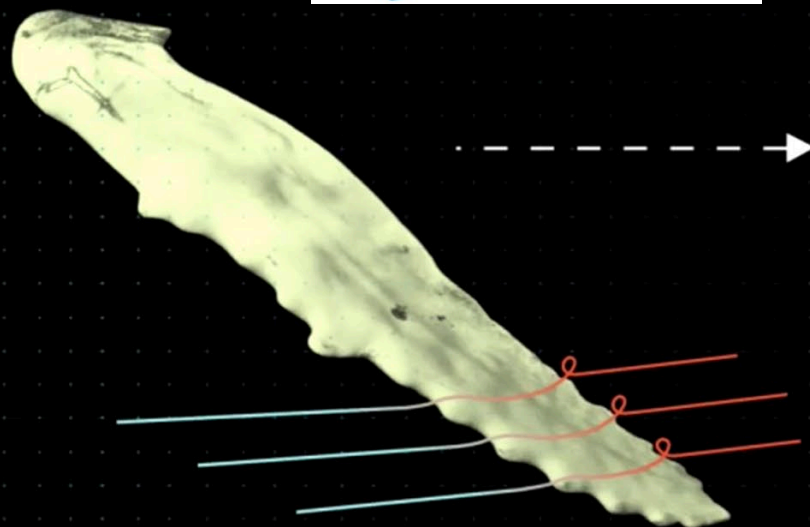
BIOMIMESIS

0,004 *H.sapiens* especie muy joven

1,5 millones de especies (conocidas)

3,8 billones de años experiencia testada

12% soluciones humanas compartidas



NIVELES



Problema de Diseño

5 polímeros para fabricar esto....

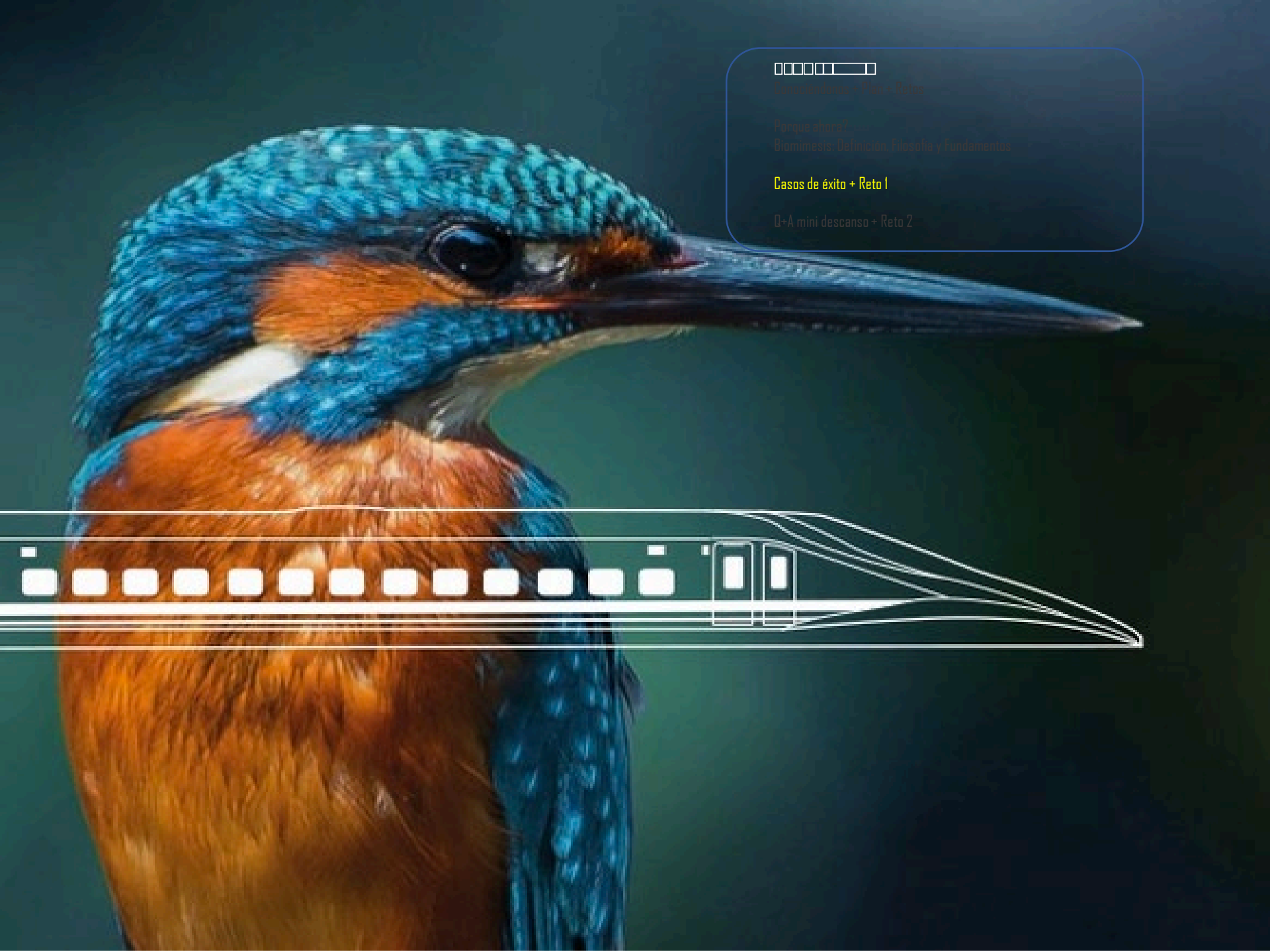


© Life on White/Caters News Agency



350 polímeros para hacer esto...





Construcción + Plan + Retos

Porque ahora?

Biomimesis: Definición, Filología y Fundamentos

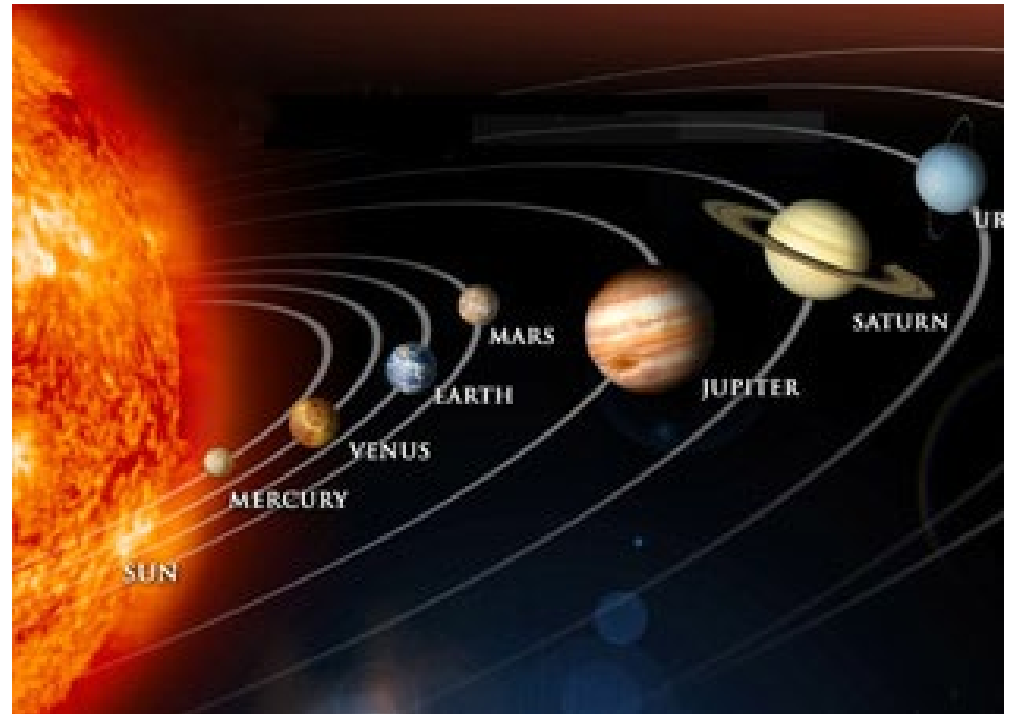
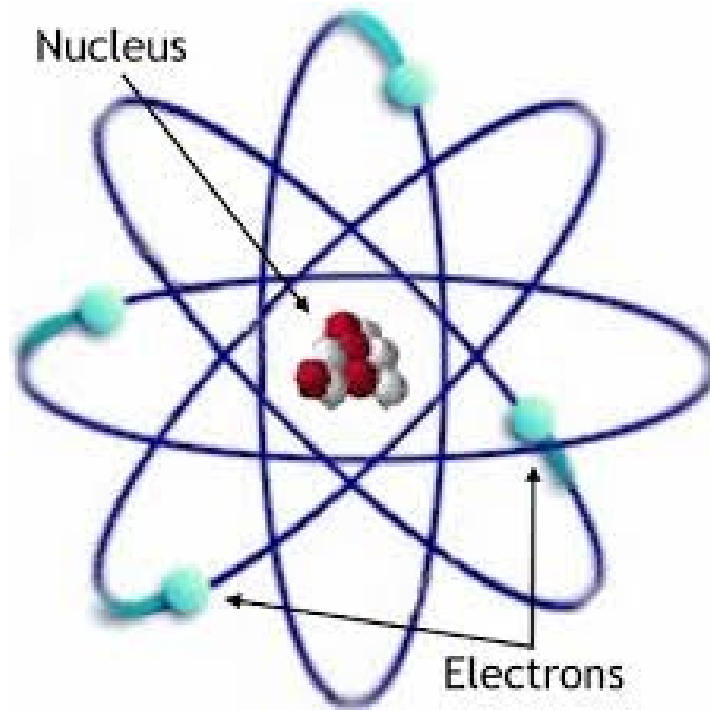
Casos de éxito + Reto 1

Q+A mini descanso + Reto 2

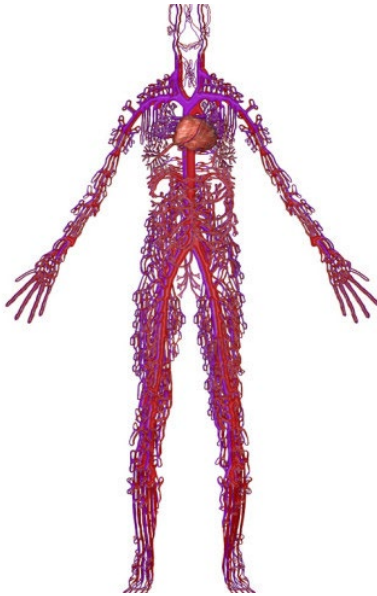
Diseño por analogías en biomimesis

1. **Analogía:** similitud en algunos aspectos entre cosas que de otro modo son diferentes; una comparación entre dos cosas, generalmente con el propósito de explicar o aclarar.
2. **Las analogías** se pueden utilizar para resolver problemas, reconociendo cuándo el diseño es similar a un problema previamente resuelto.
3. Sabemos que las **ideas estimuladas por analogías** de campo lejano (fuera del dominio común) tienen más probabilidades de ser novedosas/innovadoras que otras aproximaciones mas convencionales.

El movimiento de los electrones alrededor del núcleo de un átomo es análogo a la rotación de la Tierra alrededor del sol



Un coágulo de sangre es análogo a un atasco de tráfico e impide que las células sanguíneas realicen sus entregas vitales



El marco (estructura de sostén) de una bicicleta, es análoga en el funcionamiento al del endoesqueleto de un vertebrado



Cual es un análogo natural, al alambre de espino?



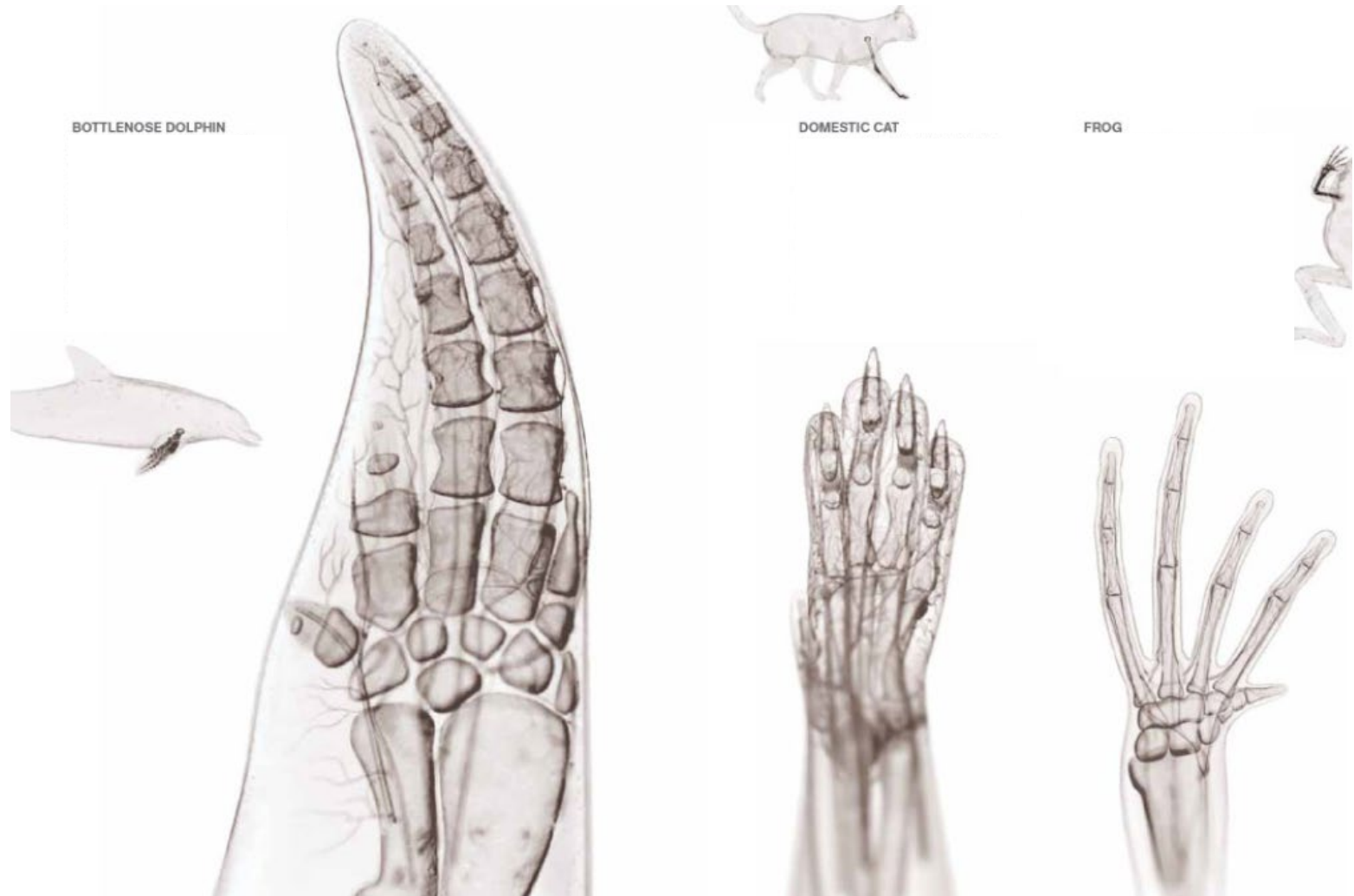
La defensa de una propiedad se asemeja a la defensa de muchos organismos vivos

la forma se ajusta a la función

MIMETIZANDO LA FORMA

MIMETIZANDO EL PROCESO

MIMETIZANDO LOS SISTEMAS



forma





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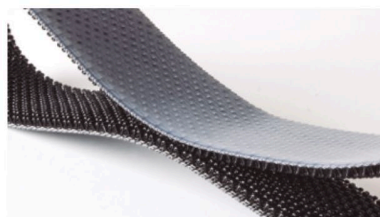
[Construction](#)



[Packaging](#)



High Technology Hook Tapes



ALFA-LOK® Hook to Hook
Fastener

Nov. 21, 1961

G. DE MESTRAL
SEPARABLE FASTENING DEVICE

3,009,235

Filed May 9, 1958

4 Sheets-Sheet 2

Fig. 1a

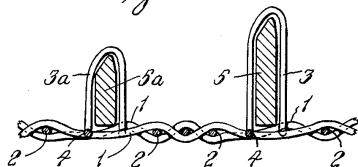


Fig. 2

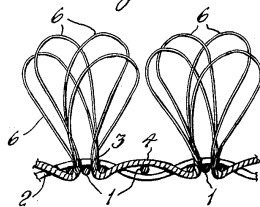


Fig. 3

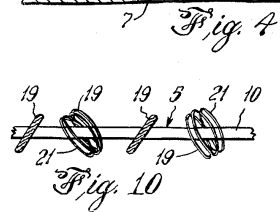
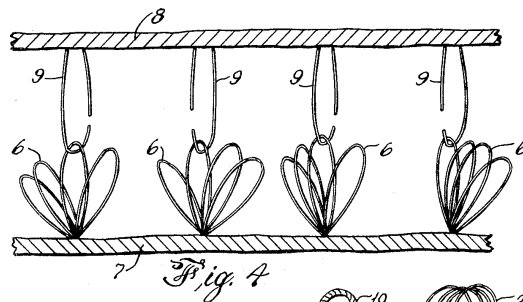
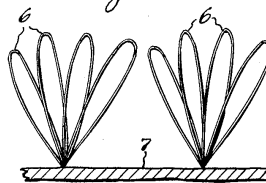


Fig. 10

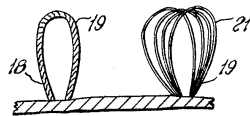


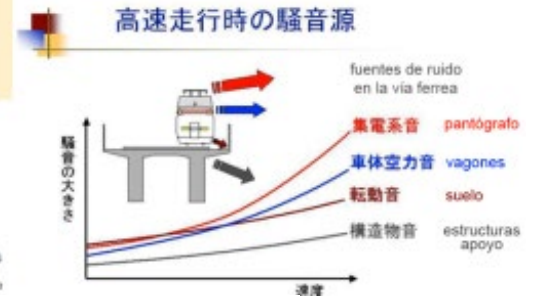
Fig. 11



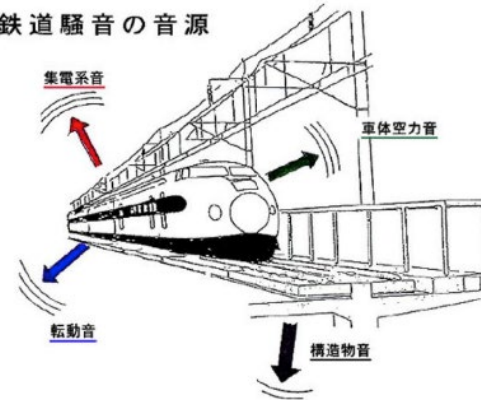


De la CURIOSIDAD
al BENEFICIO de la Sociedad **i⁴**





鉄道騒音の音源



Primer tren de alta velocidad

Shinkansen Bullet Train 1964

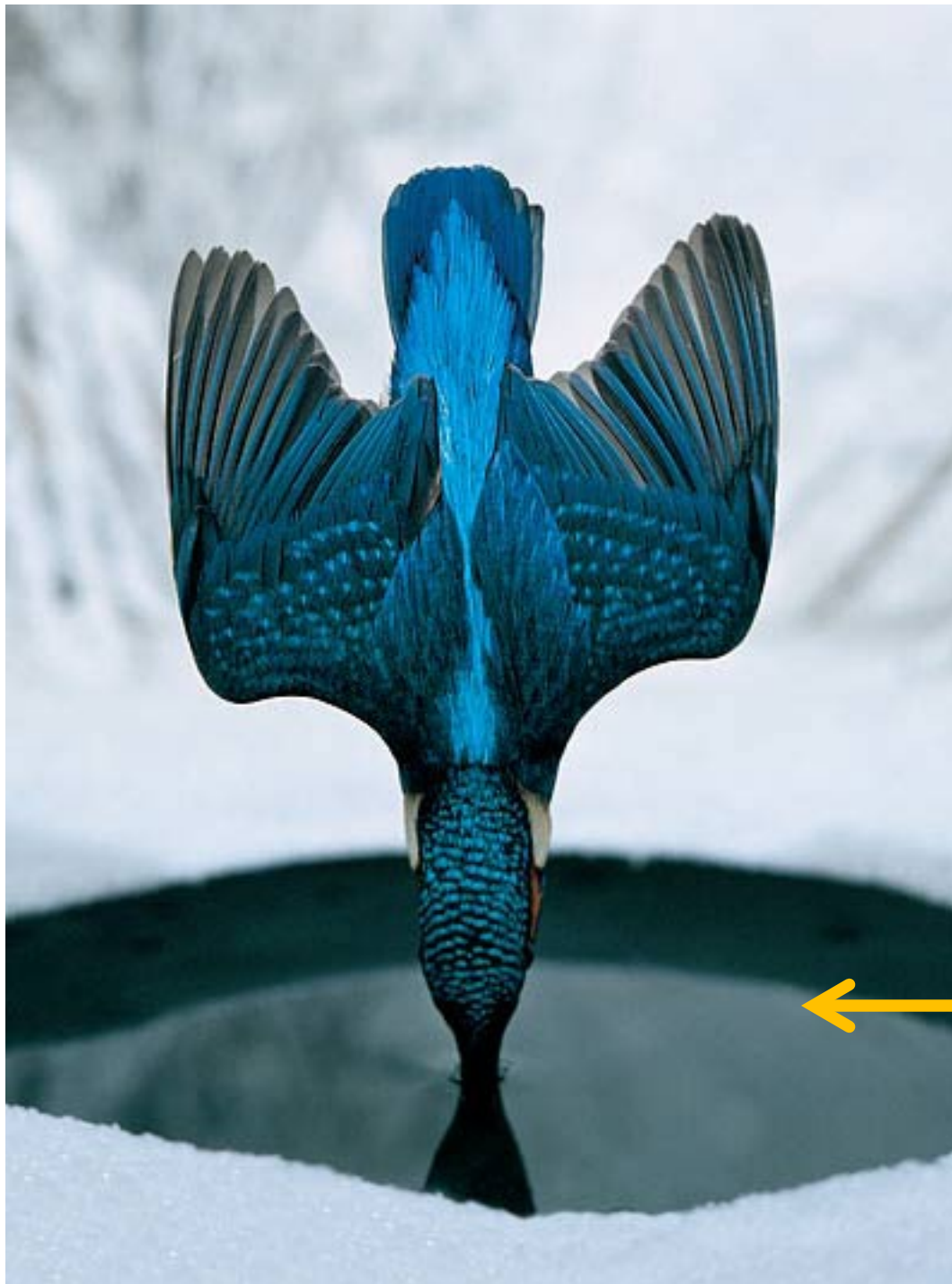
64 millones pasajeros/día



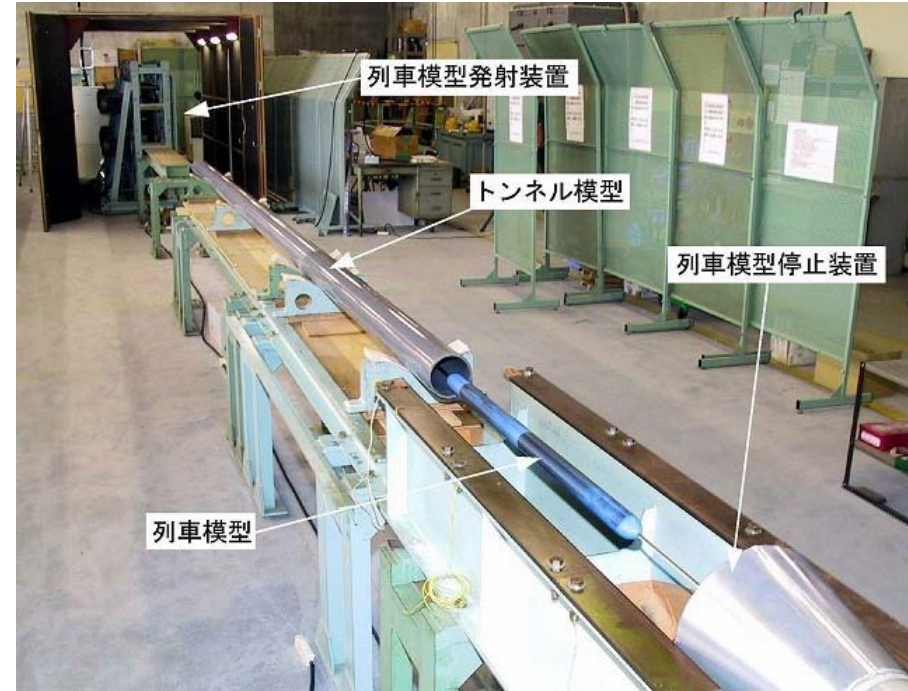


Densidad en el aire





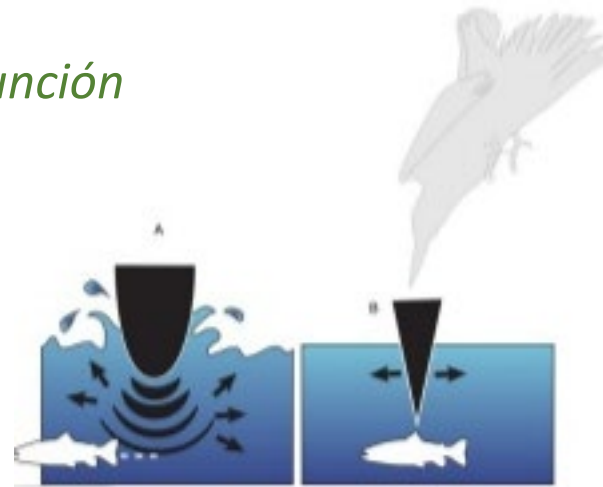
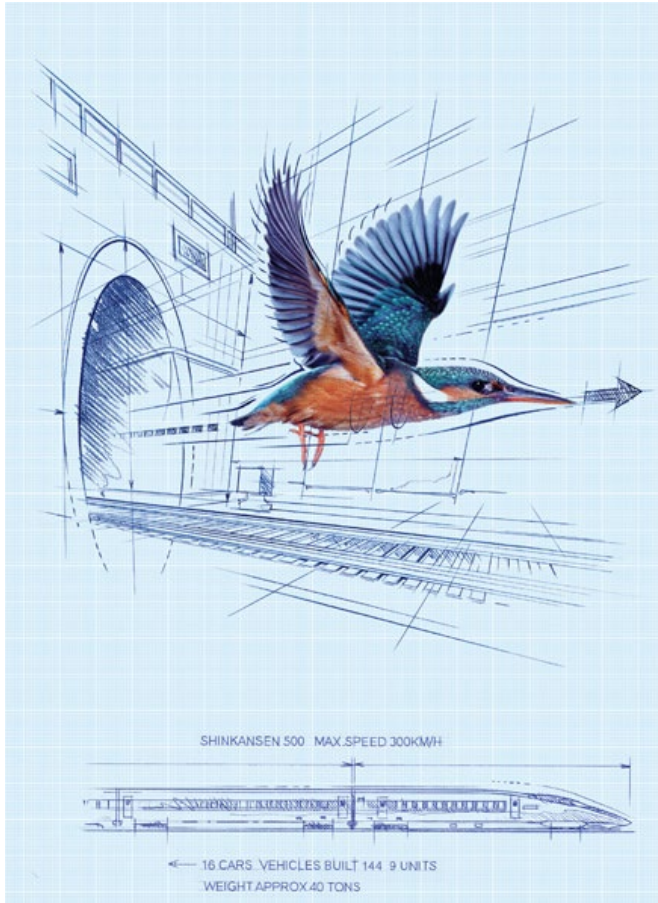
Densidad en el agua



Testaje en túnel del viento

pensamiento analógico

forma=función







+ 300km/ hora

Sin ruido al entrar en túneles (legalidad)

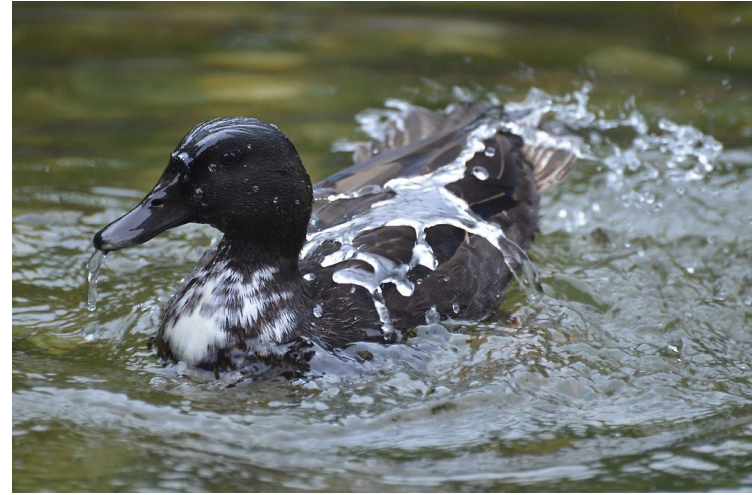
30% ahorro energético



A close-up photograph of green leaves with water droplets. The leaves are vibrant green and have a serrated edge. The water droplets are small and clear, reflecting light. The background is dark, making the green leaves stand out.

Que pueden enseñarnos las hojas sobre la autolimpieza??





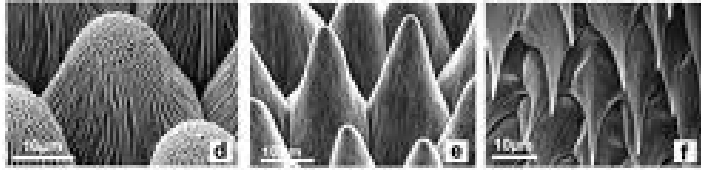
LOTUSAN

Cell surface structuring by cuticular folds



Solanum elaeagnifolium: upper leaf (a) side and (b) detail (c)

Alocasia macrorrhiza: lower leaf side



Avena montana: upper side lower leaf

Viola tricolor: upper side flower leaf

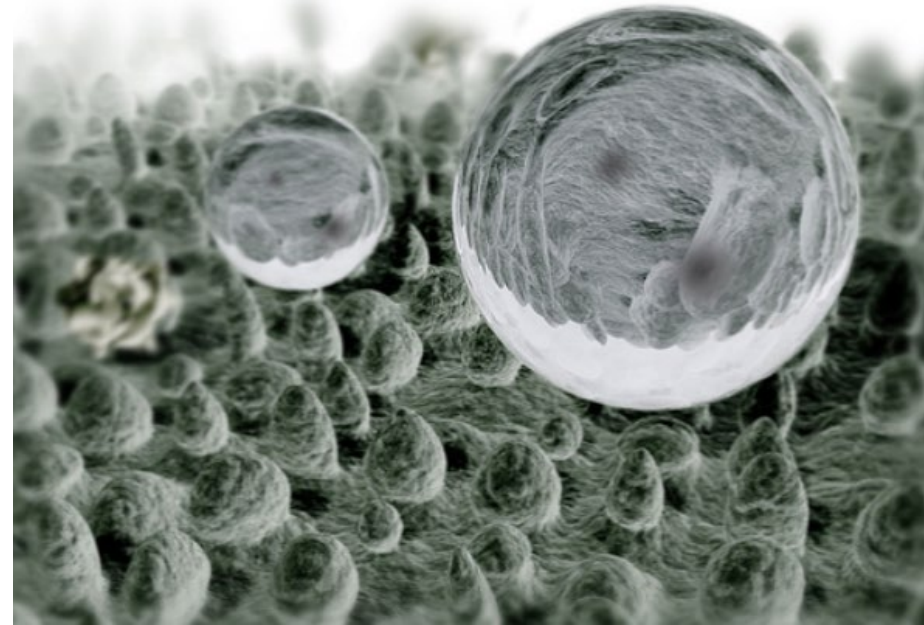
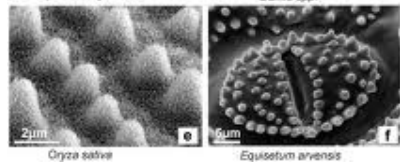
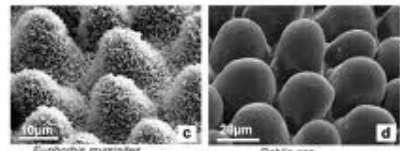
Sarracenia leucophylla: trap leaf

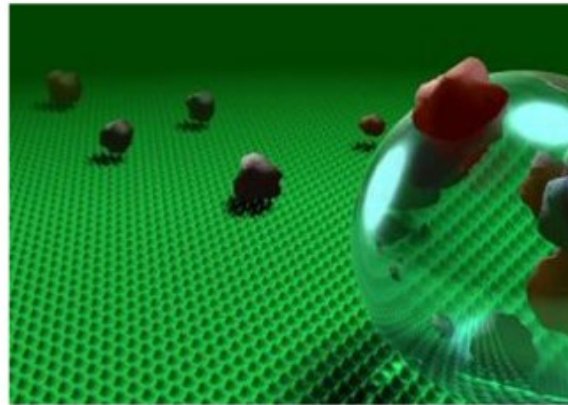
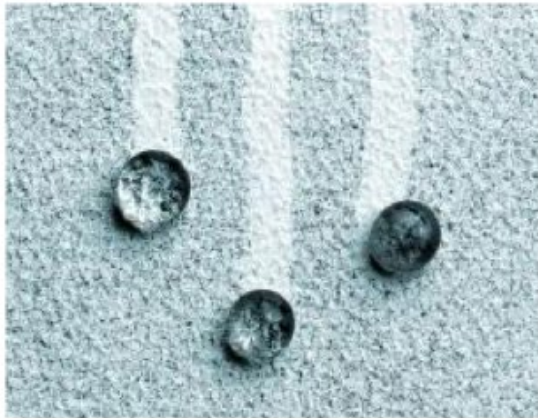


Aspidosiphon patagonicus: seed surface

Arabidopsis thaliana: seed cells with a partial removed cuticle (h) and a detail (i)

Hierarchical surface structures schematic

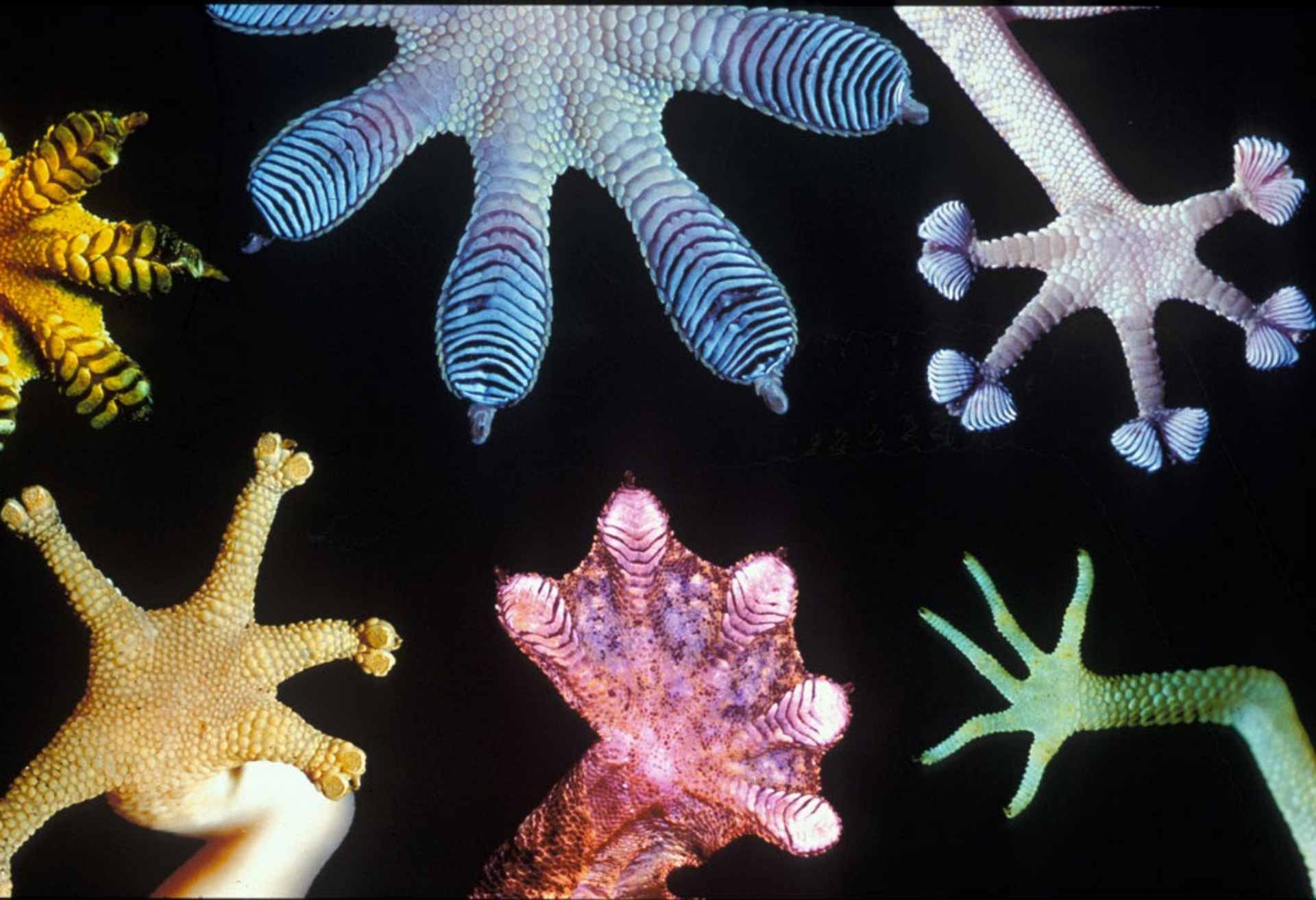


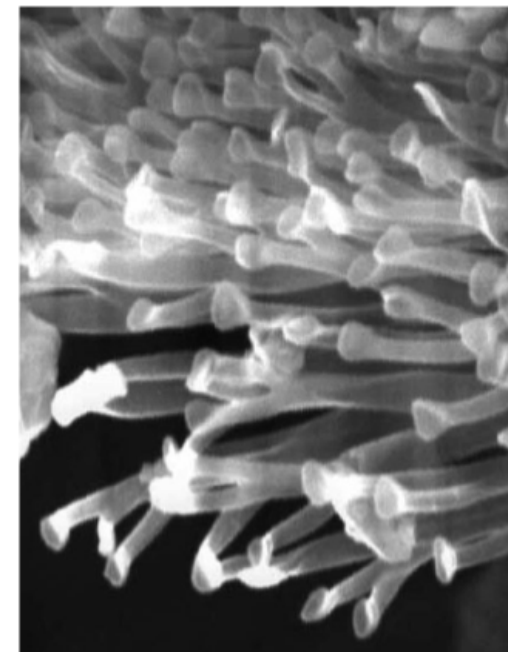
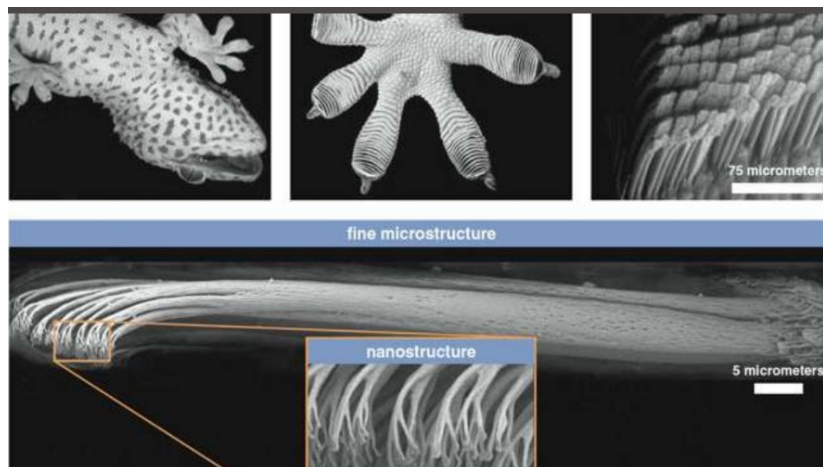
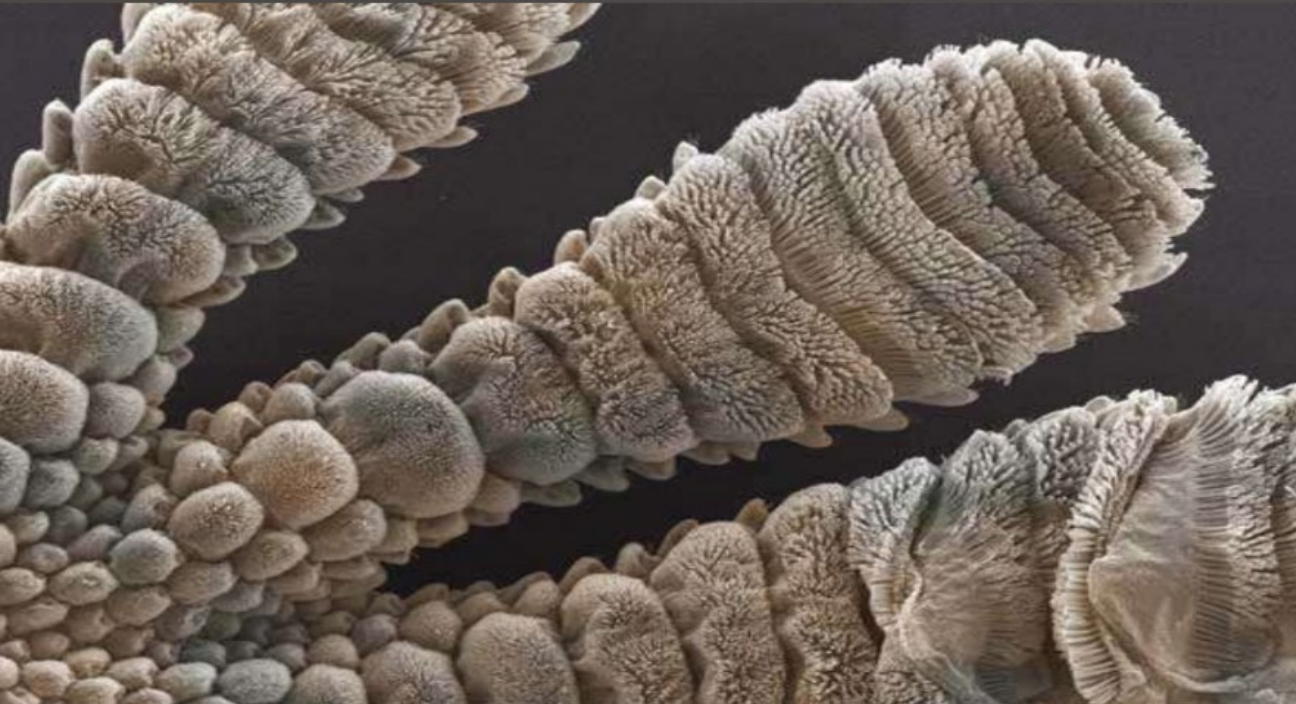


Superhidrofobicidad
Efecto Lotus

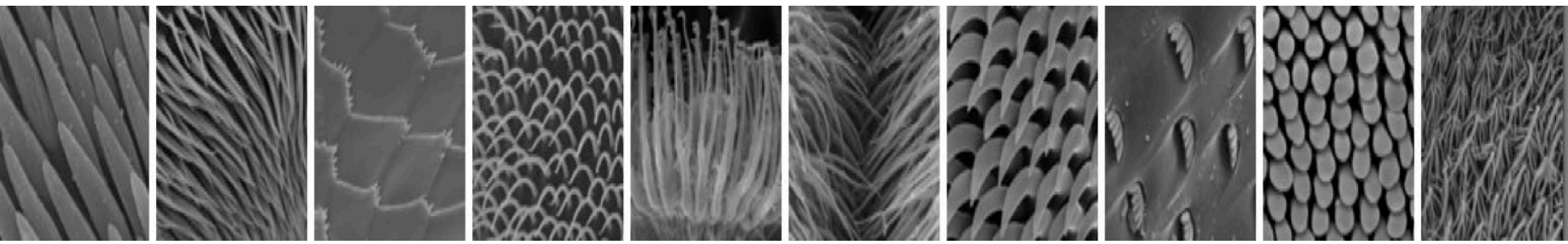
A close-up photograph of two blue geckos facing each other. Their heads are positioned symmetrically, with their mouths slightly open, revealing their pinkish tongues. The geckos' skin is covered in a dense pattern of small, raised scales, giving it a bumpy texture. The background is dark, making the bright blue color of the geckos stand out. A semi-transparent grey banner with white text is overlaid across the middle of the image.

Que pueden enseñarnos las salamanequesas sobre pegamentos?





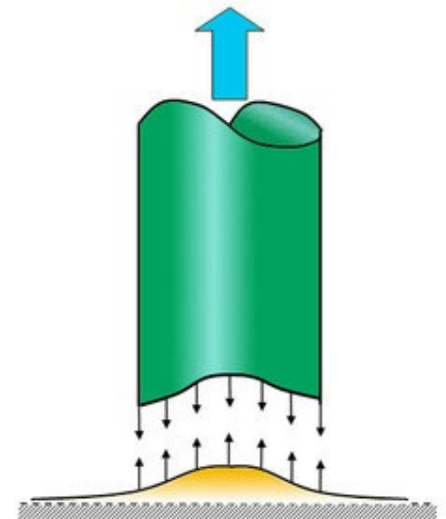
Fuerzas de Van der Waals



mecanismo: fuerzas de **Van der Waals**

es la suma de las fuerzas atractivas o repulsivas entre moléculas distintas de los enlaces covalentes que se obtiene cuando la superficie de contacto es pequeña como 100 nm.

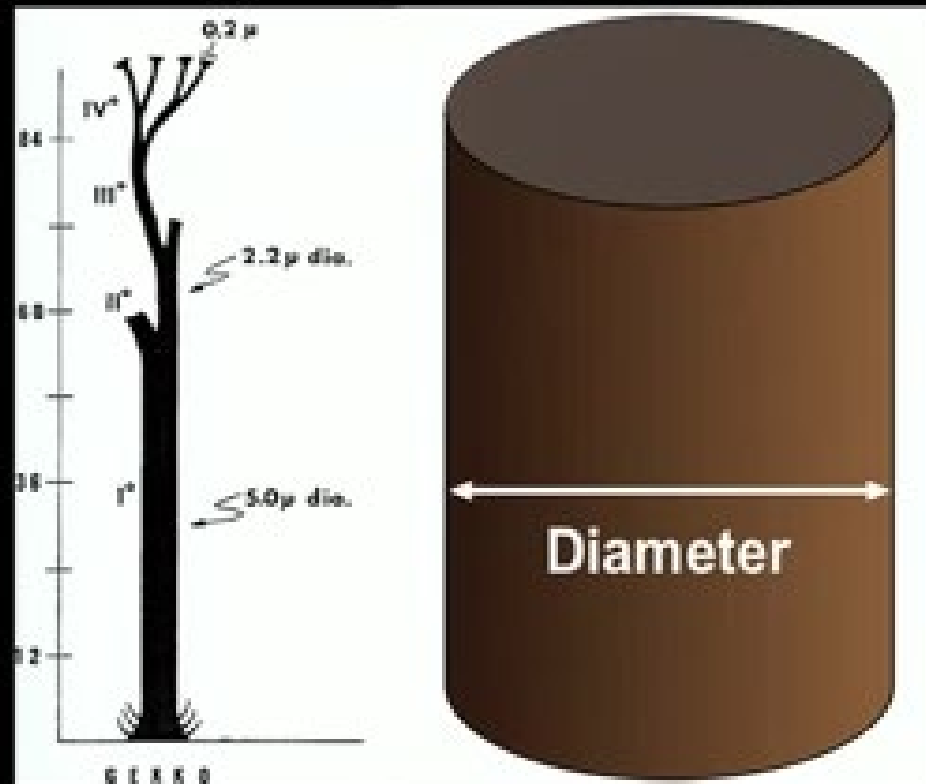
1 mm = 1.000.000 nanometros

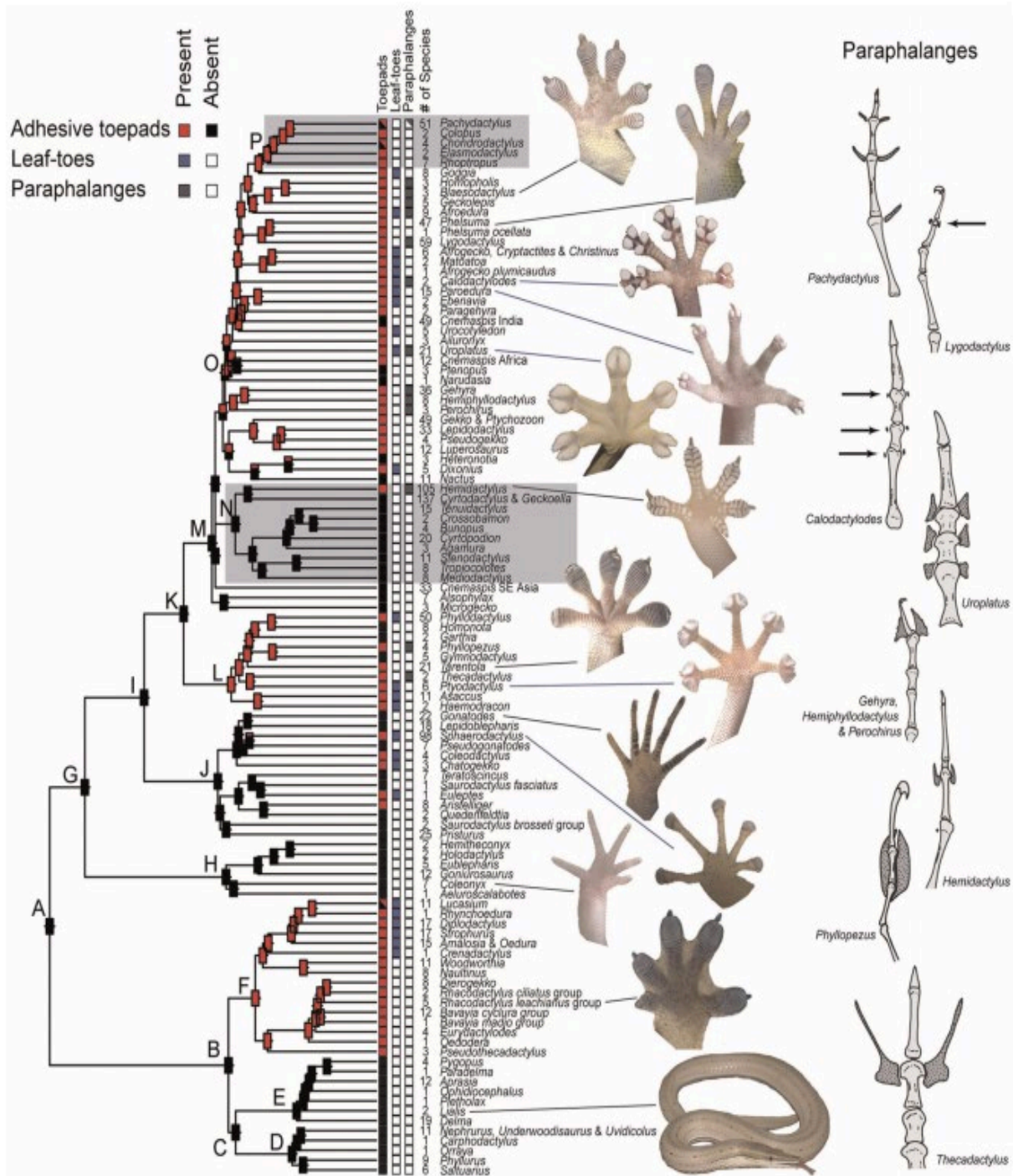
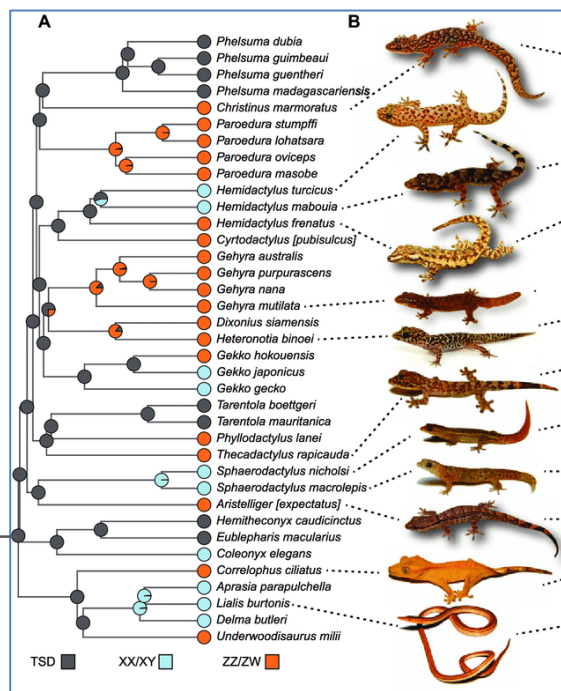


Geckos have Hairy Toes

Gecko Toe
Hair

Your Head
Hair







Interface **FLOR**

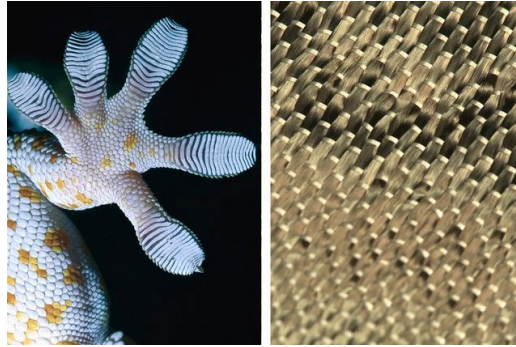




*Interface***FLOR**







GECKO BIOMEDICAL

**Gecko Biomedical received 1.3 million euros from
Bpifrance to advance its bio-inspired Surgical
Adhesive Solutions**

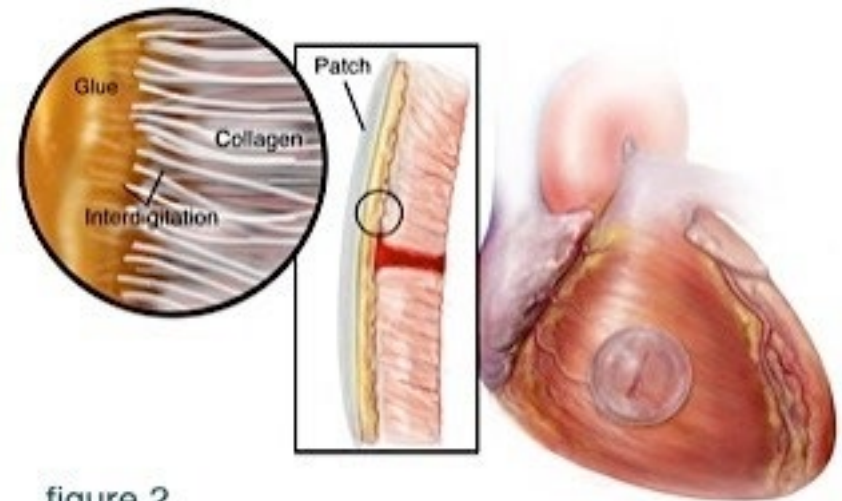


figure 2

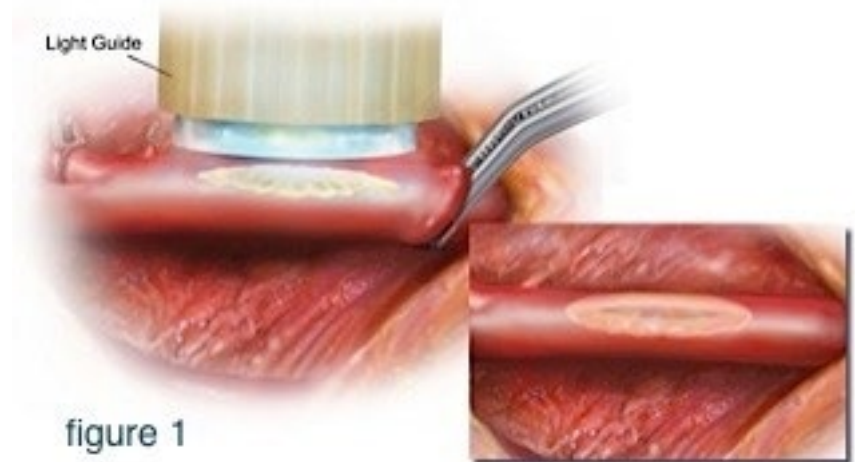


figure 1

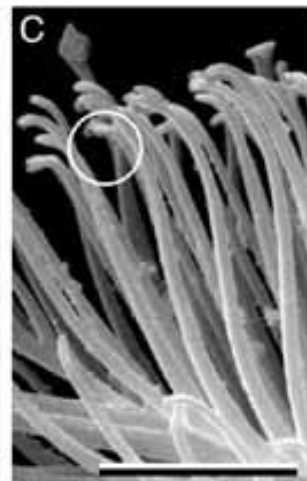
body mass →



beetle



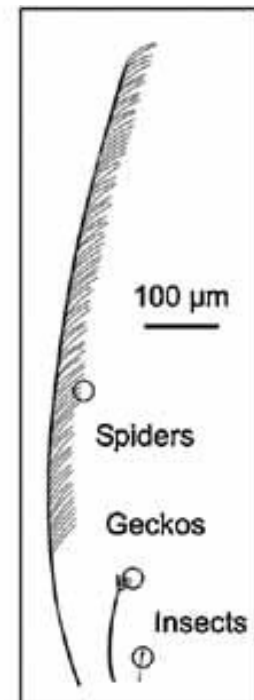
fly



spider

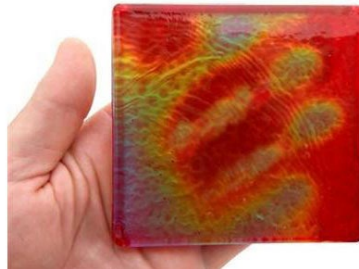
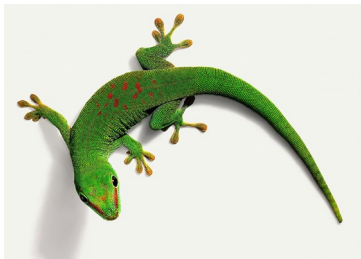


gecko



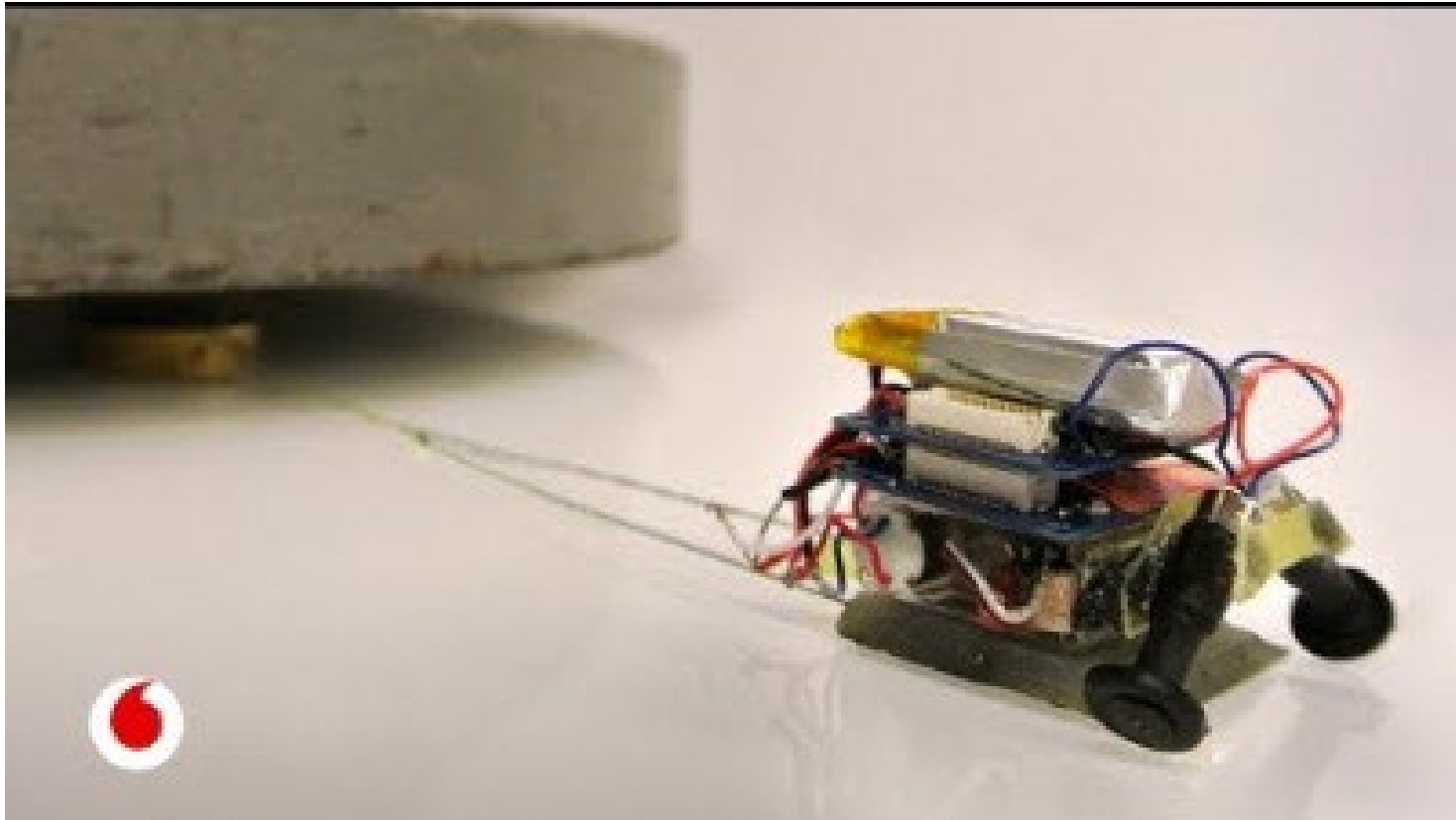
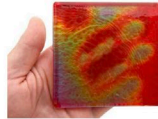
Cual es la conexión entre...??

Gecko • nuevo material • super eficiente mini robot?



<https://www.youtube.com/watch?v=AhF1qULHZSI>

Gecko • nuevo material • supereficiente mini robot?



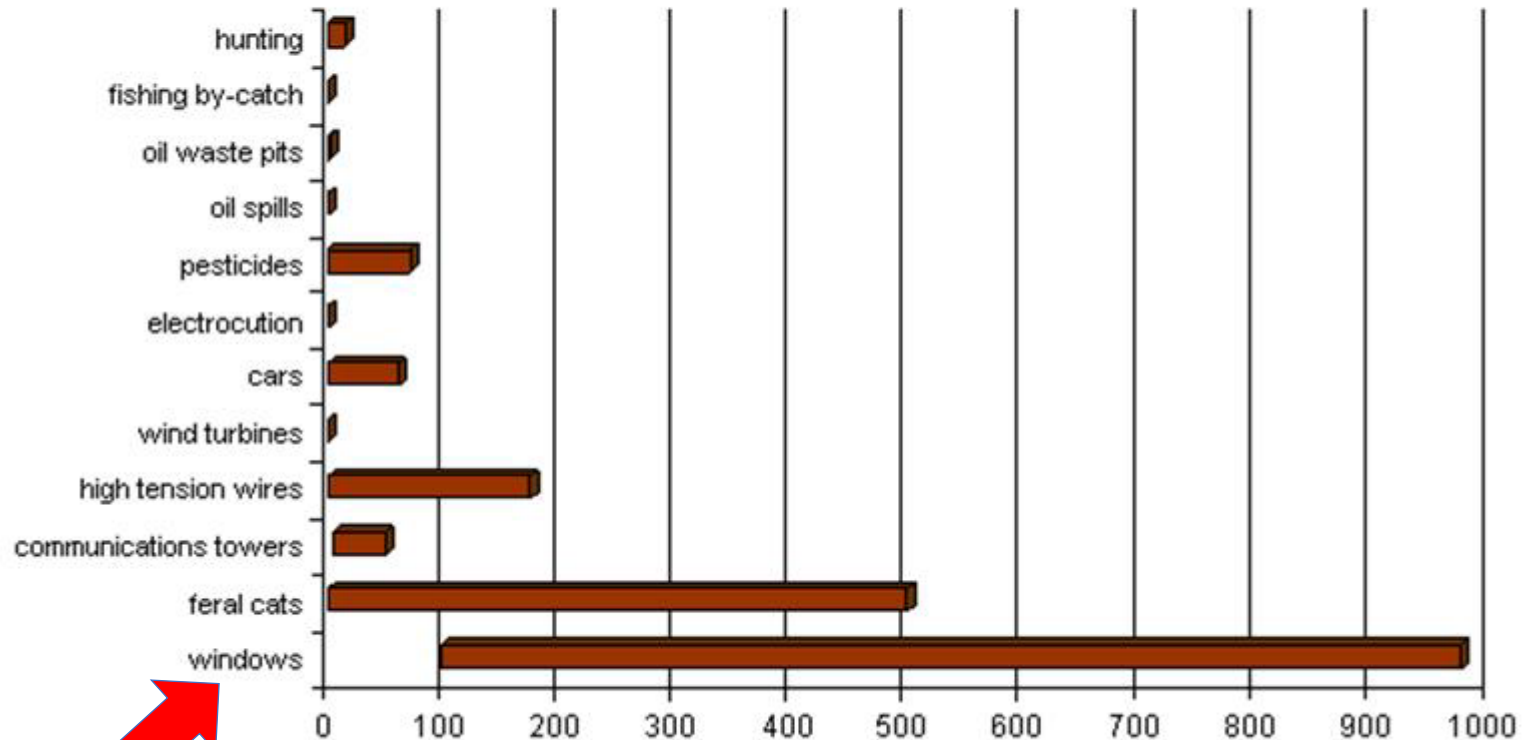
<https://youtu.be/AhF1qULHZSI>

¿?





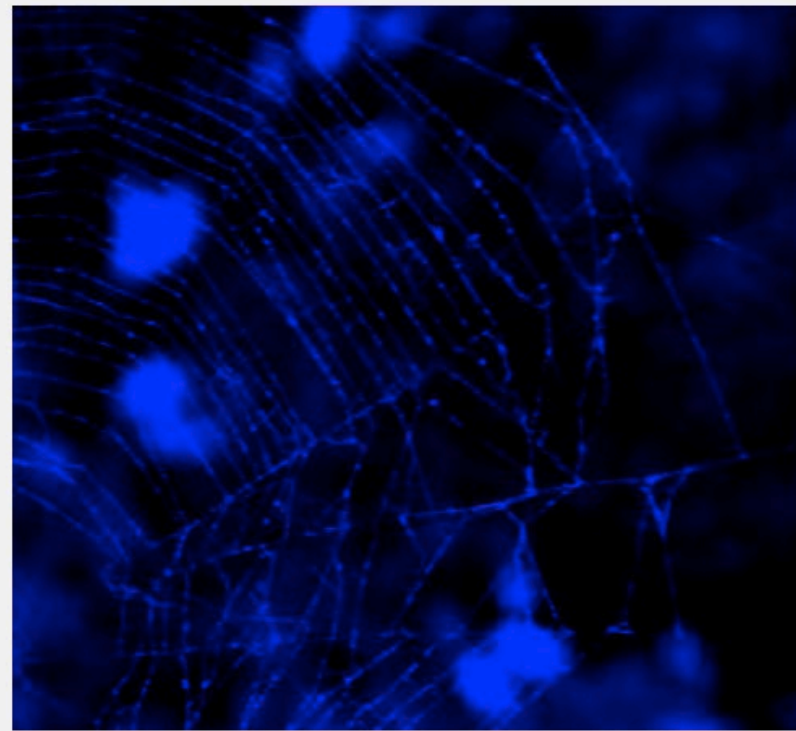
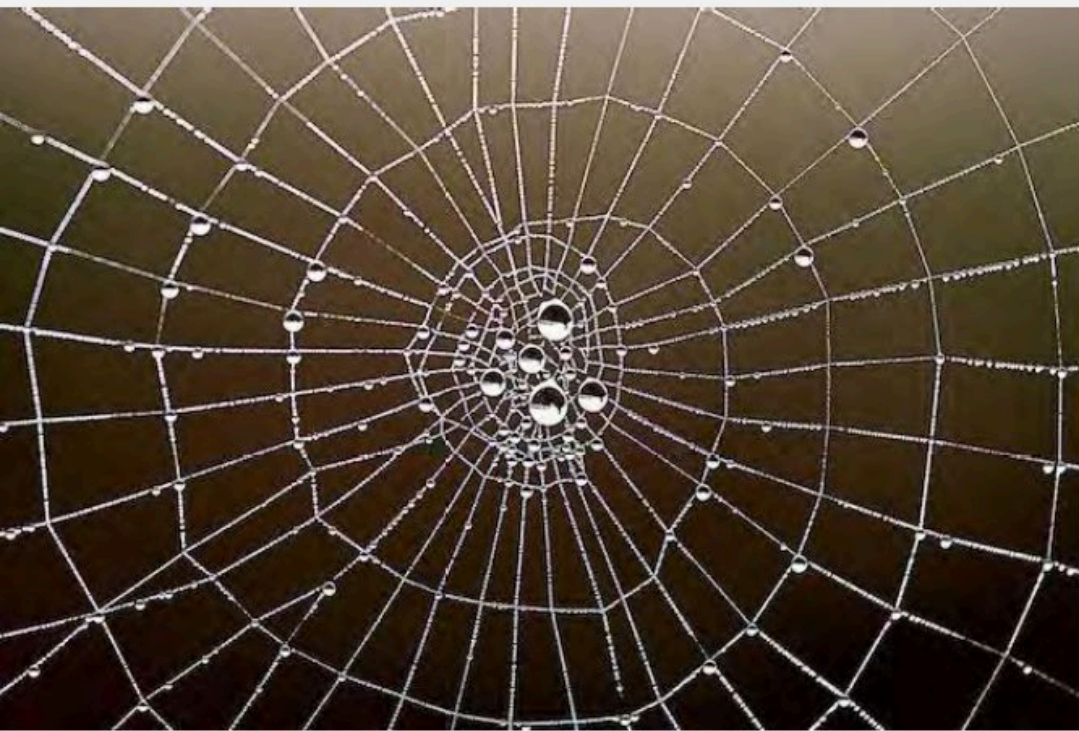
Estimated Annual Mortality (in millions of birds)





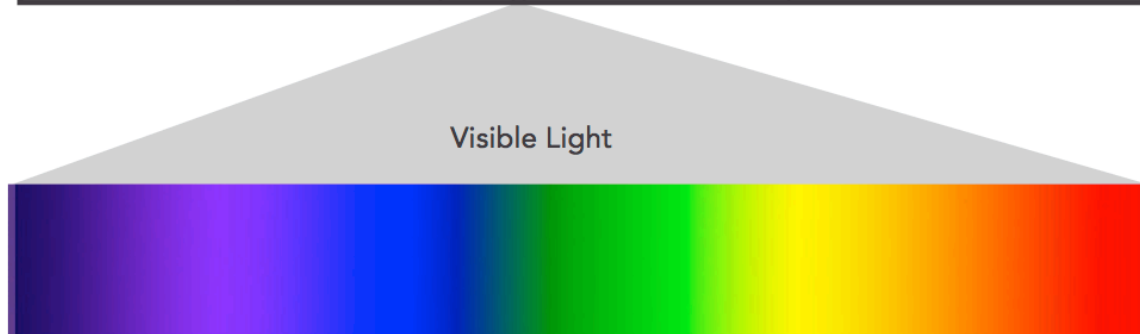


STEVE GREER
PHOTOGRAPHY

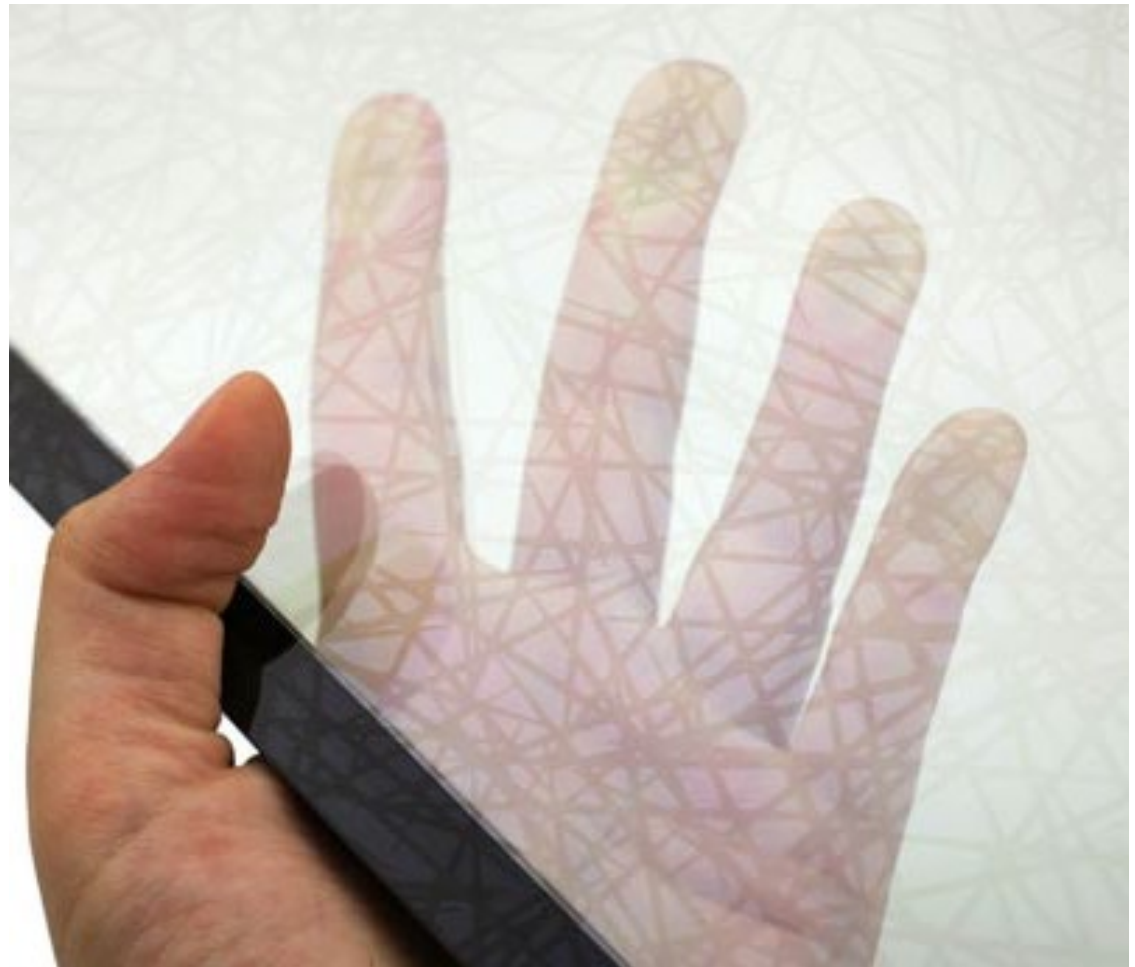




Gamma Ray	X-Ray	Ultra-violet	Infrared	Radio Waves
-----------	-------	--------------	----------	-------------



Visible light: the area of the electromagnetic spectrum visible to the human eye.





A satellite image of a hurricane, showing a well-defined eye and spiral cloud bands. The image is used as a background for the text.

CASOS DE EXITO BIOINSPIRADOS

¿Que nos enseñan los vórtices en la optimización de motores?





Nautilus Shell



Lily Impeller



PAX Impeller

Photo courtesy of Jay Harman and PAX Scientific



Vórtice

15 cm

40 millones de litros

3 bombillas de 100 wat



Tanque de 38.000.000 de litros (+ 120 m x 9 m alto)

<https://www.youtube.com/watch?v=QCAk2Ge5wQE>

<https://www.youtube.com/watch?v=QbskDwYI2dk>







How Does the Mussel Grow its Beard...

California mussels
Mytilus californianus

SUBSCRIBE



0:10 / 4:00



YouTube

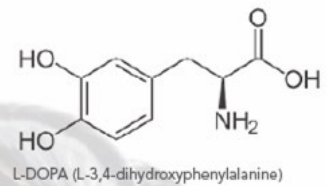




 **PureBond.**
FORMALDEHYDE-FREE TECHNOLOGY

columbia
FOREST PRODUCTS™

Innovating Responsibly.™



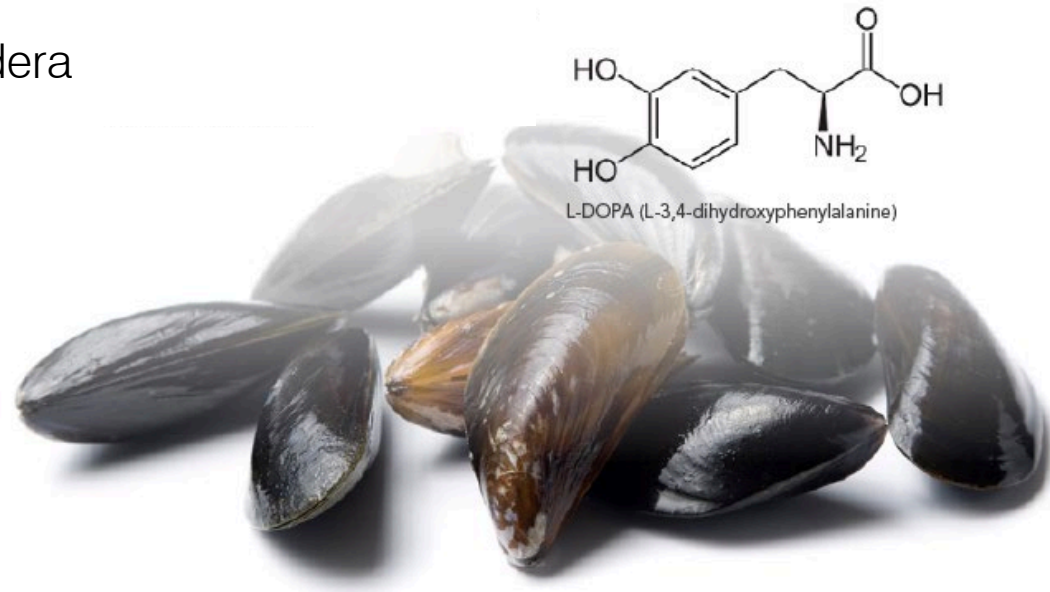
Proteínas Adhesivas Marinas

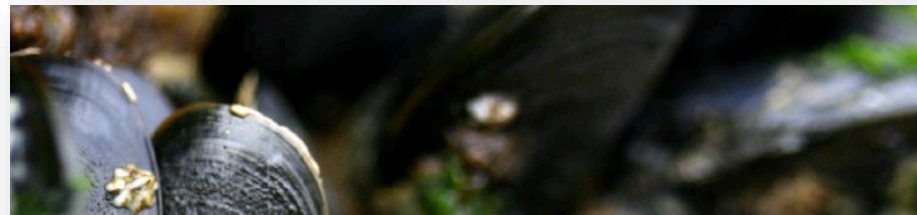
biso

aminoácidos únicos: 3,4 dihidrofenilalanina (L-DOPA)

Fuerte adherencia (teflón, acero, cristal...)

Potencial industria: Sector madera





PUREBOND® TECHNOLOGY: WOOD GLUE WITHOUT FORMALDEHYDE

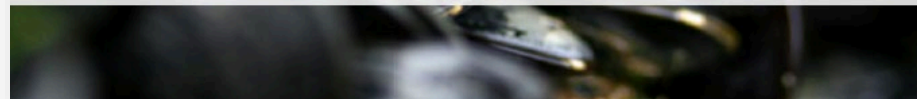
Biomimicry Case Study: Biology To Design

On the wave-battered shores of the Oregon coast lives a hardy creature, the blue mussel. This mollusk uses small adhesive threads to attach to rocky surfaces in tidal zones, resisting the erosive forces of water and waves. The mussel's tenacious grip has inspired new wood glue technology called PureBond® that is nontoxic and sustainable, leading the way for innovation in the wood products industry.



PRODUCT	PureBond® Formaldehyde-free Hardwood Plywood Technology	
INNOVATORS	RESEARCHER	COMPANY
	Dr. Kaichang Li	Columbia Forest Products
WEBSITE	http://www.columbiaforestproducts.com/PureBond.aspx	
SUSTAINABILITY WIN	Nontoxic, soy-based adhesive that is formaldehyde-free	
EMULATING FORM, PROCESS, OR SYSTEM?	Process	
LIFE'S PRINCIPLE MET	Use life-friendly chemistry	

BIOMIMICRY
Institute



The PureBond Timeline:

2000

Dr. Kaichang Li is inspired by mussels on the Oregon coast

2003

Steve Pung of Columbia Forest Products meets Dr. Li; CFP agrees to fund R&D efforts

2005

PureBond announced to the public and production begins

2006

CFP converts all 7 of its plywood plants to PureBond technology

2007

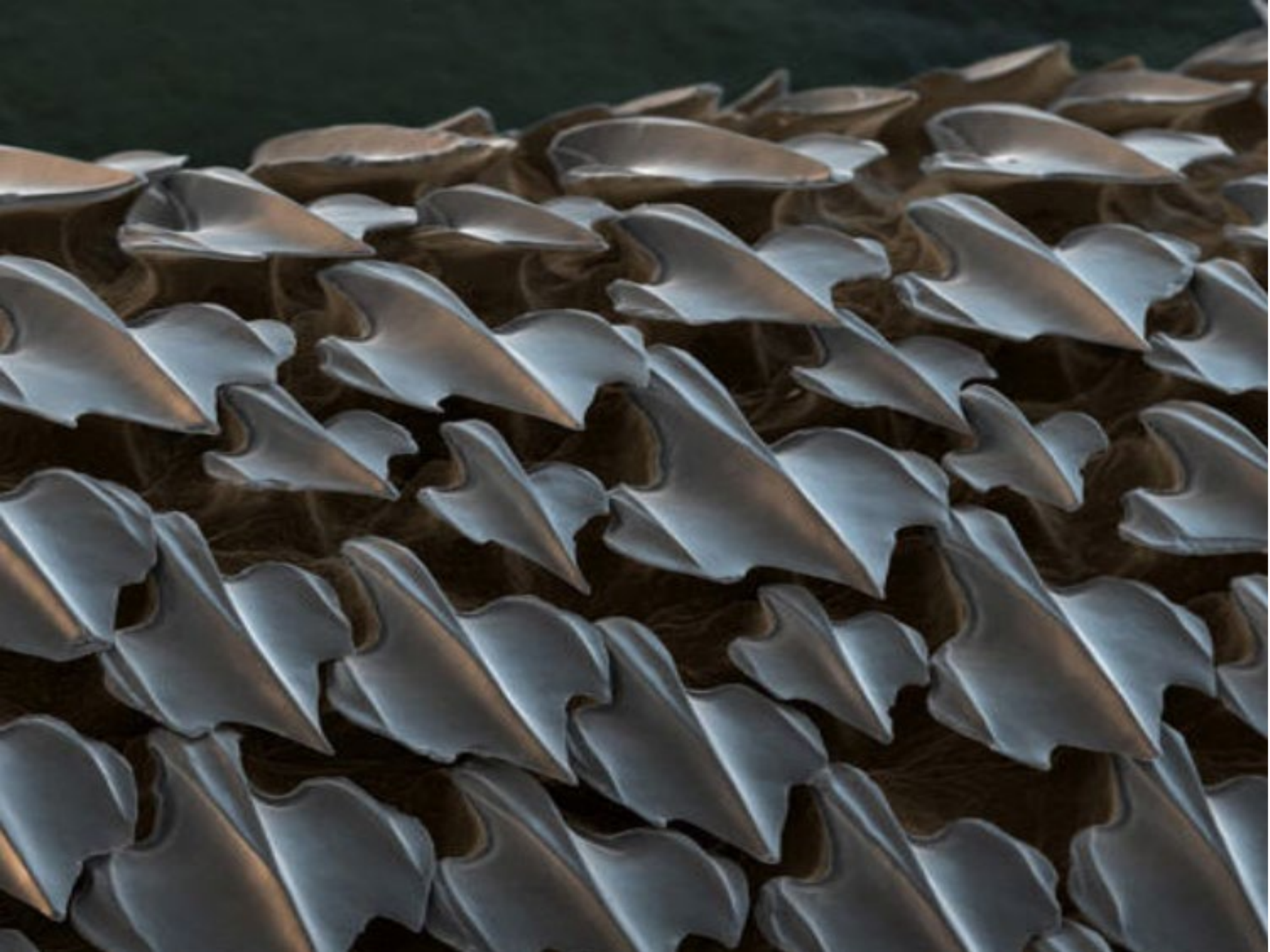
Dr. Li, CFP, and Hercules, Inc. receive Presidential Green Chemistry Challenge Award

2008

CFP announces production of 25 millionth hardwood plywood panel using PureBond technology

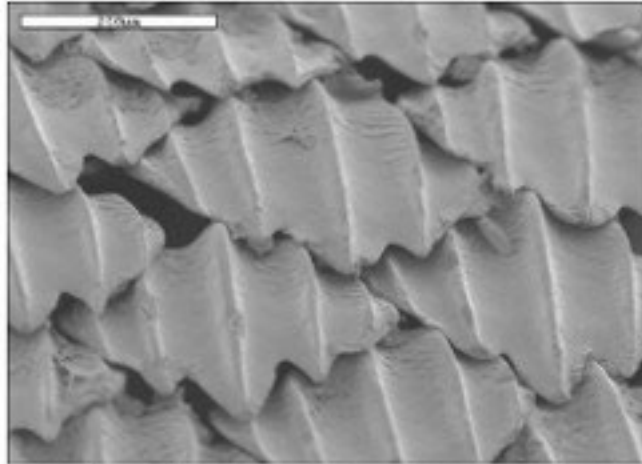
2010

Over 40 million PureBond panels have been manufactured and sold

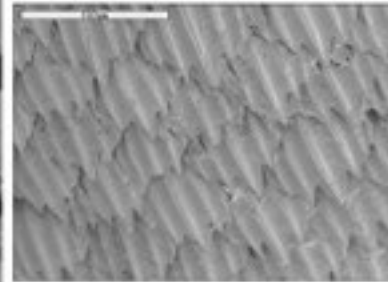




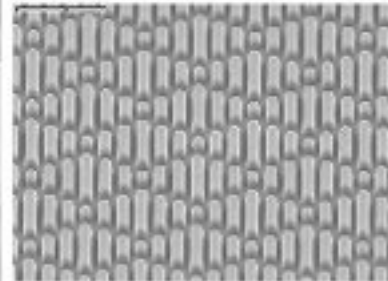
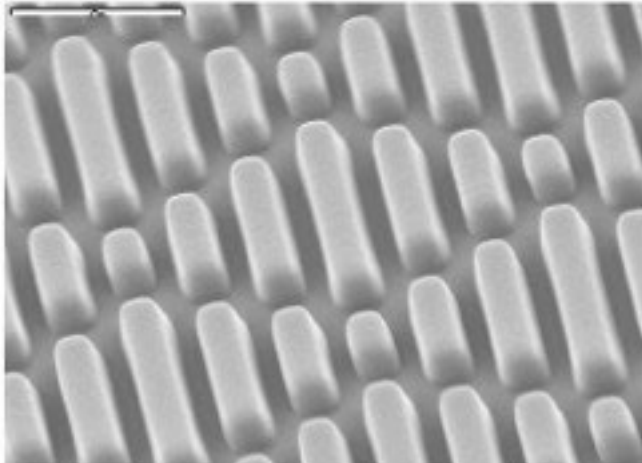


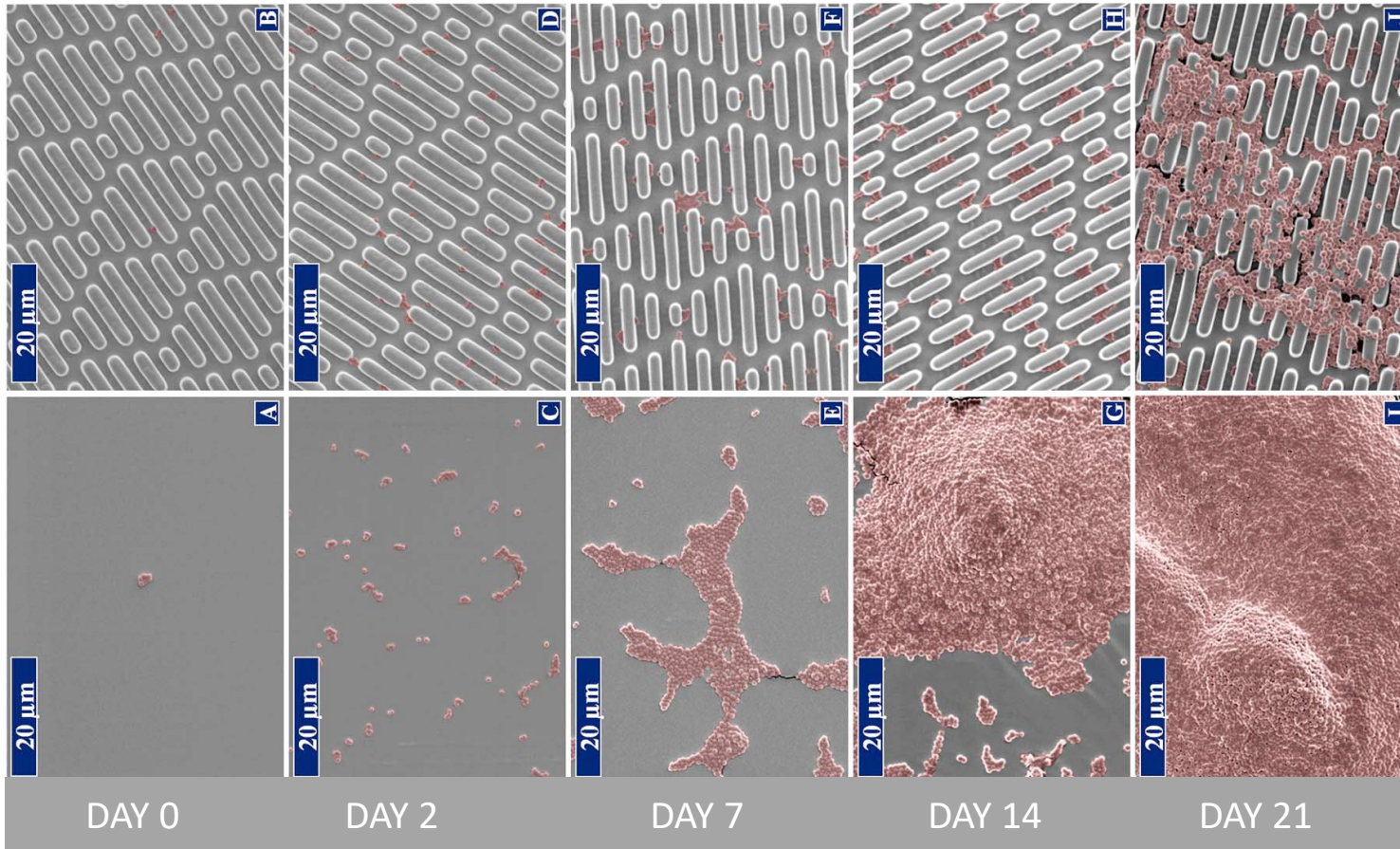


**Real Galapagos shark
skin (microscale)**



**Sharklet technology
pattern (microscale)**





Sin antibióticos
Sin química
Sin aditivos

1 cell

10 million

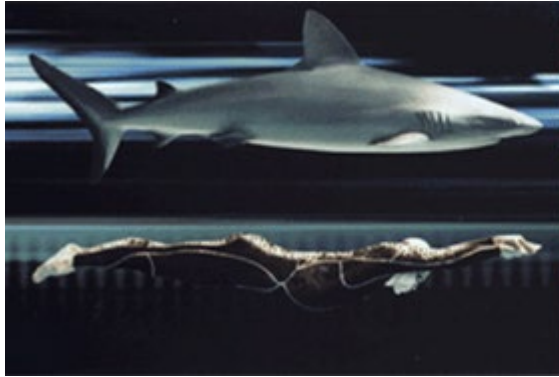
100 millions ...



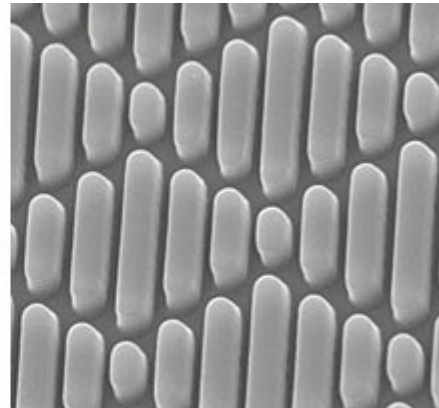


450 millones de años de experiencia en la Tierra





speedo



Sharklet™
Technologies, Inc.

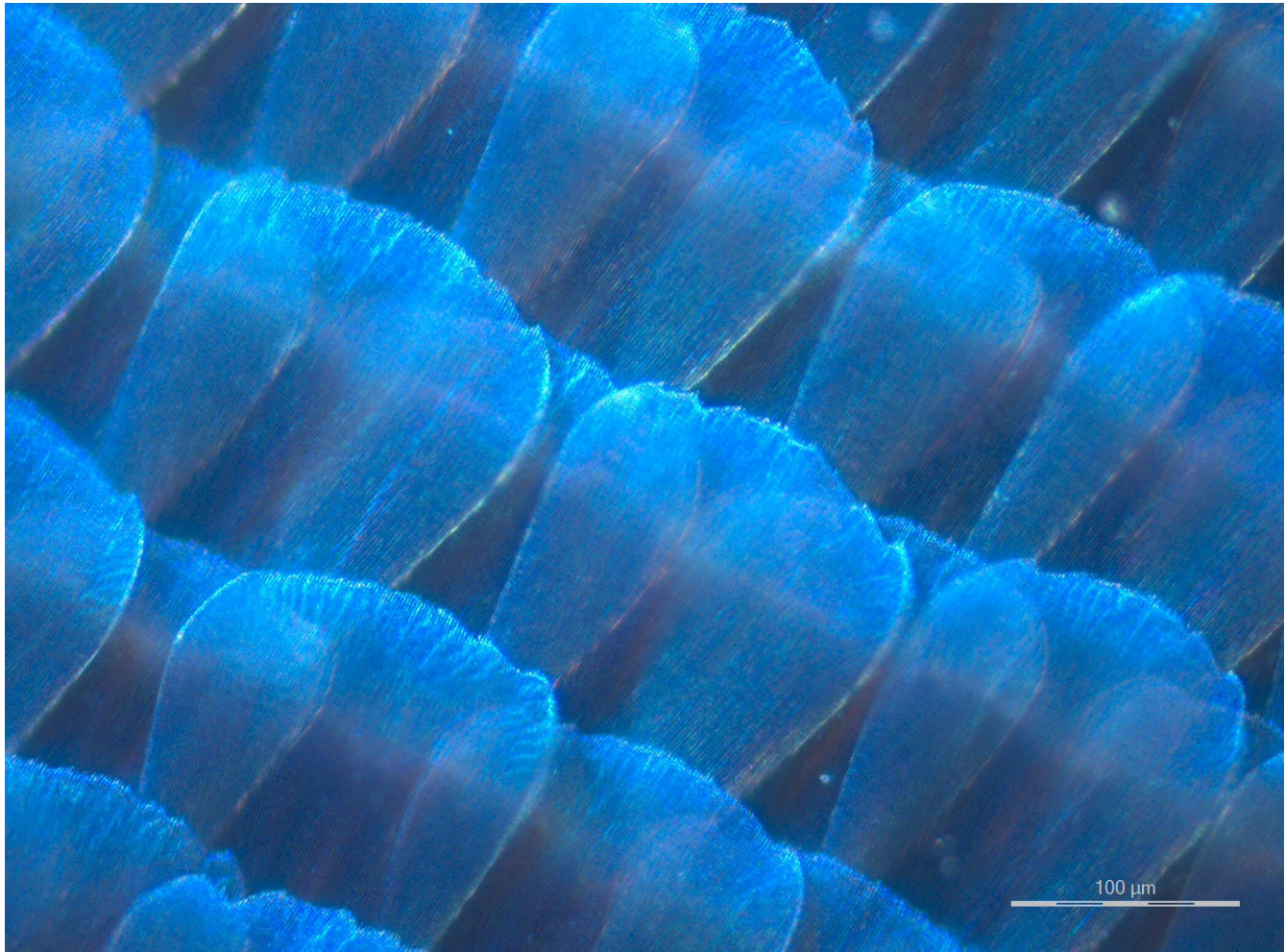


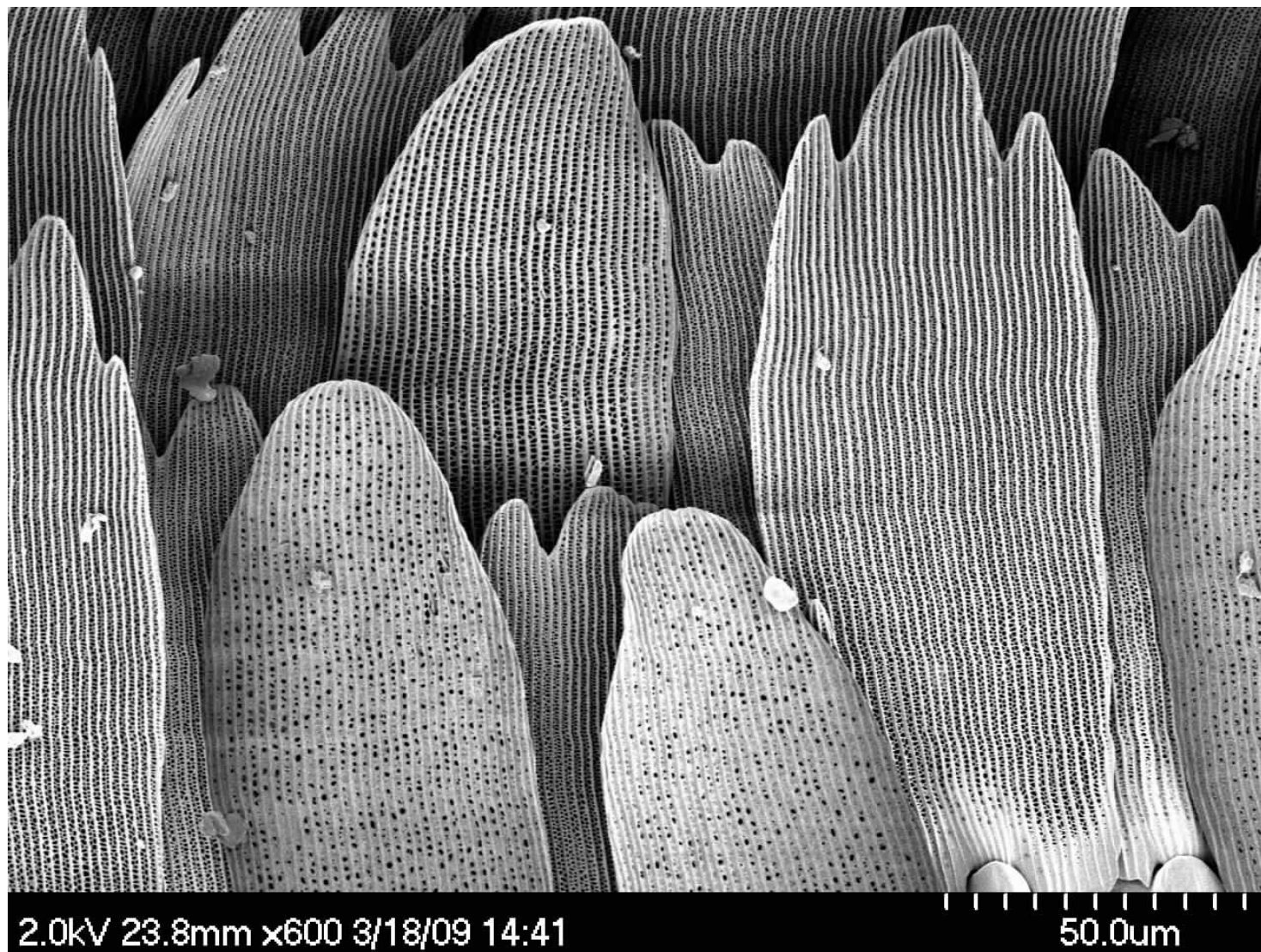


To Dye For: Textile Processing's Global Impact

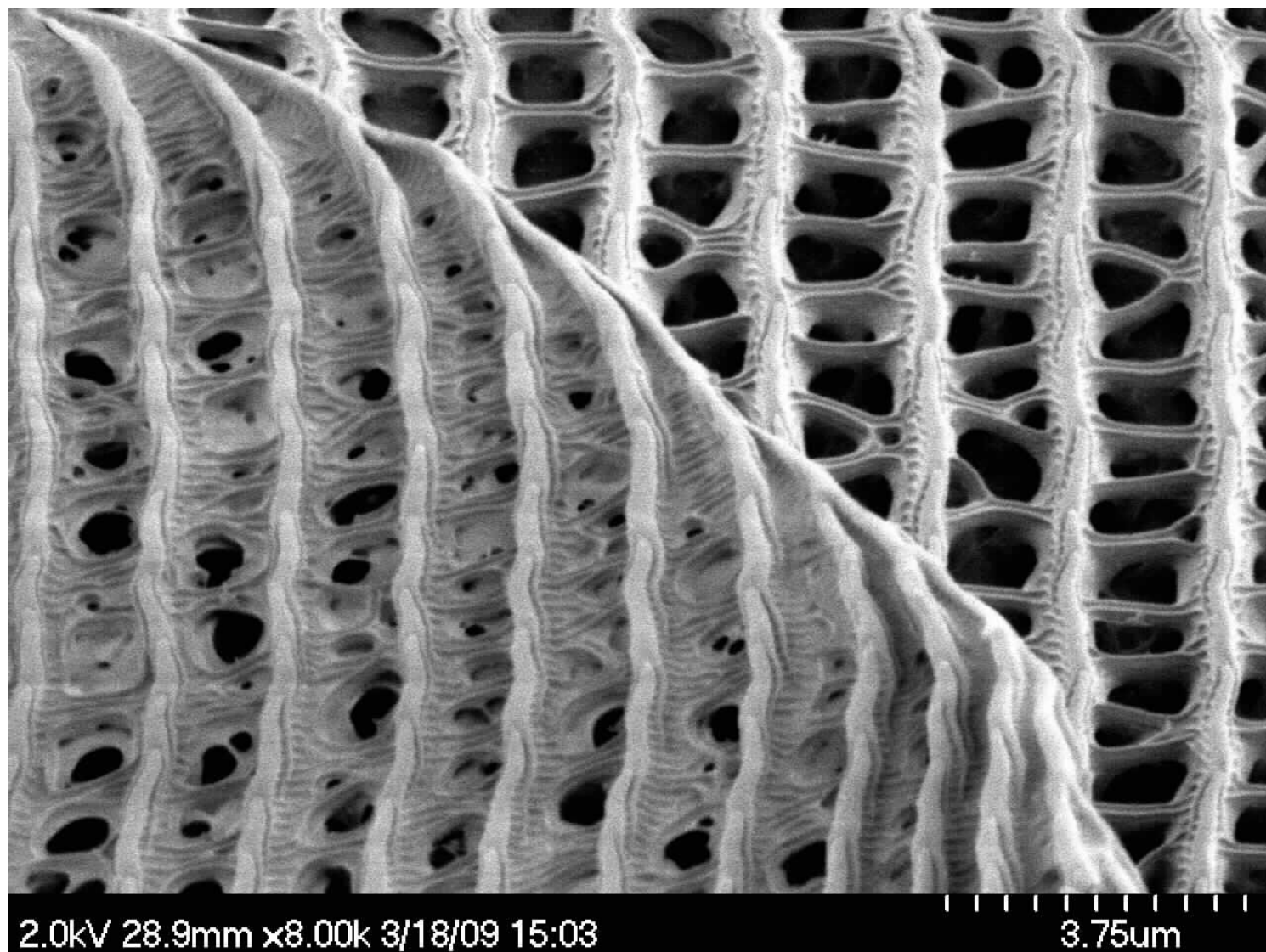




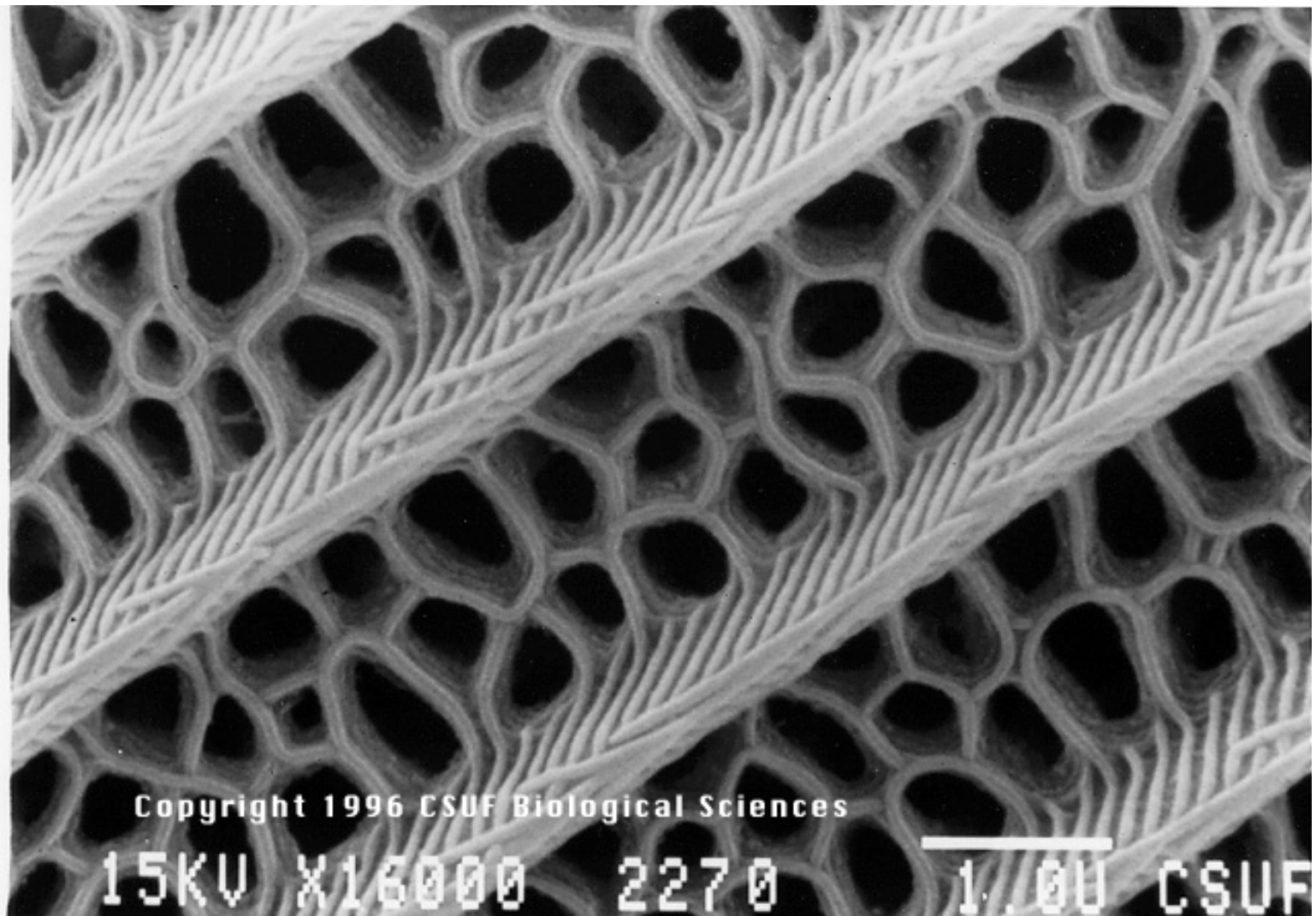




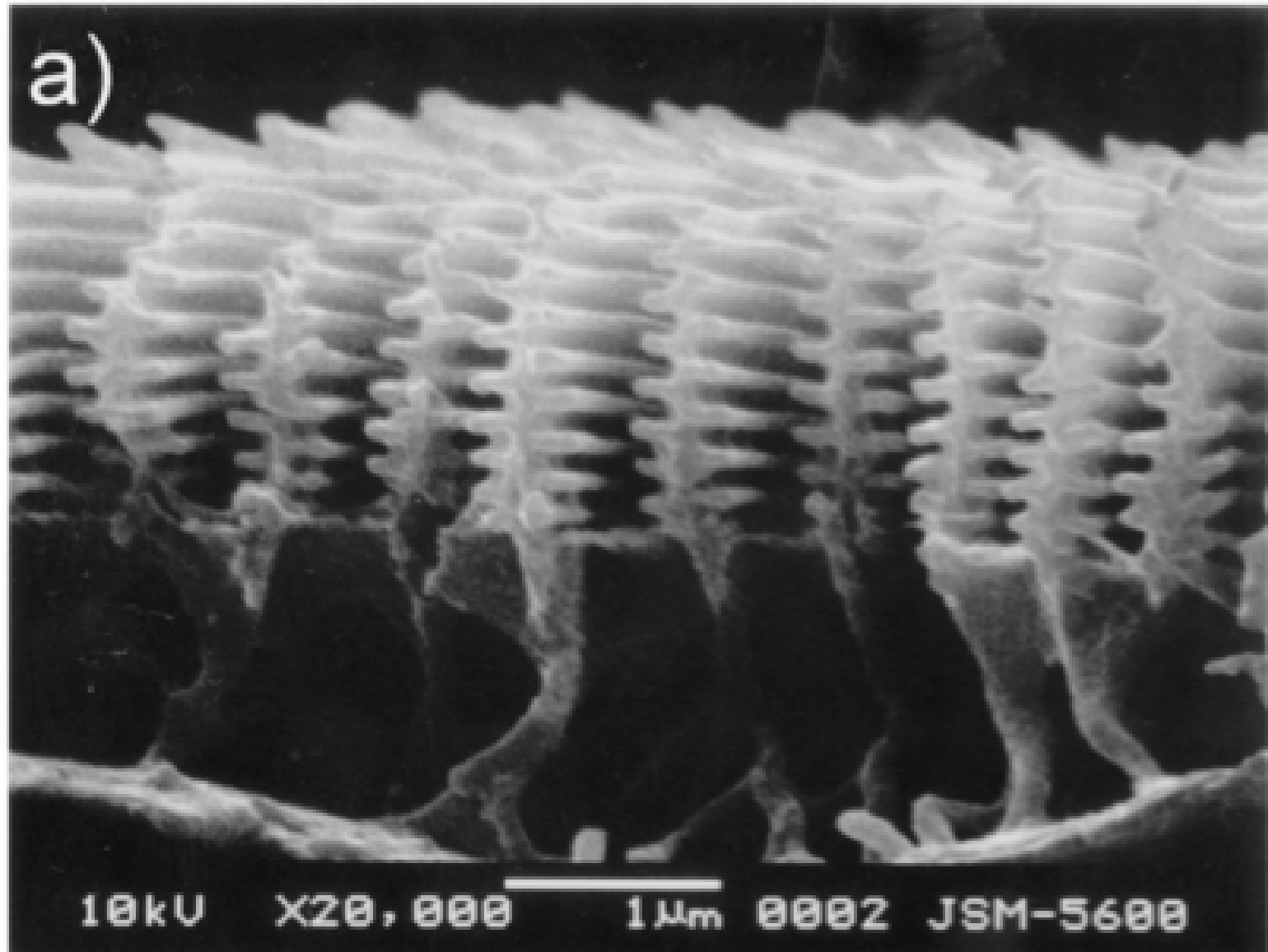
600 X magnification



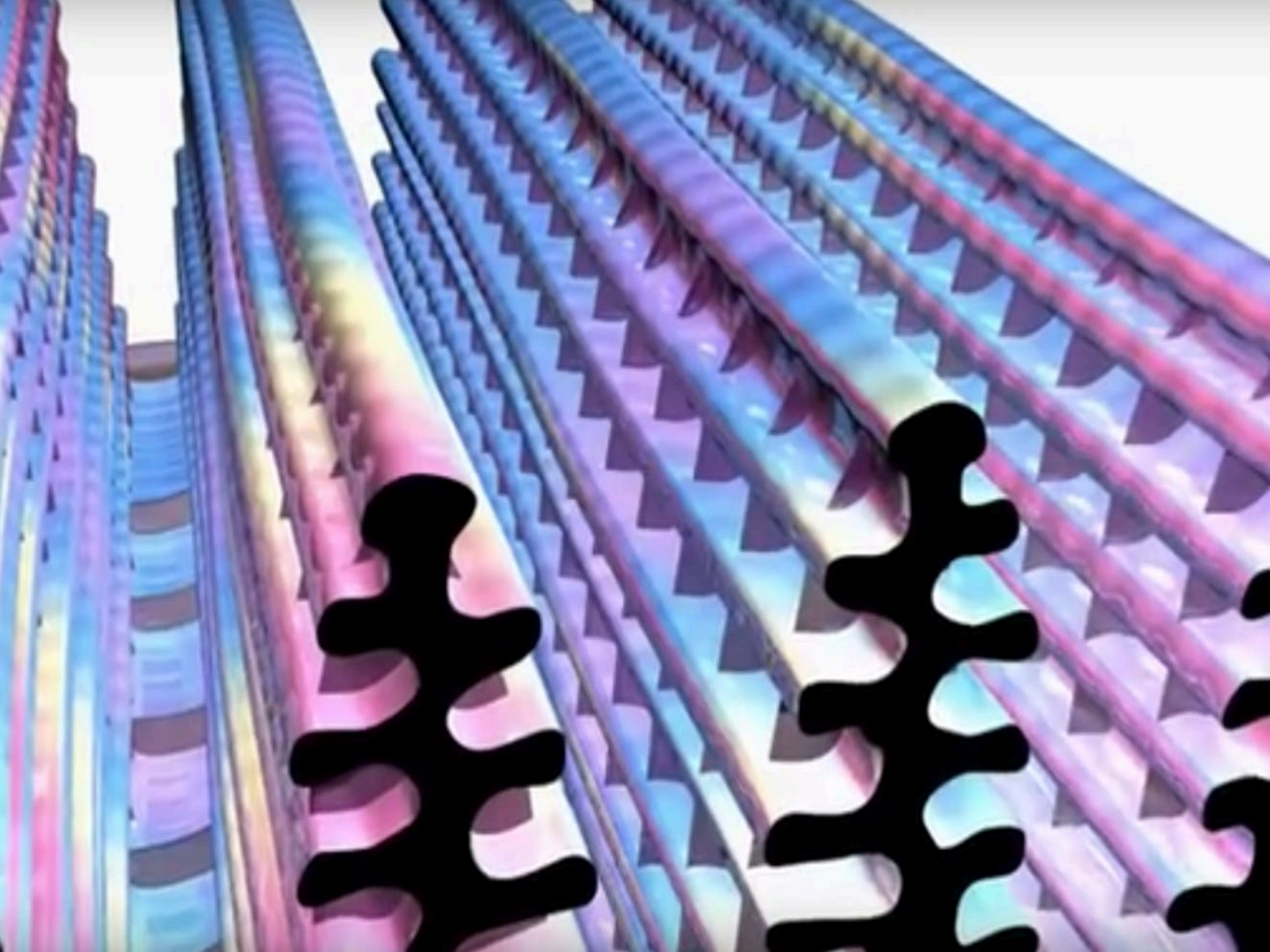
8000 X times

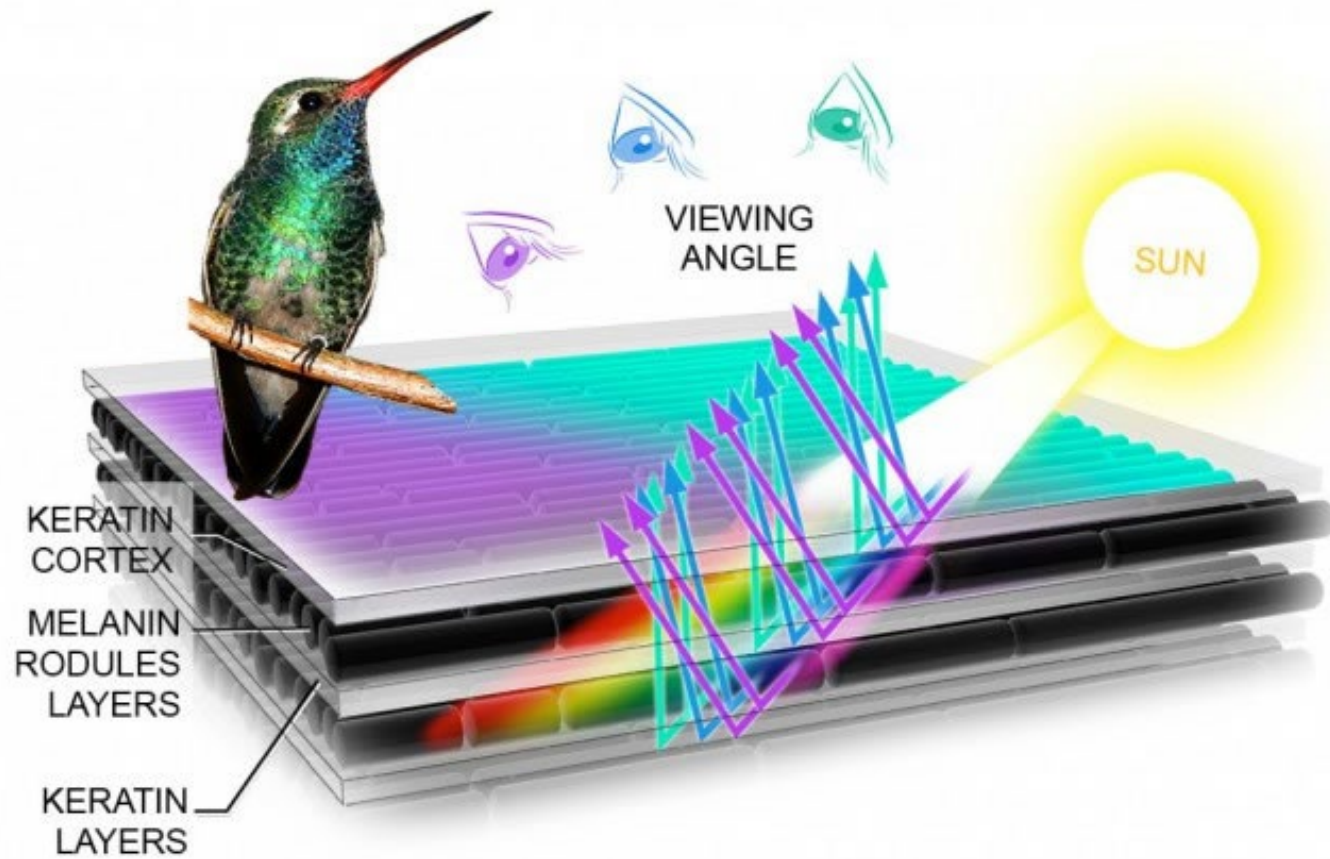


16.000 X times



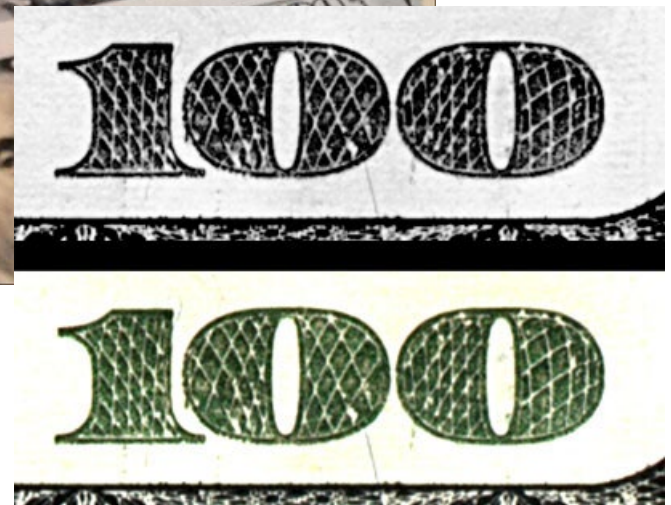
20.000 X times





Color estructural













Desierto de Namibia

Escarabajo de Namibia
Stenocara gracilipes

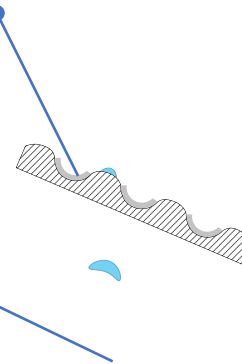




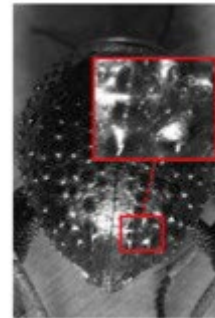
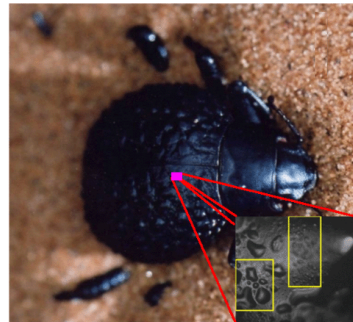


Repele agua
SUPERHIDROFOBICO

Atrae agua
SUPERHIDROFILICO



Escarabajo de Namibia



FogQuest
Sustainable Water Solutions

SAHARA
FOREST
PROJECT



nbd
nano



Do you know the insect named as onymacris unguicularis?
This insect is known for making dewdrop by using own body in desert.
By being inspired from this mysterious onymacris unguicularis, we want to provide waters to residents in desert who wander for water.

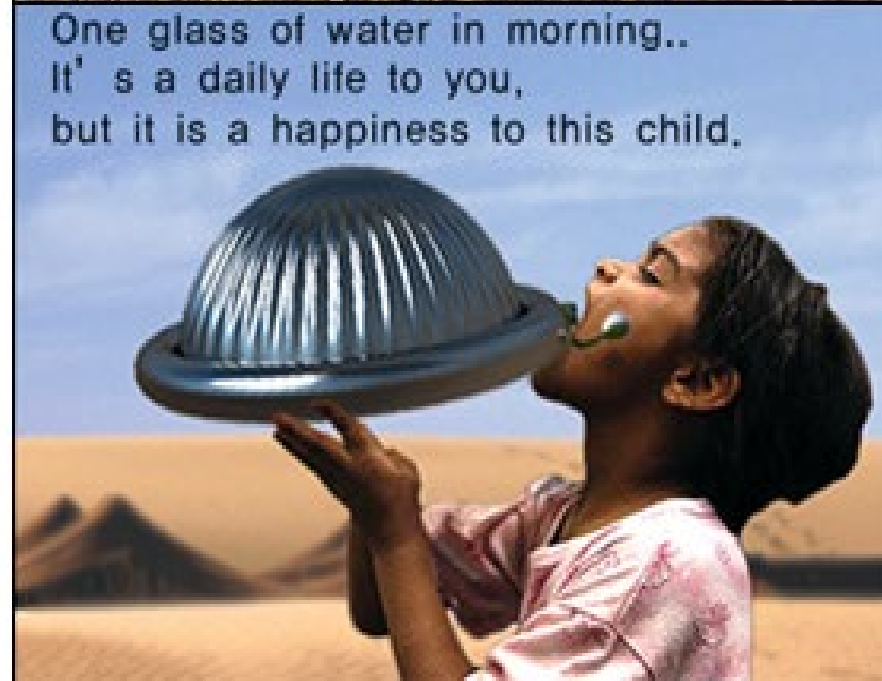


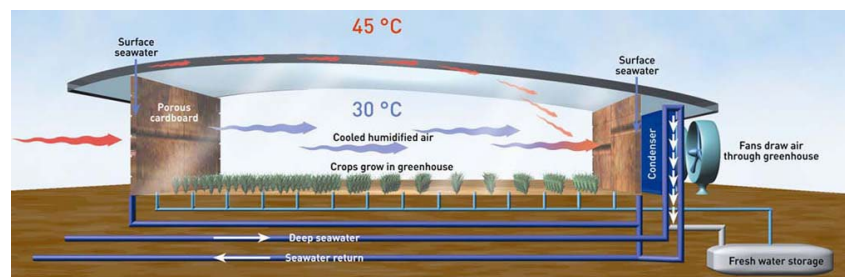
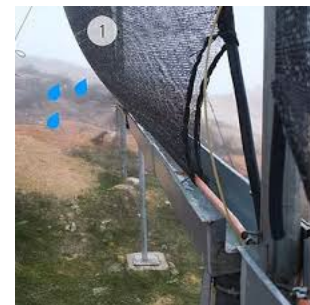


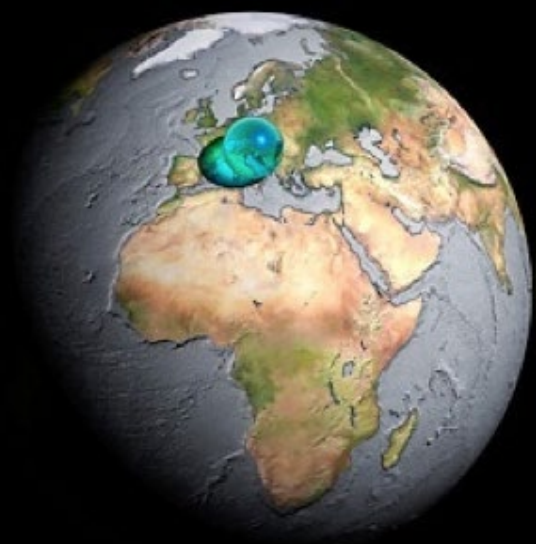
It is usually used as
gourd or basket.



One glass of water in morning..
It' s a daily life to you,
but it is a happiness to this child.







MIMETIZANDO LA FORMA

MIMETIZANDO EL PROCESO

MIMETIZANDO LOS SISTEMAS

proceso





UltraCane



Introducing the all new UltraCane...



No quibble
30 day money
back guarantee!

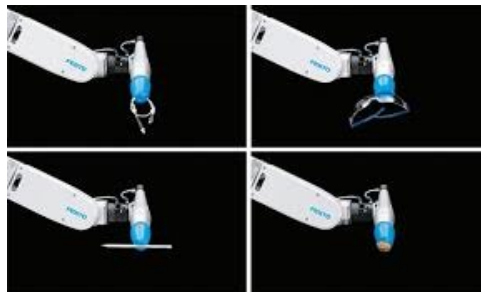
UltraCane



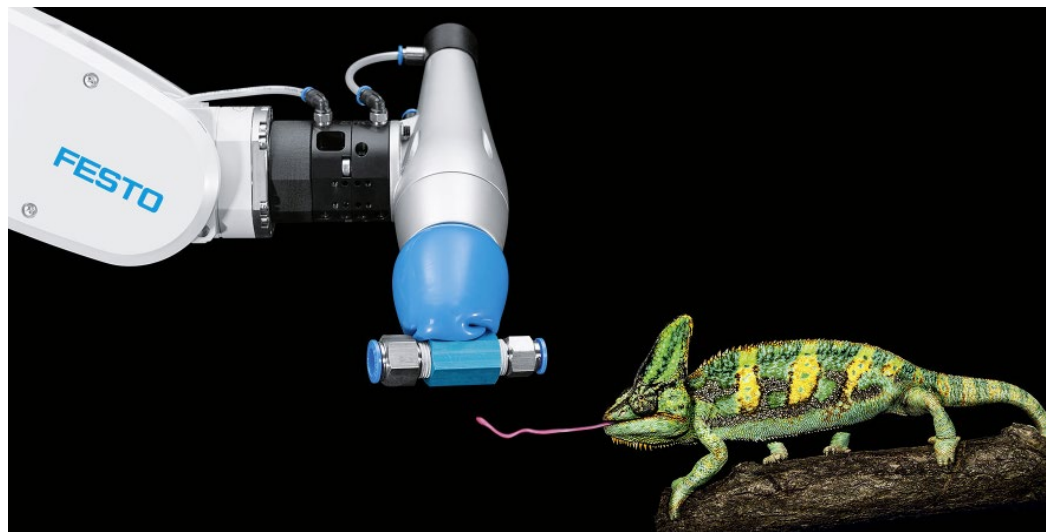
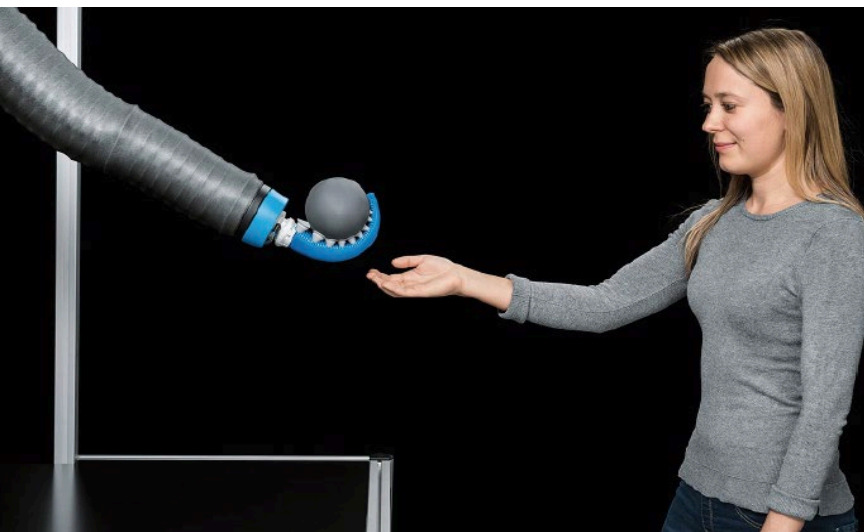
FESTO



FESTO

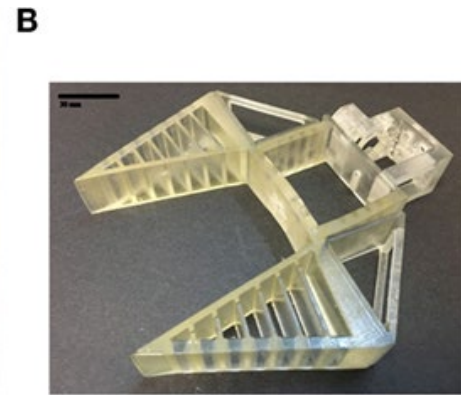
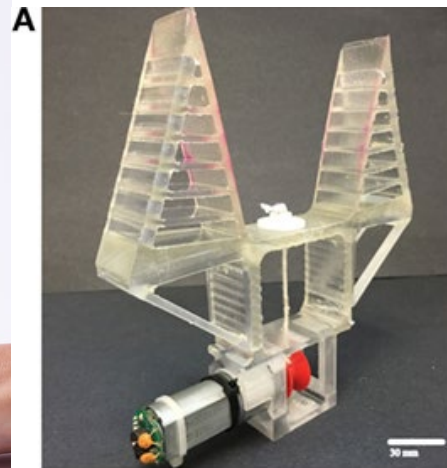


La forma se ajusta a la función

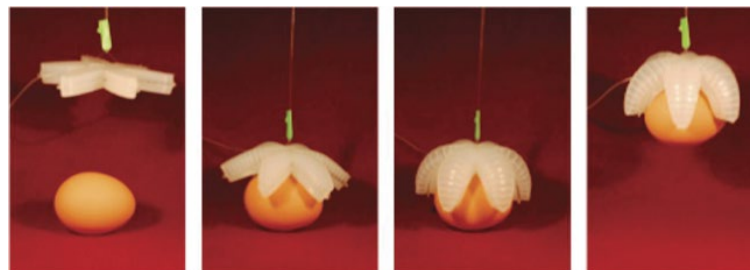




Bionictoys.de



Soft Robotic gripper

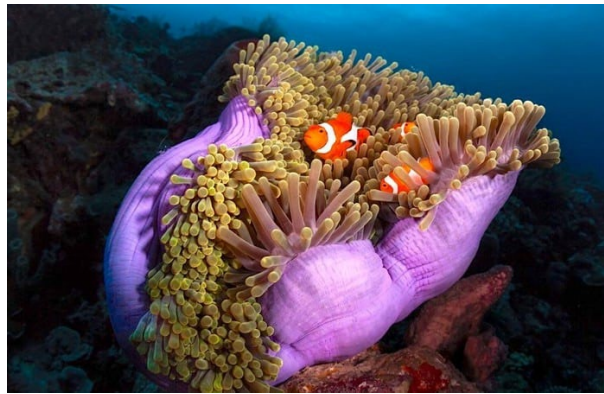


George Whiteside de Harvard

A escala de SISTEMA

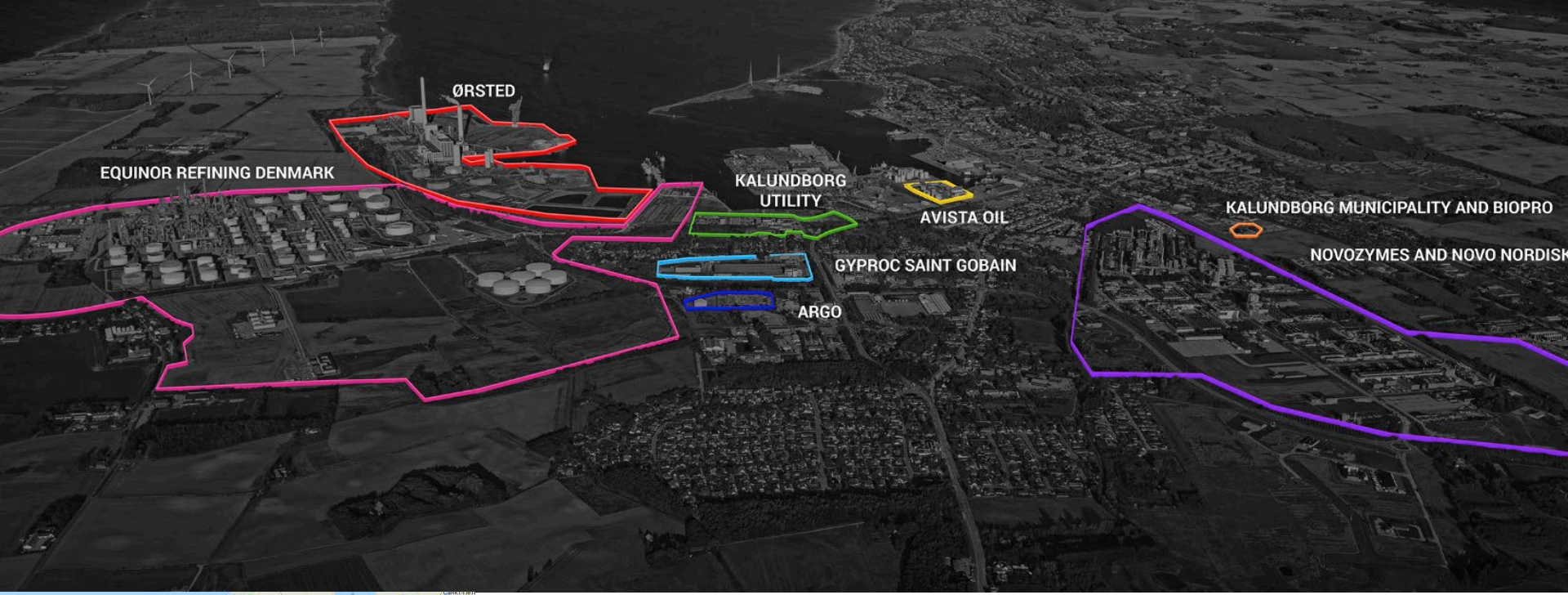
Ecología Industrial o Simbiosis Industrial

Economía Circular | Diseño Circular (C2C)

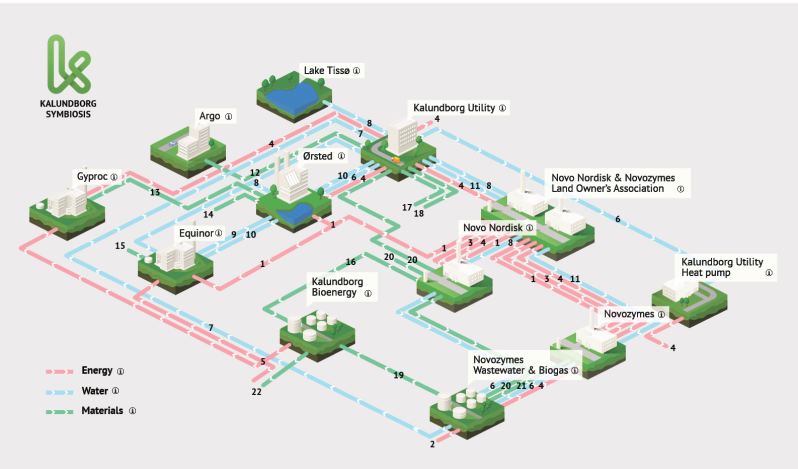


Interacciones de confianza entre 2 ó + especies
Muy frecuente en la Naturaleza

KALUNDBORG SYMBIOSIS

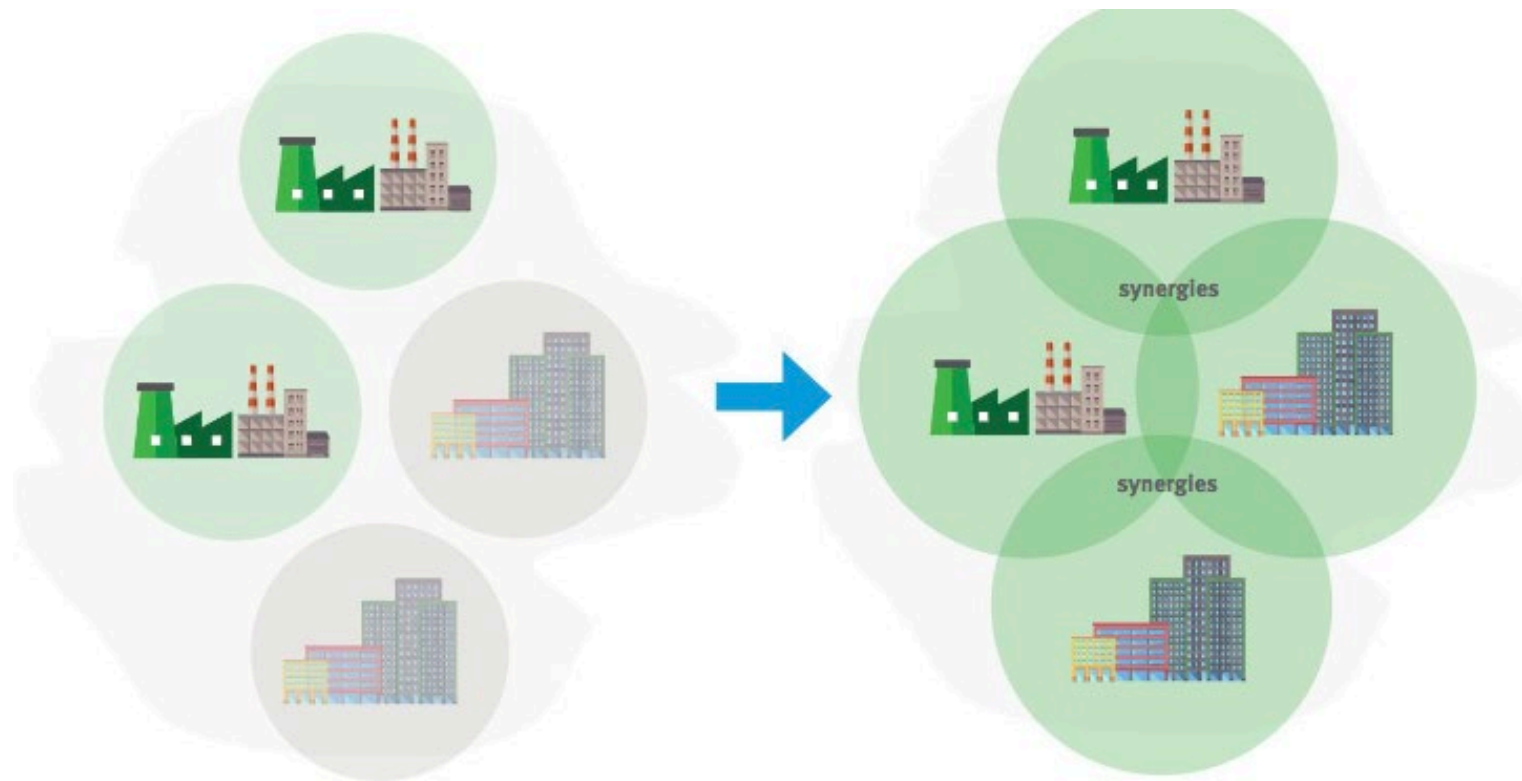


Kalunborg (Denmark)



Huella ecológica | Biocapacidad | Reducción/Eficiencia del uso de materiales y energía
Economía colaborativa | Basura 0 | Producción local





clásico

natural

Traditional Brewery

Inputs to Brewery:

- water
- hops
- yeast
- cleaners
- grains
- energy
- packaging (cardboard, ink, glass bottles, paper labels)

Outputs from Brewery:

- Beer
- waste water, spent hops, surplus yeast, spent cleaners → sewage treatment plant
- spent grain → landfill, supplemental animal feed → greenhouse gas (methane)
- heat → to atmosphere
- cardboard, ink, glass bottles, paper labels → landfill, landscape
- CO₂ → to atmosphere

Cervecera Circular



?

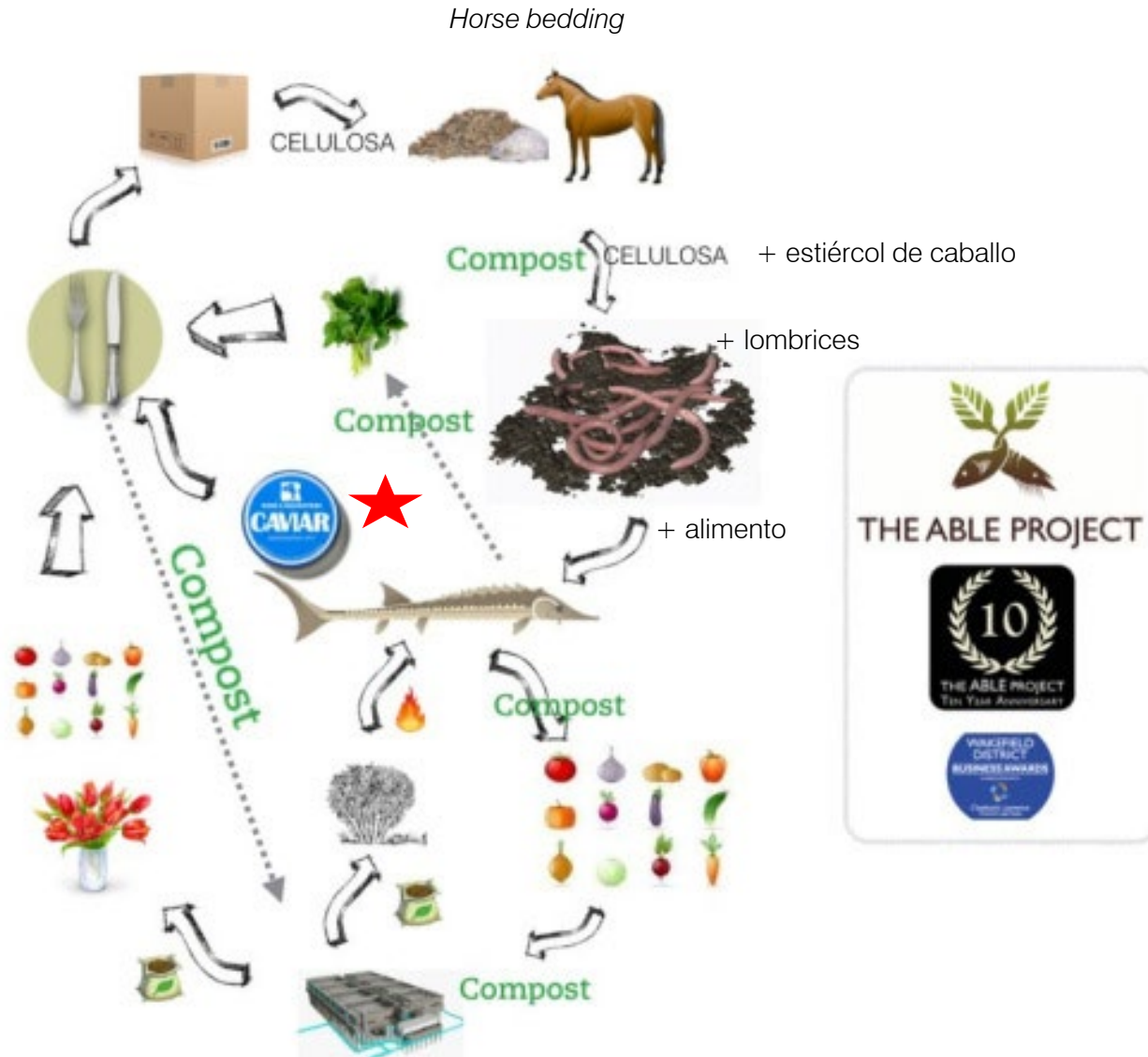


0 €/K



6,000 €/K

Pensamiento sistémico a menor escala (barrio, municipio...)







Cuantos Residuos nos rodean...?

que no vemos...

+ 600 Millones de pinos cortados/año/UE

20-30% biomasa: espículas

Tamara Orjola makes furniture and textiles using pine needles



Emma Tucker | 7 November 2016 | [2 comments](#)

[Design Academy Eindhoven](#) graduate Tamara Orjola's Forest Wool [stools](#) and carpets are made from processed pine needles left over from the timber industry.

By crushing, soaking, steaming, binding and pressing the needles, Orjola extracts the pine needles' fibre and transforms it into textiles, composites and [paper](#). The process also allows essential oils and dye to be extracted and used.



Muestrario de nuevos materiales



Socio?



**JAMES
DYSON
AWARD**

**DESIGNERS,
ENGINEERS AND
PROBLEM SOLVERS
WANTED**

JAMES DYSON AWARD

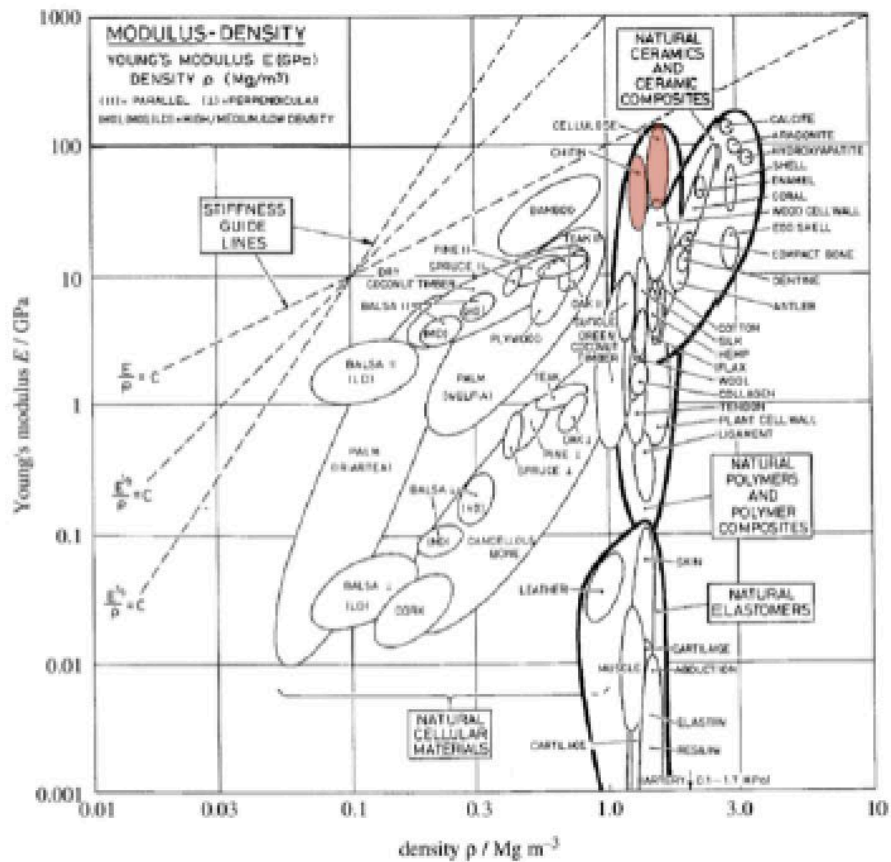
MARINATEX ES EL GANADOR DEL JAMES DYSON AWARD 2019

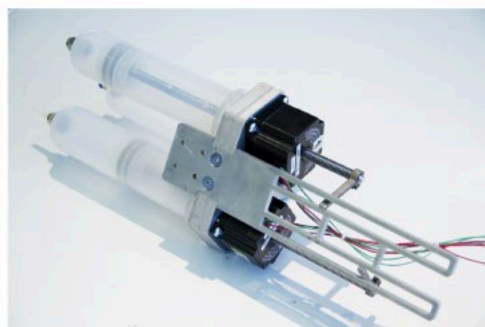
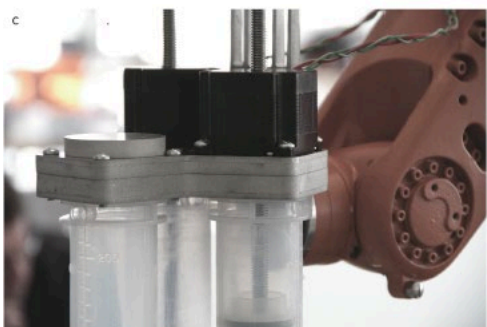
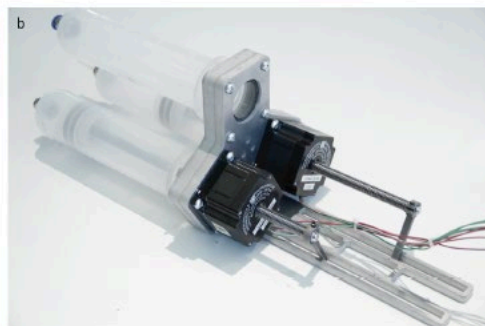
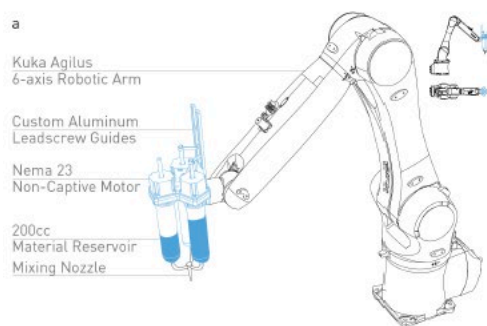
James Dyson ha elegido a MarinaTex como ganador internacional del James Dyson Award 2019. Gracias a todos los magníficos participantes por ponernos tan difícil la labor de juzgar. ¡Volveremos en 2020!

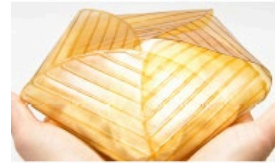
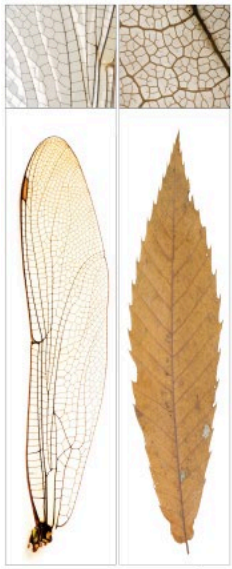


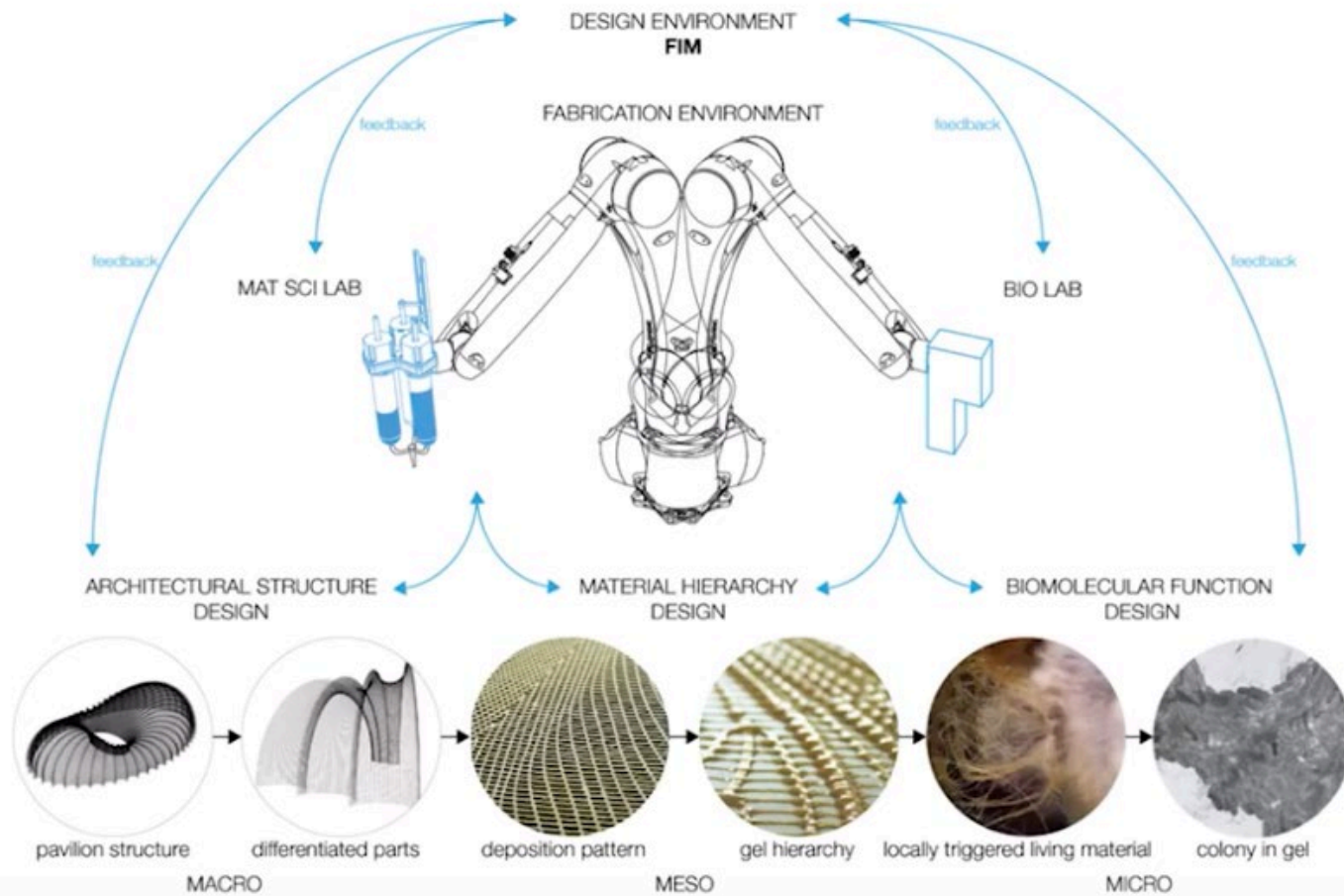
Ver el vídeo

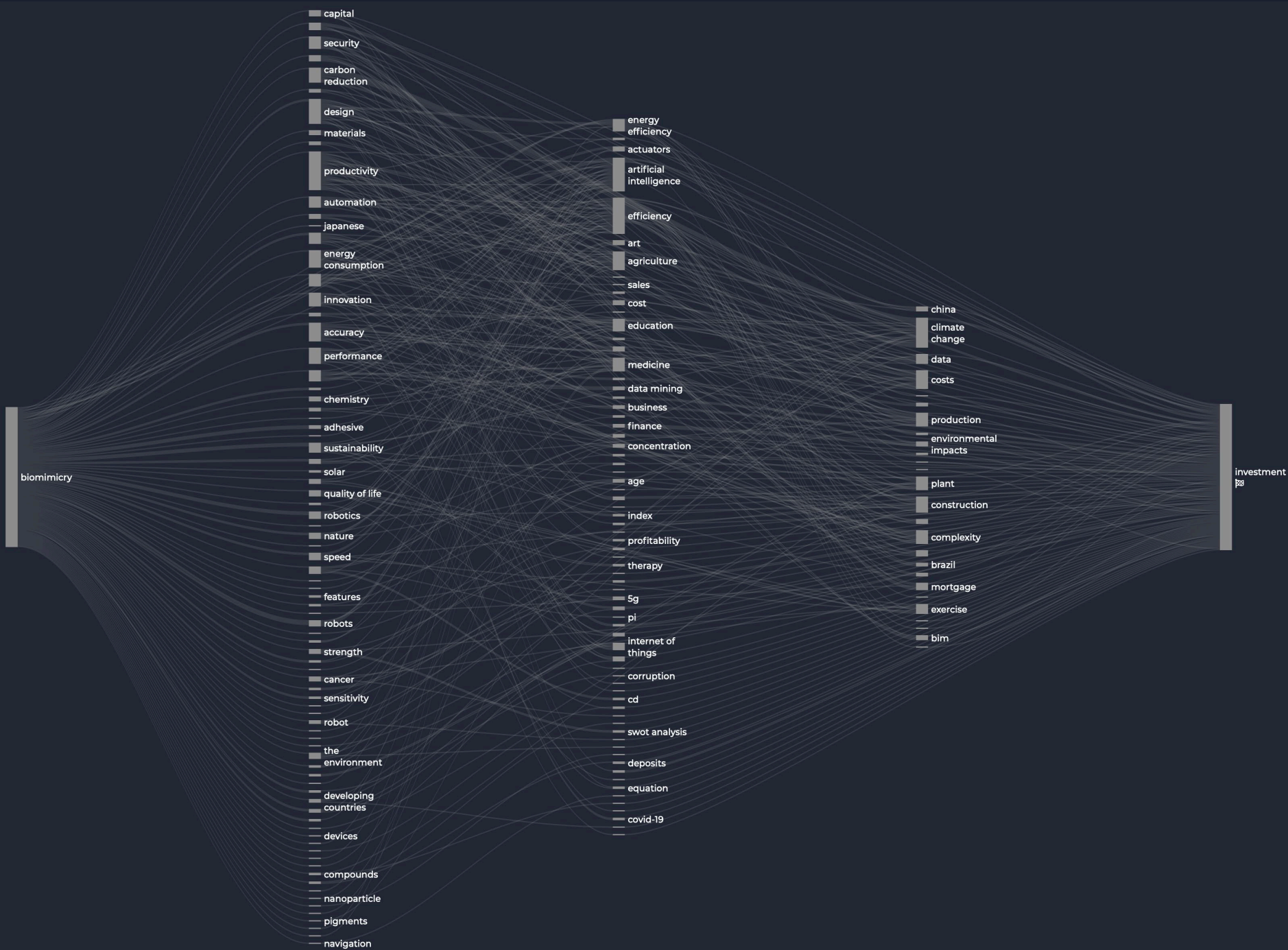
<https://www.jamesdysonaward.org/es-ES/>



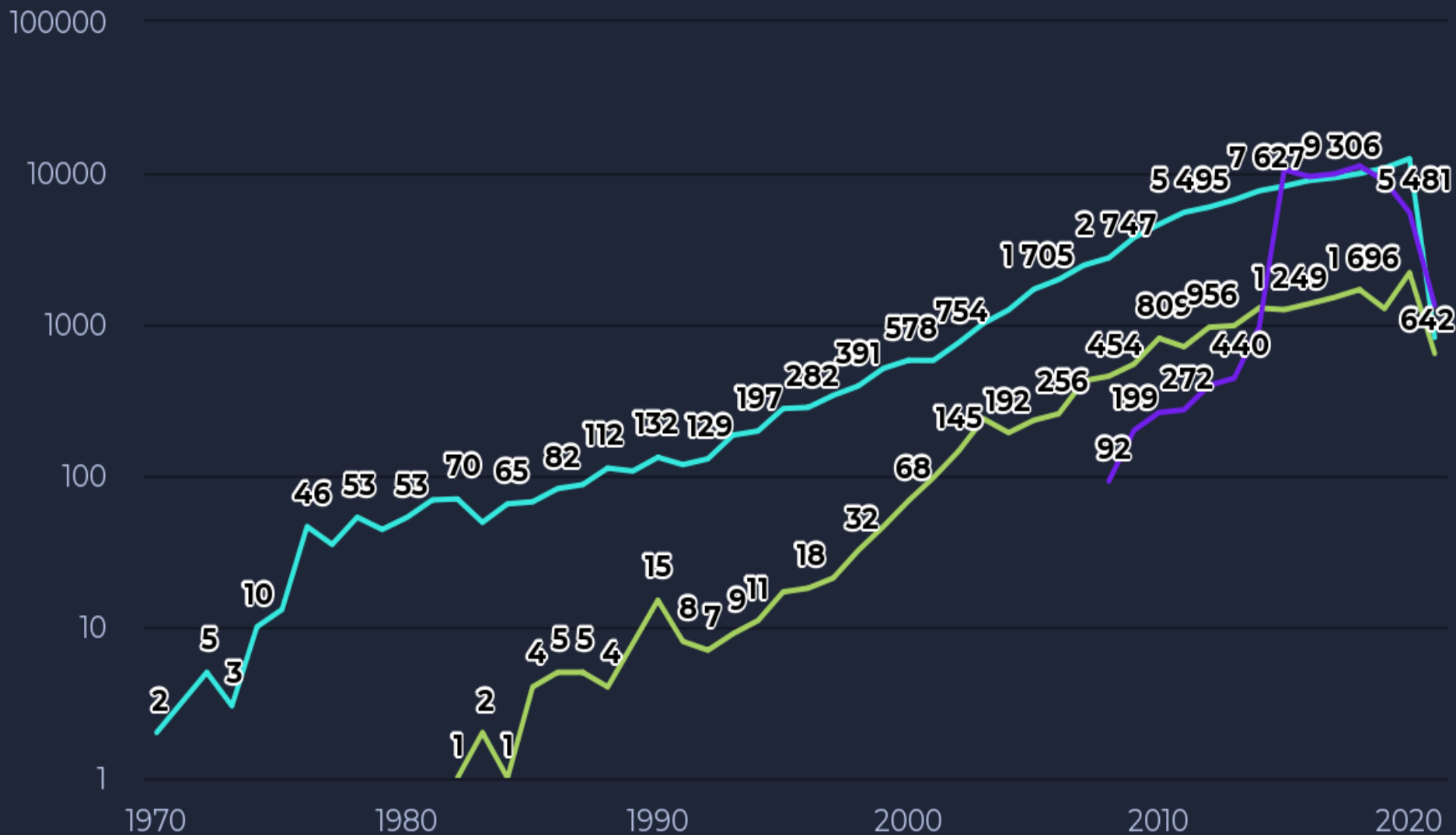




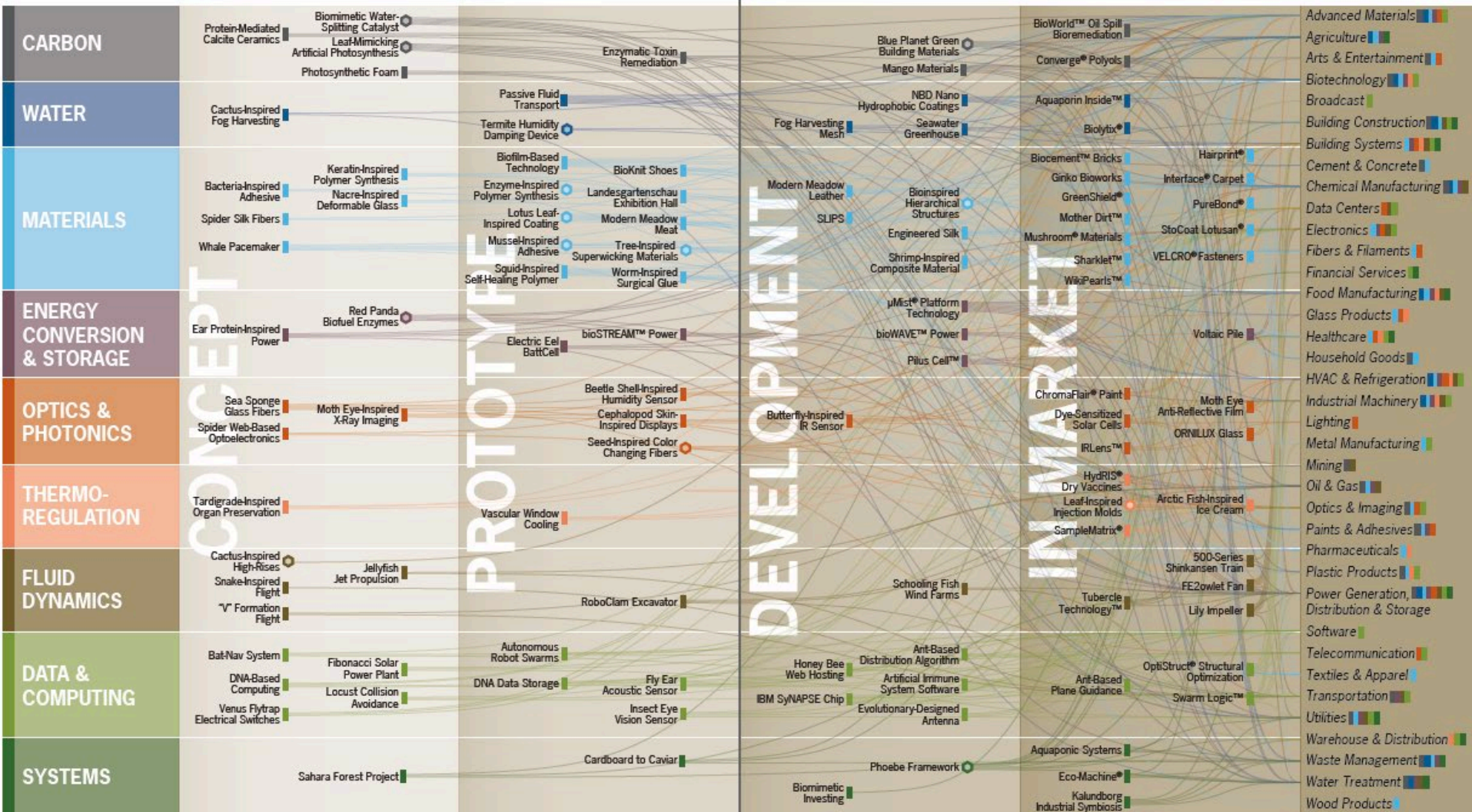




- Patents
- Publications
- News
- Clinical Trials



Biomimesis aplicada en + 40 sectores industriales



Biomímesis:

la innovación sostenible y
regenerativa inspirada en la
naturaleza.

MASTER MEDIO AMBIENTE SOSTENIBILIDAD Y ODS


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del País Vasco


Euskal Herriko
Unibertsitatea


Organización
de las Naciones Unidas
para la Educación,
la Ciencia y la Cultura


un twin
Iniciativa de la
Unión Europea
para la
cooperación
entre las
universidades
de Europa


UNESCO
Educación
para el Desarrollo Sostenible
y
Educación Ambiental de la UNESCO

INTRODUCCIÓN a la **BIOMIMESIS**

Dr. Manuel Quirós



RETO 1

Identificando funciones



MIMETIZANDO LA FORMA

MIMETIZANDO EL PROCESO

MIMETIZANDO LOS SISTEMAS

un árbol no es solo un árbol





PERCEPCION CLASICA

Nombre común: roble

Nombre científico: *Quercus spp*

Hojas simples, redondeadas...

Uso: muebles, construcción

Producción: x Tm/m³/Ha

Rango: suelos húmedos...

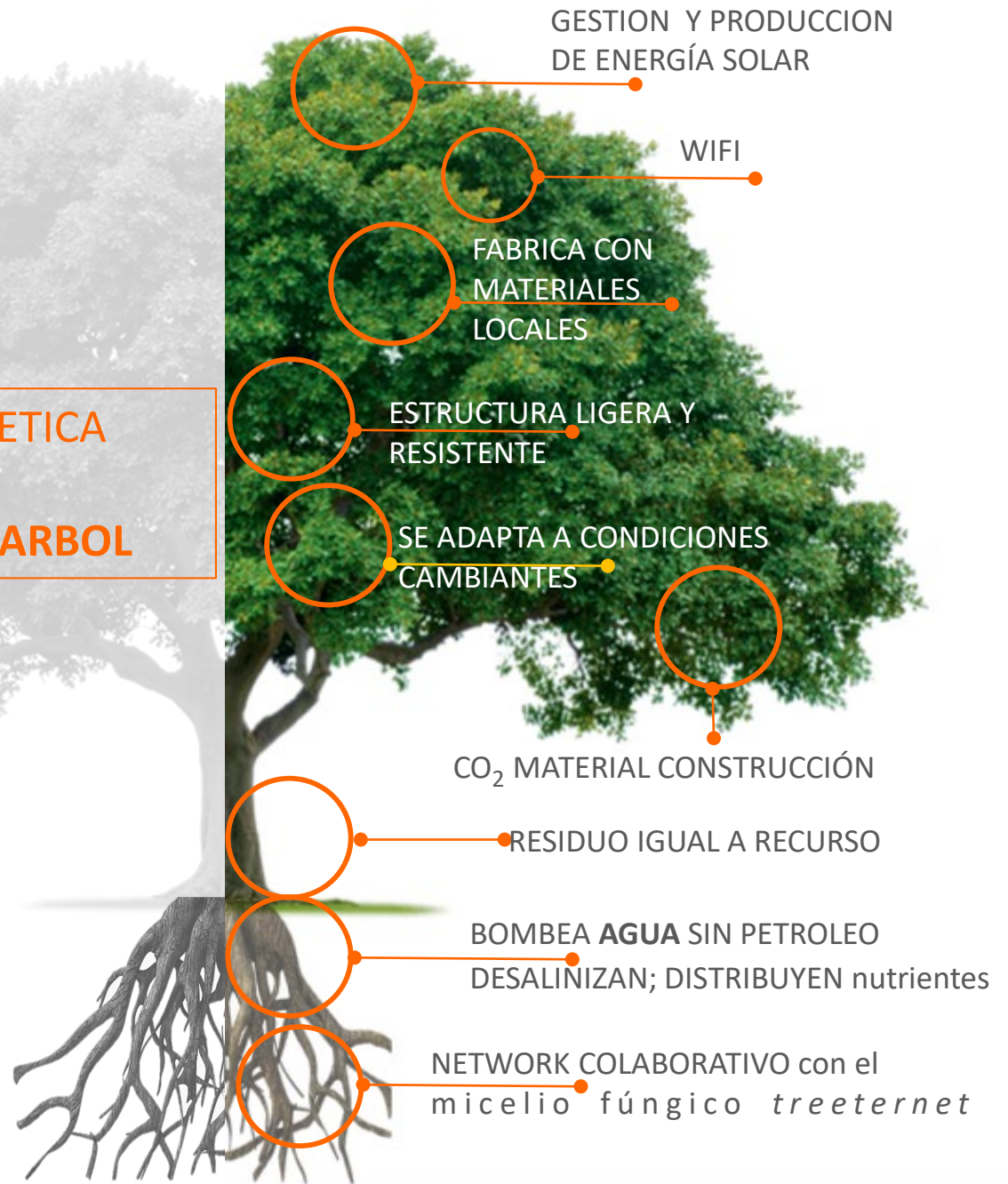
Clima: no tropical

...

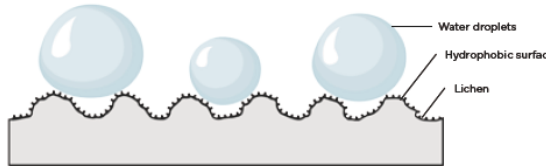
VISIÓN EXTRACTIVISTA

APRENDIENDO SOBRE el ARBOL

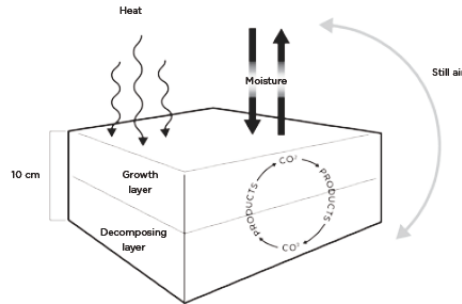
VISIÓN BIOMIMETICA
APRENDIENDO DEL ARBOL



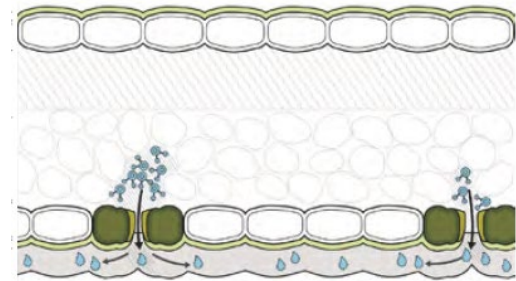
ALGUNAS ESTRATEGIAS BIOMIMÉTICAS POTENCIALMENTE APLICABLES



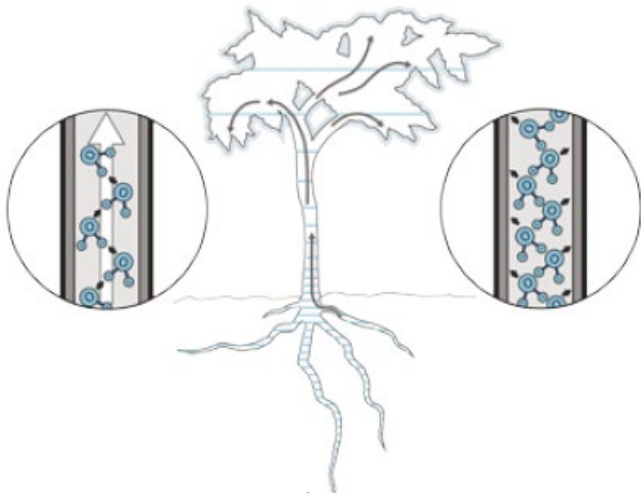
REPELER AGUA



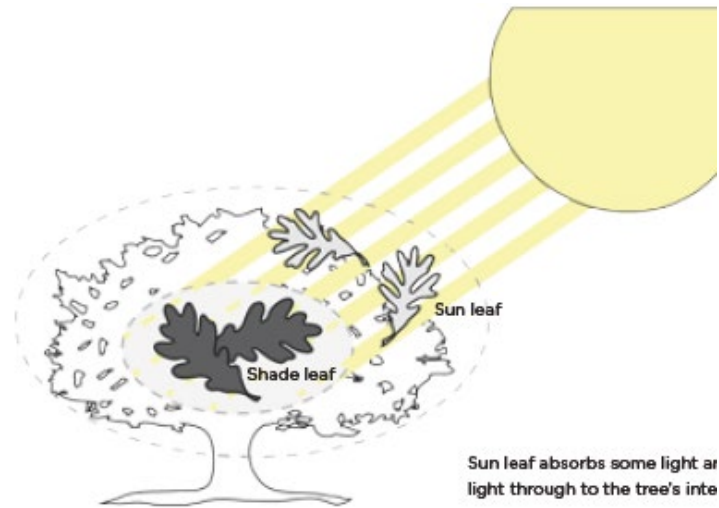
CONTROL DE LA HUMEDAD
Y DEL CALOR



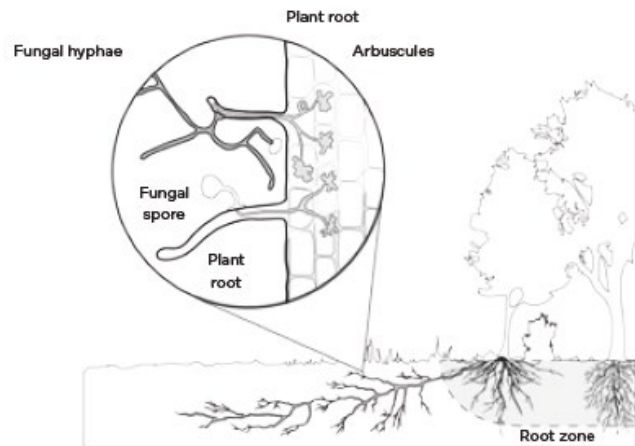
CONTROL PASIVO
DE LA ENERGÍA



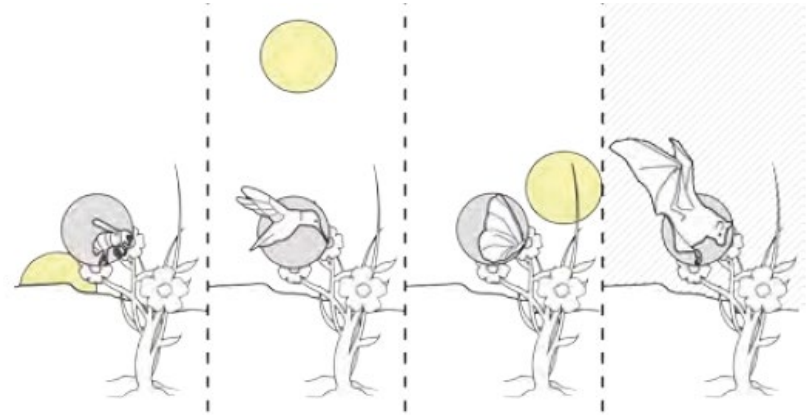
VASCULARIZACIÓN Y TRANSPORTE
DE ABAJO A ARRIBA DEL AGUA



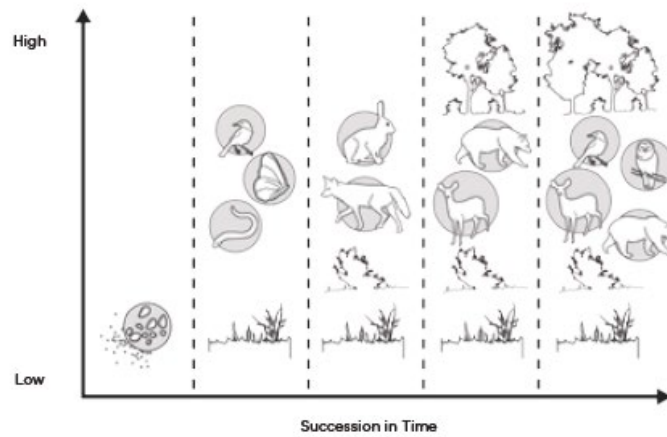
OPTIMIZACIÓN ENERGÉTICA
CON MATERIALES LOCALES



NETWORK REGENERATIVO



ECONOMÍA COLABORATIVA



DISEÑO ADAPTATIVO

DISTRIBUCION ENERGIA
NO EMPLEADA A EDIFICIOS
CERCANOS

FABRICA DE ENERGÍA SOLAR

CERO MATERIALES TOXICOS

MINIMO USO LUZ ARTIFICIAL

HABITAT PARA
LA BIODIVERSIDAD

DISEÑO PARA EL DESENSAMBLAJE

MITIGACION
CALOR

PURIFICACIÓN NAT.
DEL H₂O Y REUTILIZACION

POLINIZACION

EVENTOS CULTURALES

Oficinas Bullitt Foundation
6 plantas
15.000 m²
Seattle, Washington, USA

materiales



monomaterial



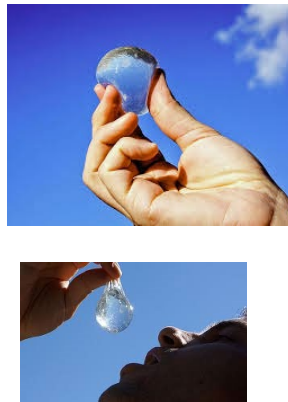
biodegradable



fúngico



quitosán



envase comestible

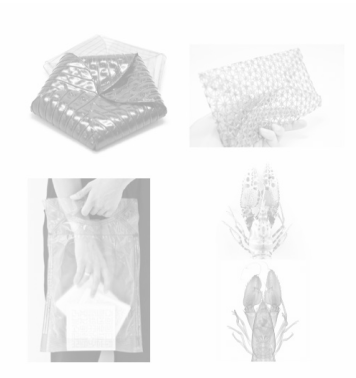


diy

materiales



monomaterial



quitosán



envase comestible



©2010 Steelcase. Used with permission.

fúngico

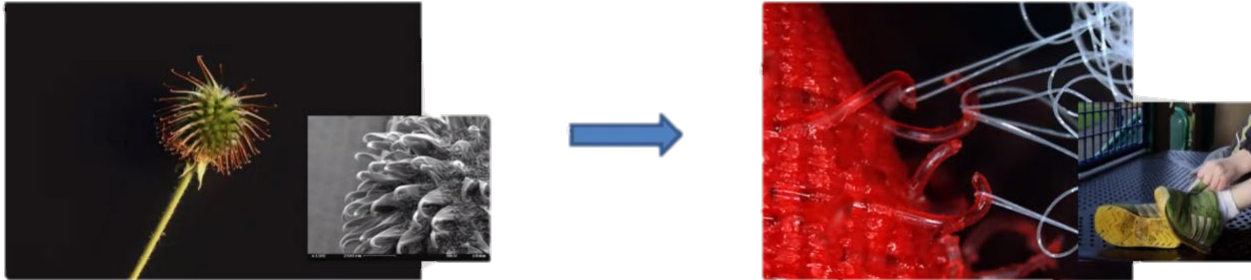


diy

El biomimético como inspiración en el diseño

El biomimético como inspiración en el diseño

Habilidad de reconocer en la Naturaleza, nuevos Diseños innovadores



Oportunidades de encontrar para el diseño, un análogo en un modelo biológico

Oportunidades de encontrar para el diseño, un análogo en un modelo biológico





It's time to ask nature.

asknature.org



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CONTRIBUTE



COMMUNITY



ASKNATURE LABS



ABOUT



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Powered by

BIOLOGICAL STRATEGIES	1,759
○ COLLECTIONS	1,609
○ RESOURCES	233
○ INSPIRED IDEAS	197

FUNCTIONS

How might we ...

> Break down	86
> Get, store, or distribute resources	401
> Maintain community	208
> Make	130
> Modify	376
> Move or stay put	298
> Process information	265
> Protect from physical harm	791

LIVING SYSTEMS

What might we learn from ...

○ Plants : Plantae	55
○ Mammals : Mammalia	34
○ Human : Homo sapiens	27
○ Bacteria : Bacteria	22
○ Insects : Insecta	15
○ Western Honeybee : Apis mellifera	12
○ Bees : Apidae	11

Biological Strategies

Clear all

STRATEGY

Whiskers sense prey movement

Harbor seals

Capture, absorb, or filter organisms · Sense motion



STRATEGY

Quorum determines new hive site

Honeybees

Cooperate within the same species



STRATEGY

Fiber arrangement is highly efficient

Bamboos : Bambusa

Manage compression · Manage tension · Physically assemble structure



STRATEGY

Pitcher rims are extremely slippery

Tropical Pitcher Plants : Nepenthes

Capture, absorb, or filter organisms · Move in/on liquids



STRATEGY

Ultra-absorbent feather structure carries water

Capture, absorb, or filter liquids · Modify material characteristics · Store liquids



STRATEGY

A flexible body allows the earthworm to burrow through soil

Earthworm

Distribute gases · Distribute liquids · Manage compression · Move in/on solids · Optimize shape





Función y estrategia

Vínculos fundamentales entre la biología y el diseño.

Piensa en que es lo que quieres que tu diseño/propuesta
realice (*función*)

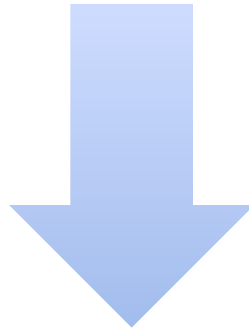
y **no** en cual es el próximo diseño/propuesta que quiero hacer...

Estudia, observa y entiende como organismos y sistemas alcanzan
las mismas funciones que tu quieres que tu diseño desempeñe

IDENTIFICANDO FUNCIONES

...no preguntes a la Naturaleza como diseñar un casco...

Lo que realmente quieres es encontrar un modo para **proteger**
la cabeza de un ciclista de los potenciales impactos



facilita la búsqueda de organismos





“Biologizar”



Tomar el reto a resolver (humano) y re-planteatelo de nuevo de modo que la respuesta la podamos encontrar en la biología.

¿Cómo la naturaleza....?

La clave: **BIOLOGIZACIÓN** del reto

nos preguntamos...

Como captura la Naturaleza el CO₂?

Como aísla (T^a) la Naturaleza?

Como reduce la fricción la Naturaleza?

Como se adhiere la Naturaleza?

Como ve sin luz la Naturaleza?

Como almacena agua la Naturaleza?

Como elimina el impacto la Naturaleza?

Como repele bacterias la Naturaleza?

Como se comunica la Naturaleza?

Como produce color la Naturaleza?

Como almacena energía la Naturaleza?

...





Como podríamos...?



Como la Naturaleza...?



Pregunta de diseño

Biologizar la pregunta



Pregunta de diseño

Biologizar la pregunta



Pregunta de diseño

Biologizar la pregunta



Pregunta de diseño

Como mantener frescos
los edificios en verano?

Biologizar la pregunta

Como la naturaleza regula
la T^a en climas calientes?



Pregunta de diseño

Biologizar la pregunta



Pregunta de diseño

Biologizar la pregunta



Pregunta de diseño

Como mantener frescos los edificios en verano?

Biologizar la pregunta

Como la naturaleza regula la T^a en climas calientes?



Pregunta de diseño

Como podríamos reducir el exceso de agua tras las lluvias y las riadas en las ciudades...?

Biologizar la pregunta

Como la naturaleza maneja el exceso de agua?



Pregunta de diseño

Biologizar la pregunta



Pregunta de diseño

Como mantener frescos los edificios en verano?

Biologizar la pregunta

Como la naturaleza regula la T^a en climas calientes?



Pregunta de diseño

Como podríamos reducir el exceso de agua tras las lluvias y las riadas en las ciudades...?

Biologizar la pregunta

Como la naturaleza maneja el exceso de agua?



Pregunta de diseño

Como reducir el uso de tóxicos en la pintura?

Biologizar la pregunta

Como produce color la naturaleza?

Estrategias de éxito en la Naturaleza

VARIEDAD (Biodiversidad)

INTERDEPENDENCIA

COOPERACIÓN

SOLAR

LOCAL

BASE ACUOSA (sin petróleo)

...



La diversidad de
especies asegura el
funcionamiento del
sistema

Control térmico

Fijación de N_2

Polinización

Control de plagas

Alimento herbívoros

Formación suelo

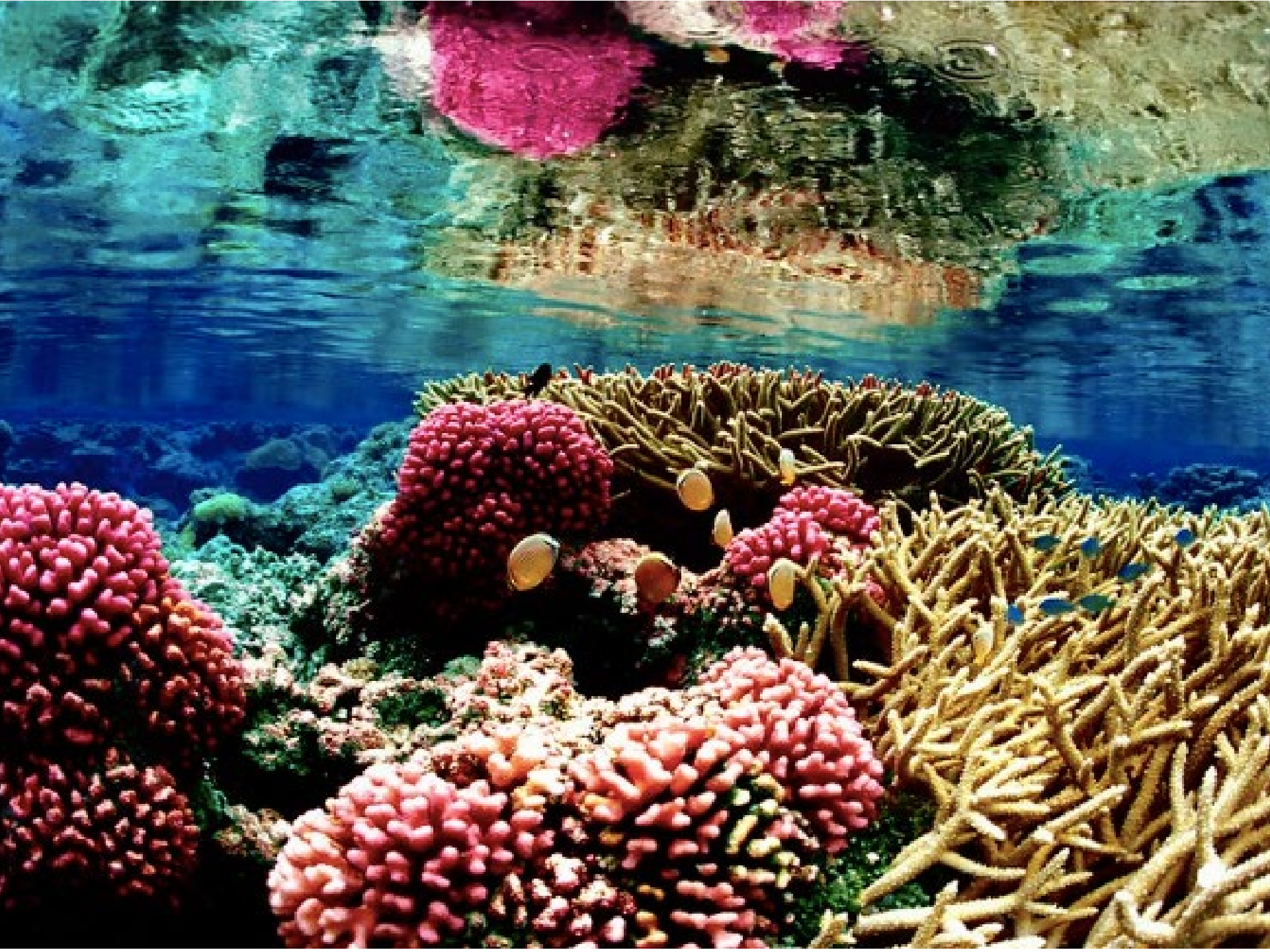
Retención de H_2O

Fotosíntesis

Automantenimiento
de Biodiversidad

Captura CO_2





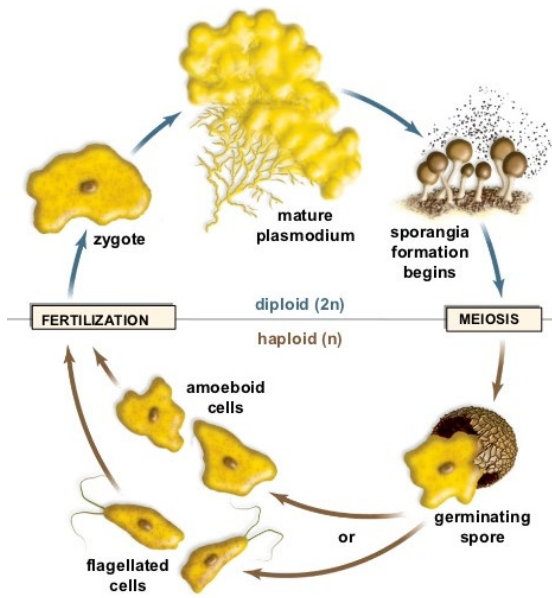
¿La NO diversidad
de especies asegura
el funcionamiento del
sistema?



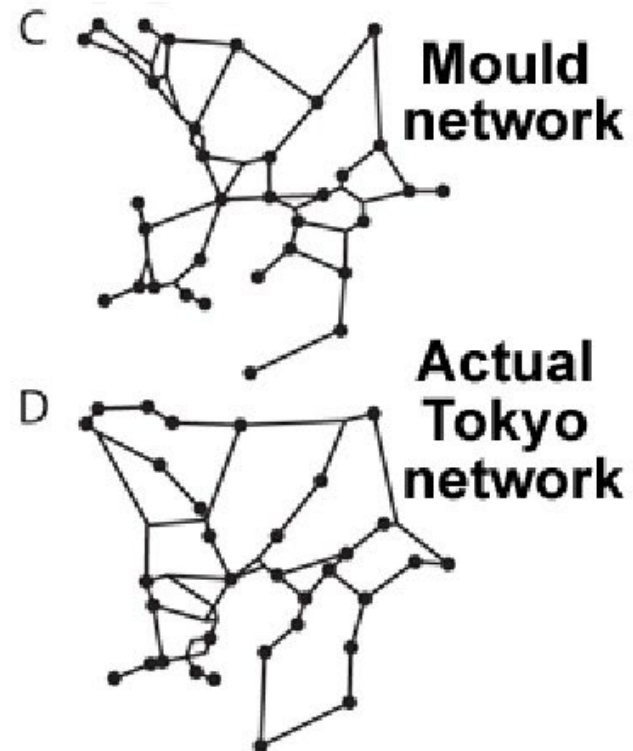
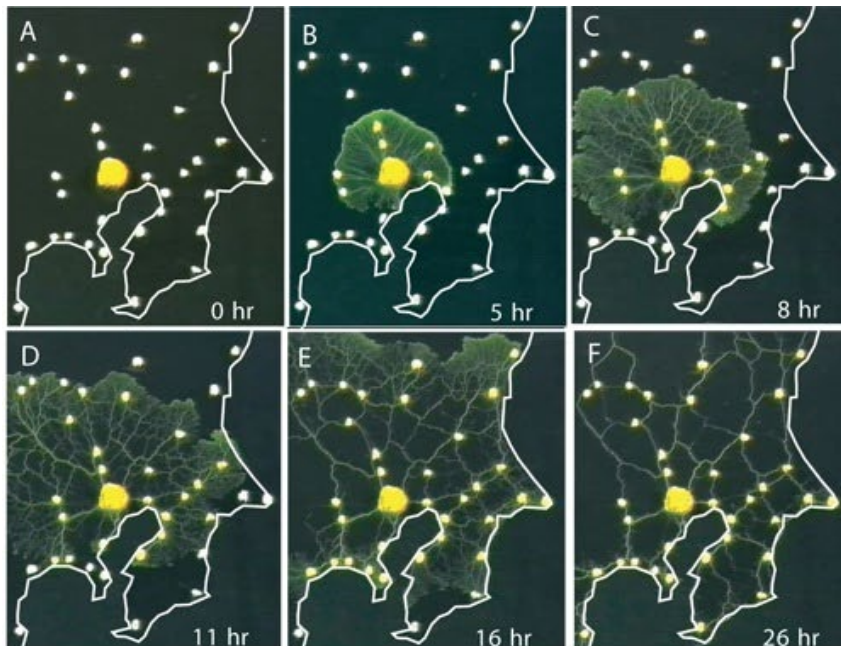


Slime mould *Physarium plasmodium*

- A ☐ traje NASA
- B ☐ mapa de trenes
- C ☐ mejora visión nocturna

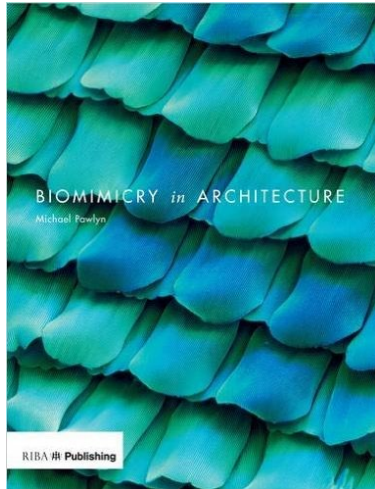


- A ☐ traje NASA
- B ☒ mapa de trenes
- C ☐ mejora visión nocturna



Biomimesis a vuestro ritmo...

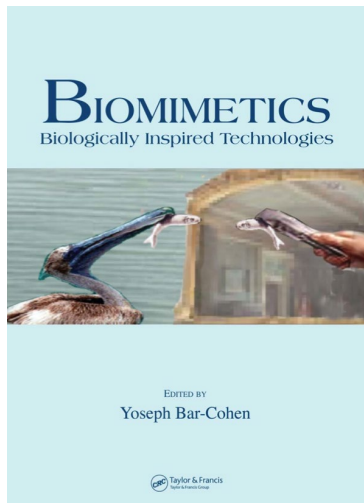
algunos Recursos



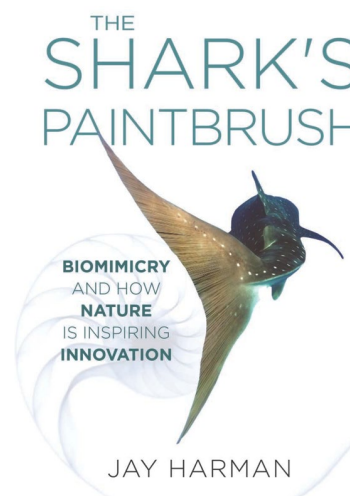
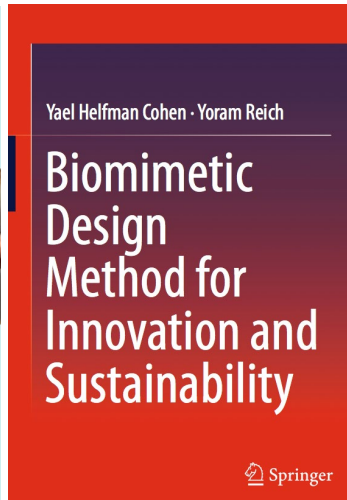
arquitectura



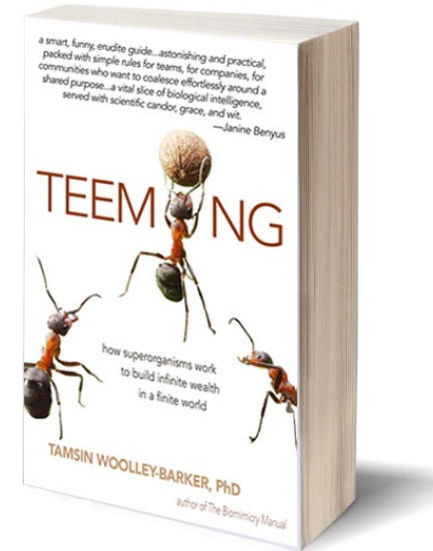
diseño



tech + innovación

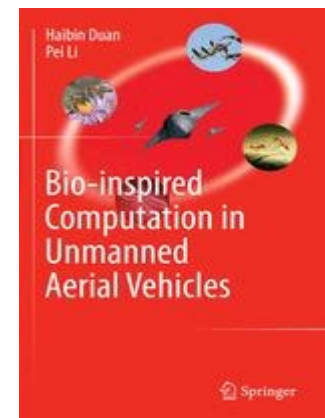
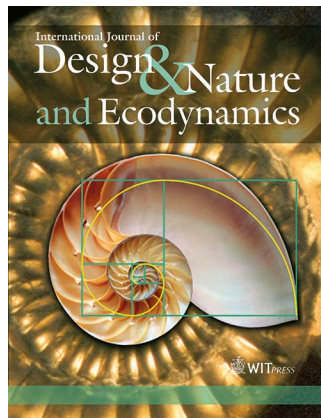


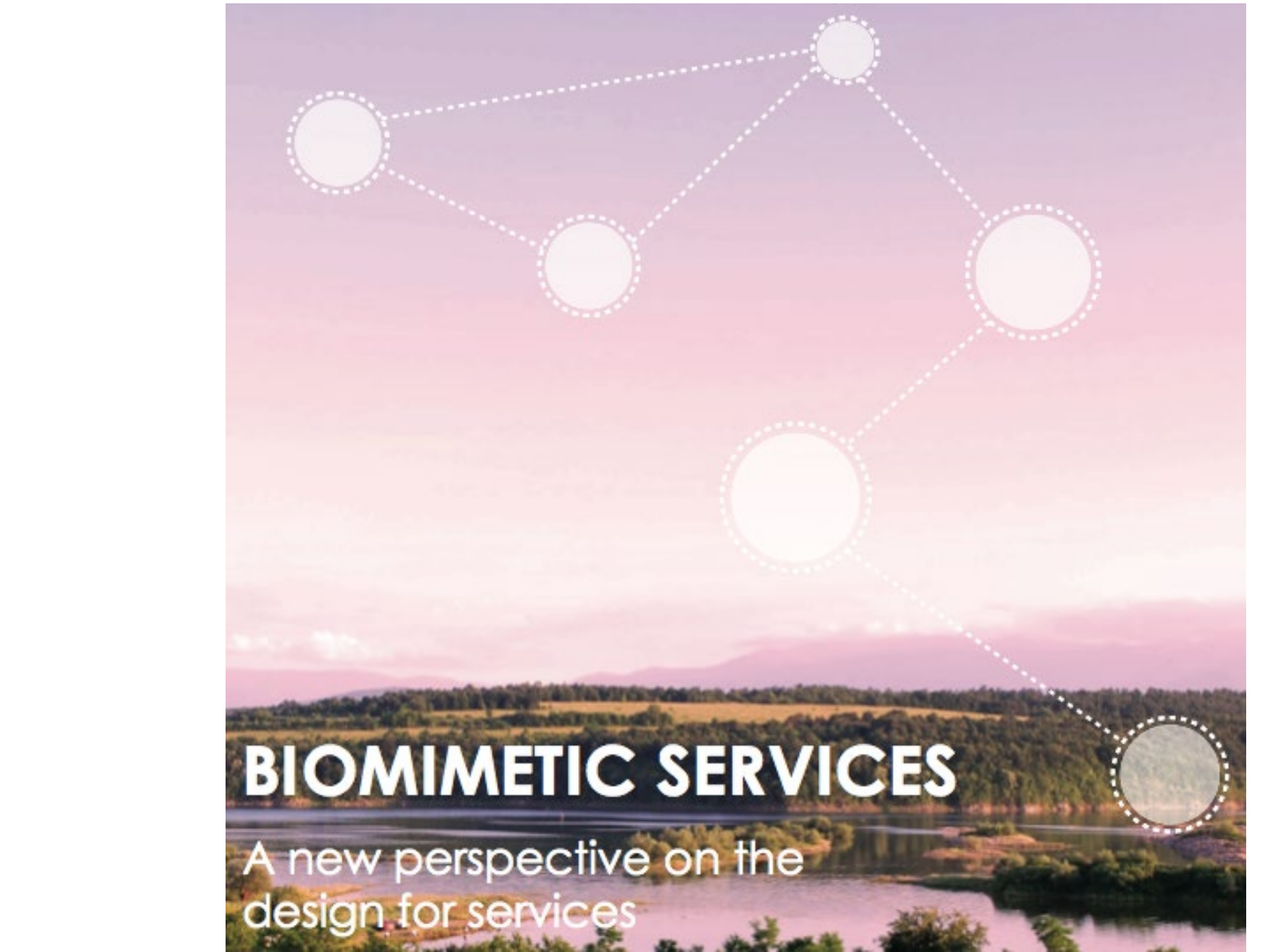
literatura





revistas

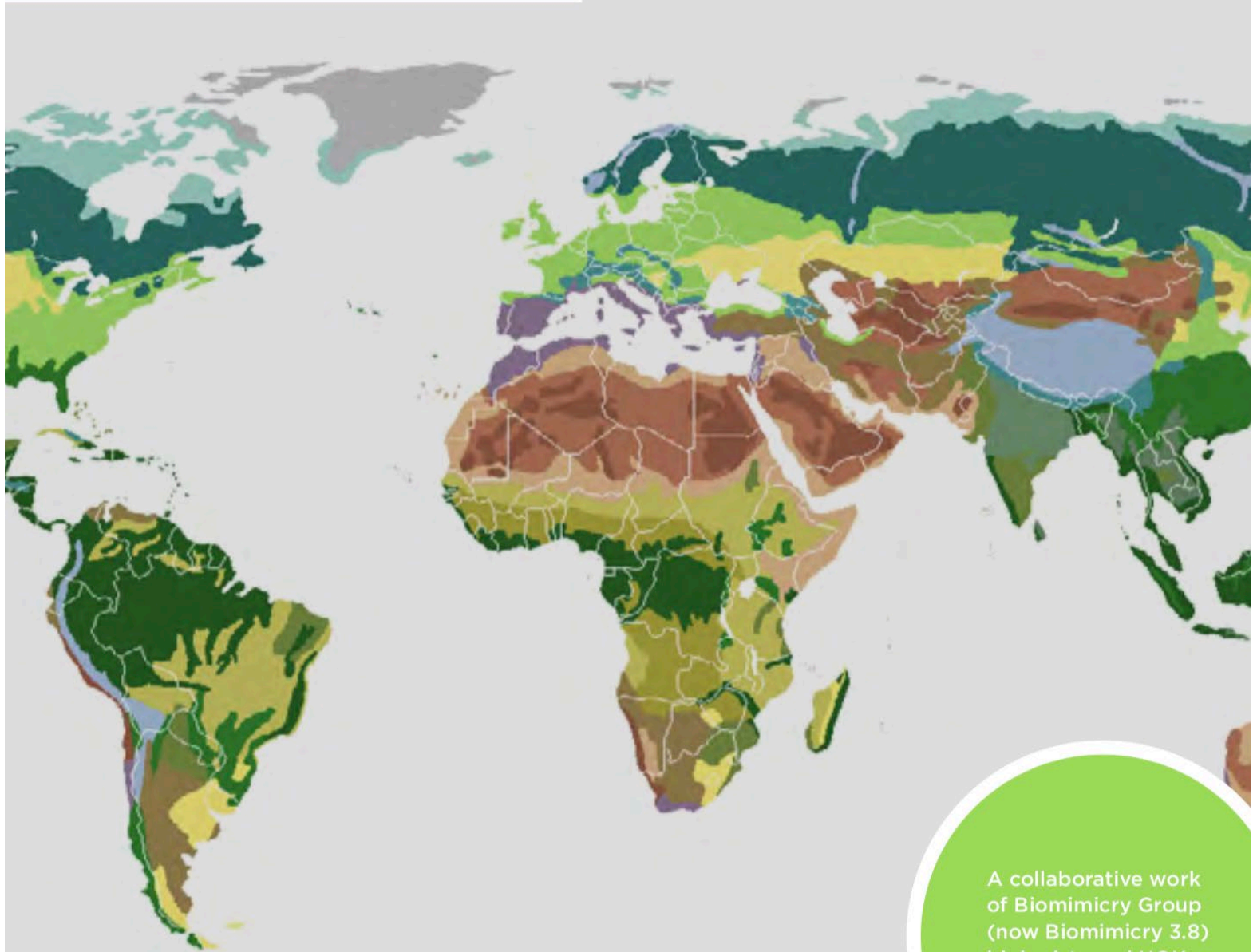




BIOMIMETIC SERVICES

A new perspective on the
design for services

TEMPERATE BROADLEAF FOREST



A collaborative work
of Biomimicry Group
(now Biomimicry 3.8)
biologists and HOK
designers



EU

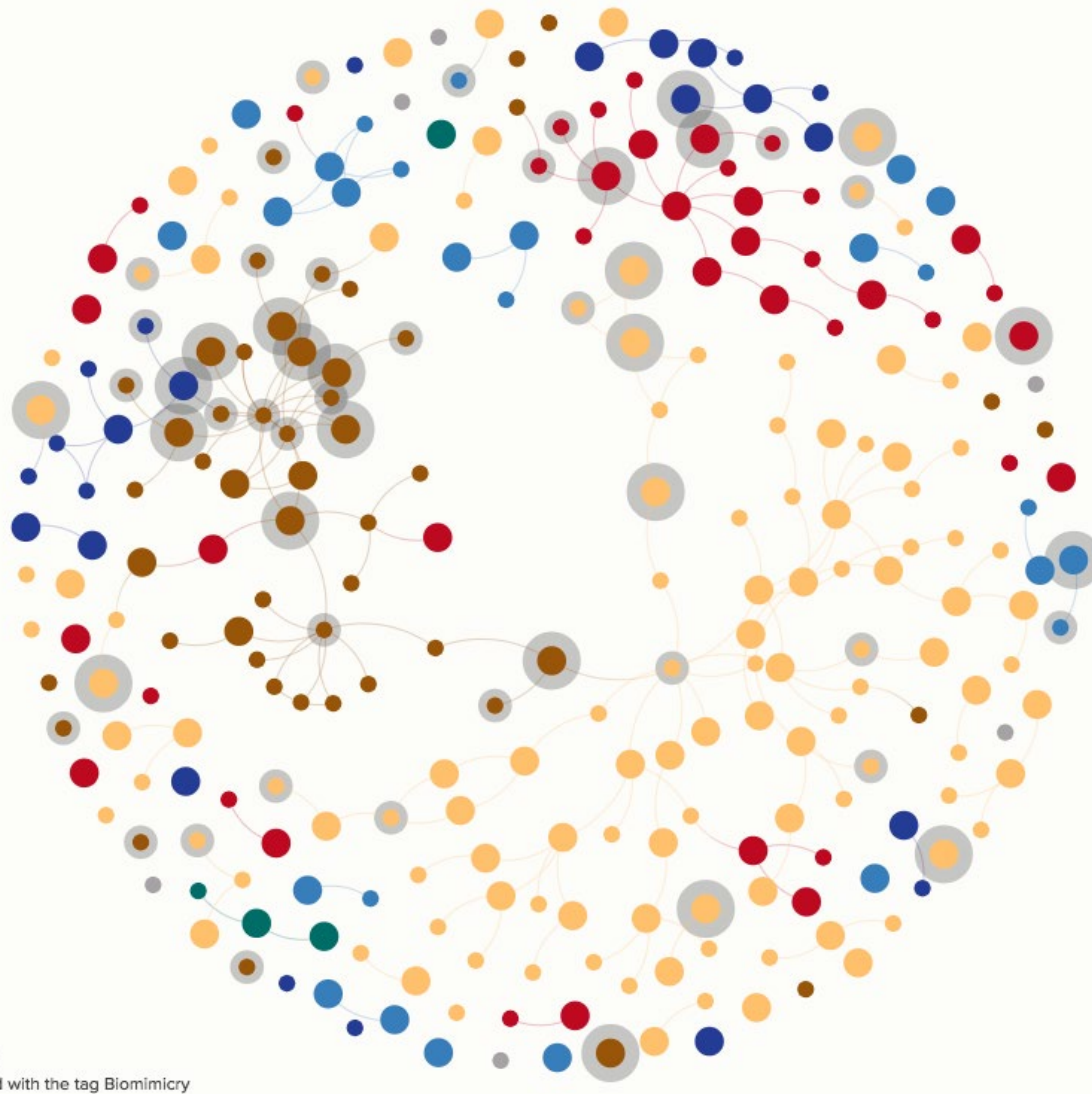


biomimicry uk



Biomimicry Switzerland
Discover > Innovate > Collaborate > Commercialize





NORDIC WORKING PAPERS

Biomimicry in the Nordic Countries

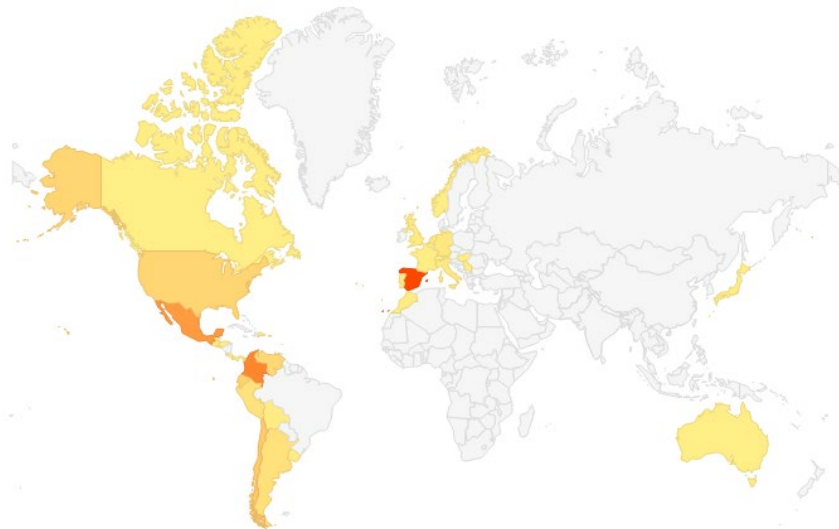
Torben Anker Lenau, Technical University of Denmark
Anna Maria Orrù, PhD SAR/MSA
Lilli Linkola, Ethica Ltd.

<http://dx.doi.org/10.6027/10.6027/NA2018-906>
NA2018-906
ISSN 2311-0562

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natureinspireus.wordpress.com



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	Mexico		Japan
	Chile		Guatemala
	Ecuador		Canada
	United States		France
	Venezuela		Malta
	Argentina		Panama
	Peru		Netherlands
	Germany		Switzerland
	Puerto Rico		Norway
	Italy		European Union
	El Salvador		Hungary
	Costa Rica		Australia
	United Kingdom		Belgium
	Dominican Republic		
	Bolivia		
	Morocco		
	Uruguay		
	Portugal		

Biomímesis:

la innovación sostenible y regenerativa inspirada en la naturaleza.

ENERO 2023

By Santander

Figura. 4
Formas de bioinspiración.

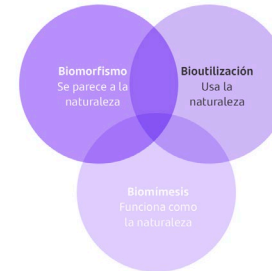


Figura. 7
Estimación por sectores industriales del impacto en las ventas de productos y servicios biomiméticos en el mercado norteamericano según el FBFI.
La Bioinspiración influirá a muchas industrias en 2030. Porcentaje estimado de ventas industriales



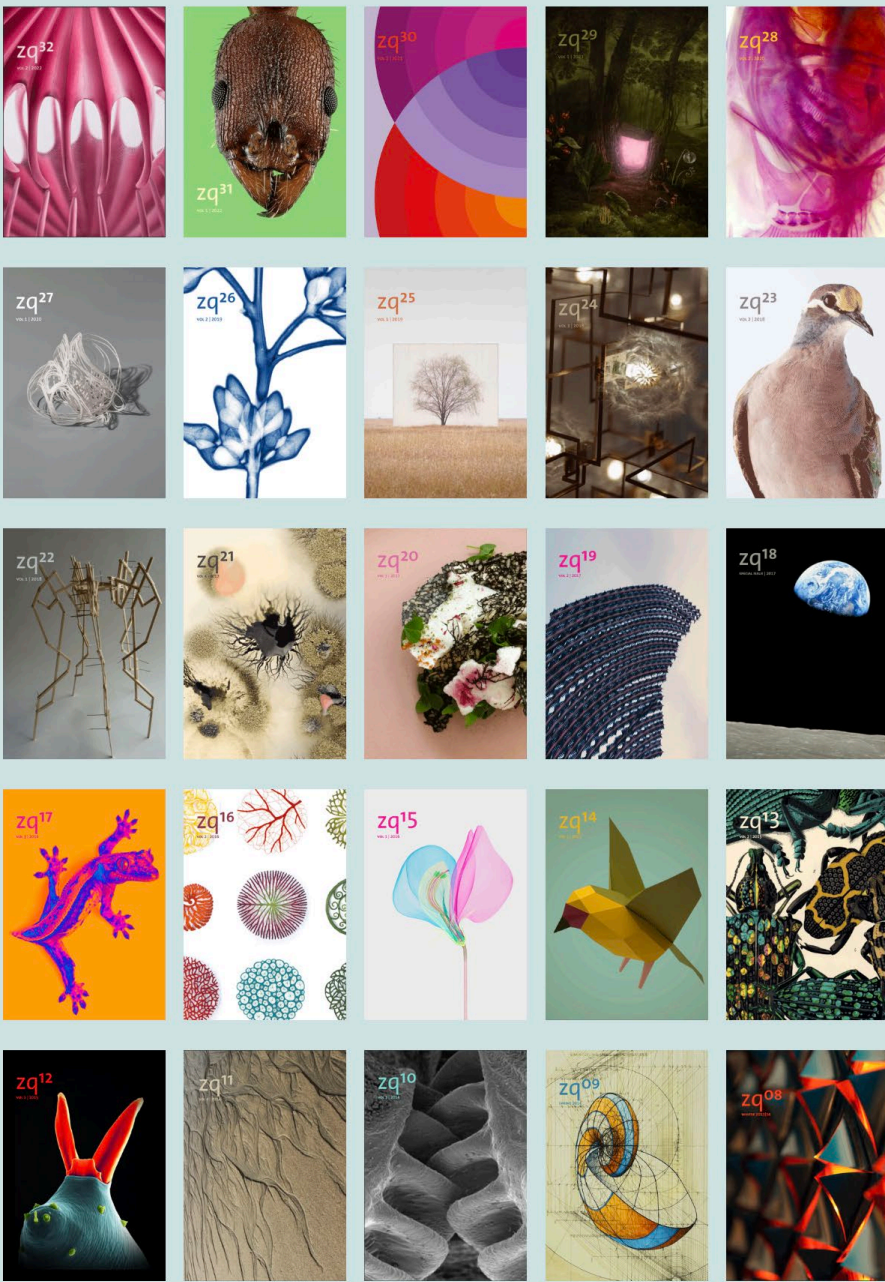
Autor

Manuel Quirós

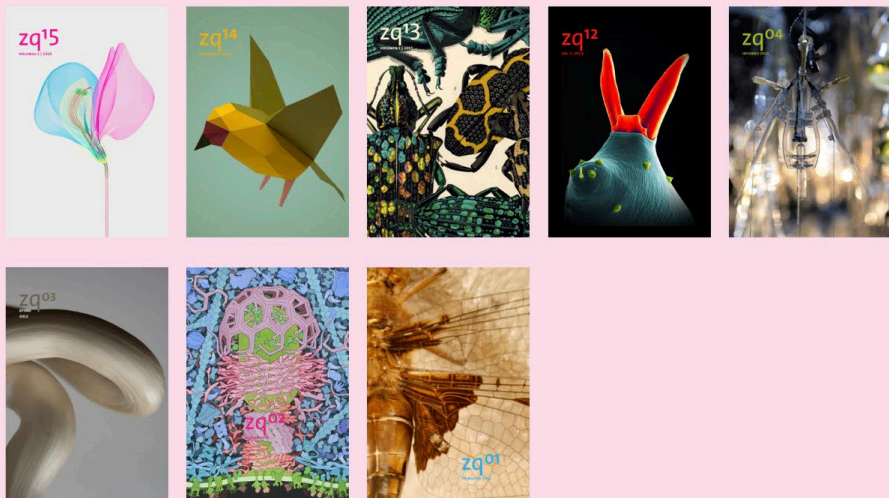
Doctor en Biología; profesor a tiempo parcial en el Instituto de Empresa; la Cátedra de la Unesco de la Universidad del País Vasco; la Universidad de Navarra y ESIC University

Imparte asignaturas de biomimesis, sostenibilidad y regeneración, biodiversidad y conservación, innovación disruptivas bioinspirada y RSC/ASG. Es cofundador de la Biomimicry Iberia Association y de la Red Internacional de Estudios en Biomimesis.

English editions



Ediciones en español



ZQ Zygote Quarterly



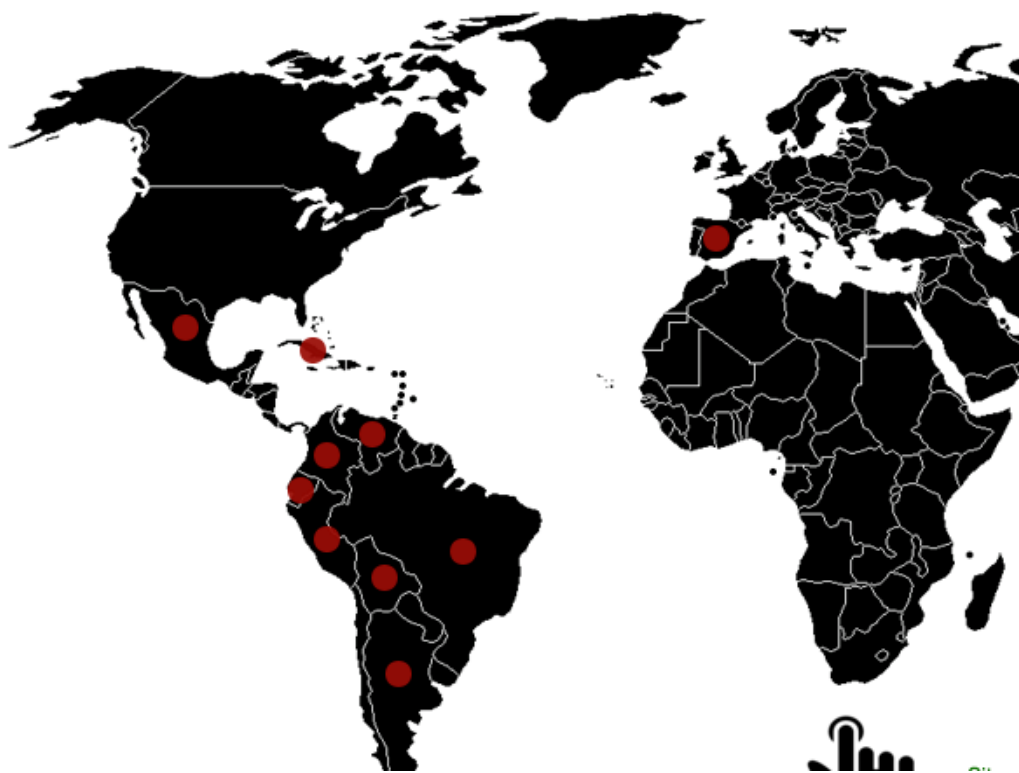
<http://natureinspireus.com/>



<https://redinternacionalbiomimesis.org>



<https://biomimicryiberia.com/>



PONENTES PRINCIPALES DEL SIMPOSIO



RED INTERNACIONAL DE ESTUDIOS BIOMIMÉTICOS RI+3 Biomimesis



GLOBAL BIOMIMICRY NETWORK



NATURE, INNOVATION + THE FUTURE OF DESIGN





THE BIOMIMICRY
CENTER

A joint effort between ASU and Biomimicry 3.8
that facilitates biomimicry education and
research activities.



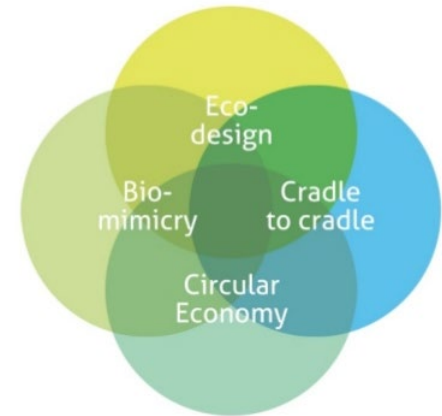
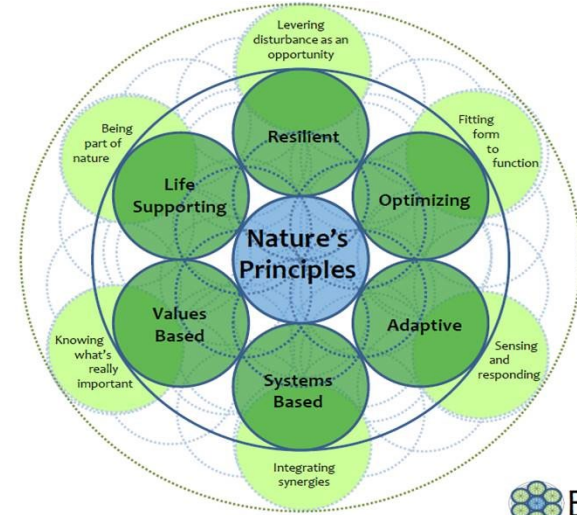
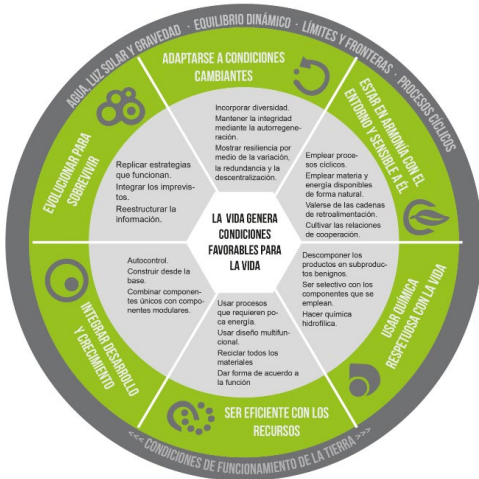


BRIC

BIOMIMICRY RESEARCH
& INNOVATION CENTER
INITIATIVE

mi diseño





ESCUELAS USA

ESCUELAS EUROPEAS

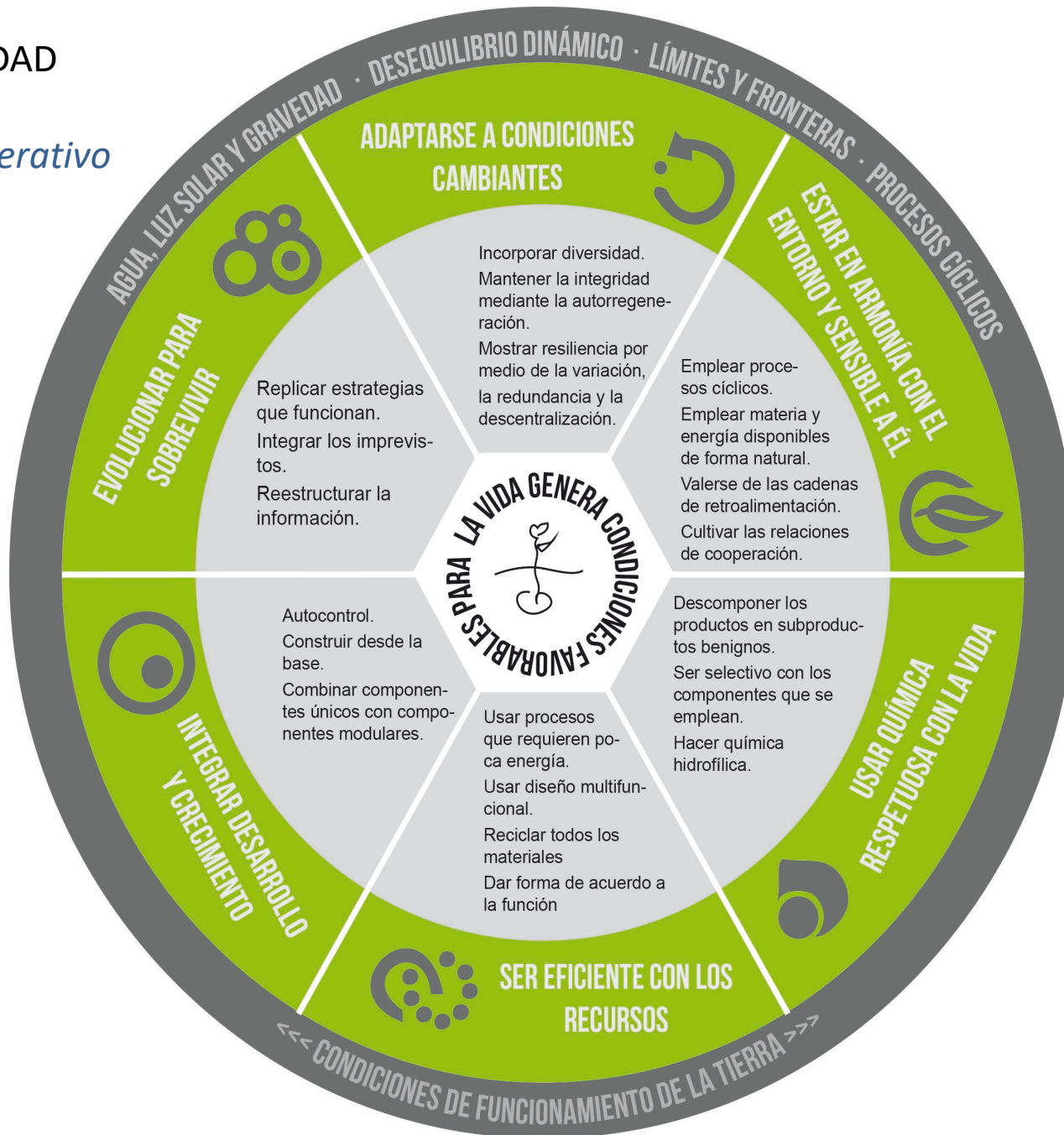
COMO FUNCIONA LA VIDA (PV, PUN)

INTRUCCIONES OPERATIVAS DE LA TIERRA

- SOLAR
- FUERZA DE LA GRAVEDAD
- H₂O
- DINÁMICAS NO EN EQUILIBRIO (equilibrio no estático, procesos de cambio...)
- LIMITES Y FRONTERAS (agua, atmósfera, energía solar, recursos...)
- PROCESOS CÍCLICOS
- RESIDUOS = RECURSOS

SOSTENIBILIDAD

diseño regenerativo



Principios de Vida o de Sostenibilidad y Regeneración

Lecciones de diseño desde la naturaleza

Patrones que se repiten en la mayor parte de los organismos

Estrategias de éxito para la supervivencia

Testadas y prototipadas durante millones de años

Integradas y optimizadas para crear condiciones de vida

Aplicables a los sectores industriales y sociales humanos (transversalidad)



EVOLUCIONAR
PARA SOBREVIVIR

incorporación
continua de
información nueva y
sustancial que
permite perdurar en
el tiempo

- Replicar
estrategias
que funcionan
- Integrar lo
inesperado
- Recombinación
de la información



SER EFICIENTE CON LOS
MATERIALES
Y LOS RECURSOS

el empleo inteligente
y conservador de
recursos brinda
oportunidades

- Usa un diseño
multifuncional
- Procesa con bajo
coste energético
- Recicla todos los
materiales
- Adapta la forma a la
función



ADAPTARSE A LAS
CONDICIONES
CAMBIANTES

dar respuesta ante
cambios continuos
y dinámicos
(no en equilibrio)

- Incorpora
diversidad
- Integridad
mediante la
autorenovación
- Resiliencia
mediante la
variación,
redundancia
y descentralización



INTEGRA DESARROLLO
CON CRECIMIENTO

invierte de modo
optimo en estrategias
que combinen
desarrollo con
crecimiento

- Combina el diseño
modular con
componentes
anidados
- Construye de
abajo a arriba
- Autoorganización



LOCAL Y CON CAPACIDAD
DE RESPUESTA

integrar y ajustarse
al medioambiente
que te rodea

- Emplea energía y
materiales
fácilmente
disponibles
- Cooperativo
- Basado en procesos
cíclicos
- Retroalimentación



EMPLEA UNA
QUÍMICA INOCUA

emplea una
química que
mantenga los
procesos vivos

- Construye con
pocos elementos
- Descomposición
en compuestos
benignos
- Emplea una
química
hidrosoluble

COMPARTIR LA SABIA INNOVACIÓN DE LA NATURALEZA

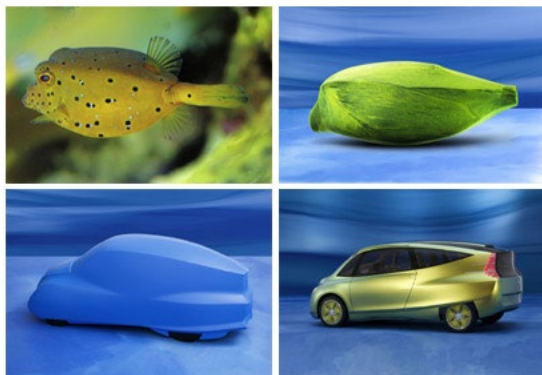


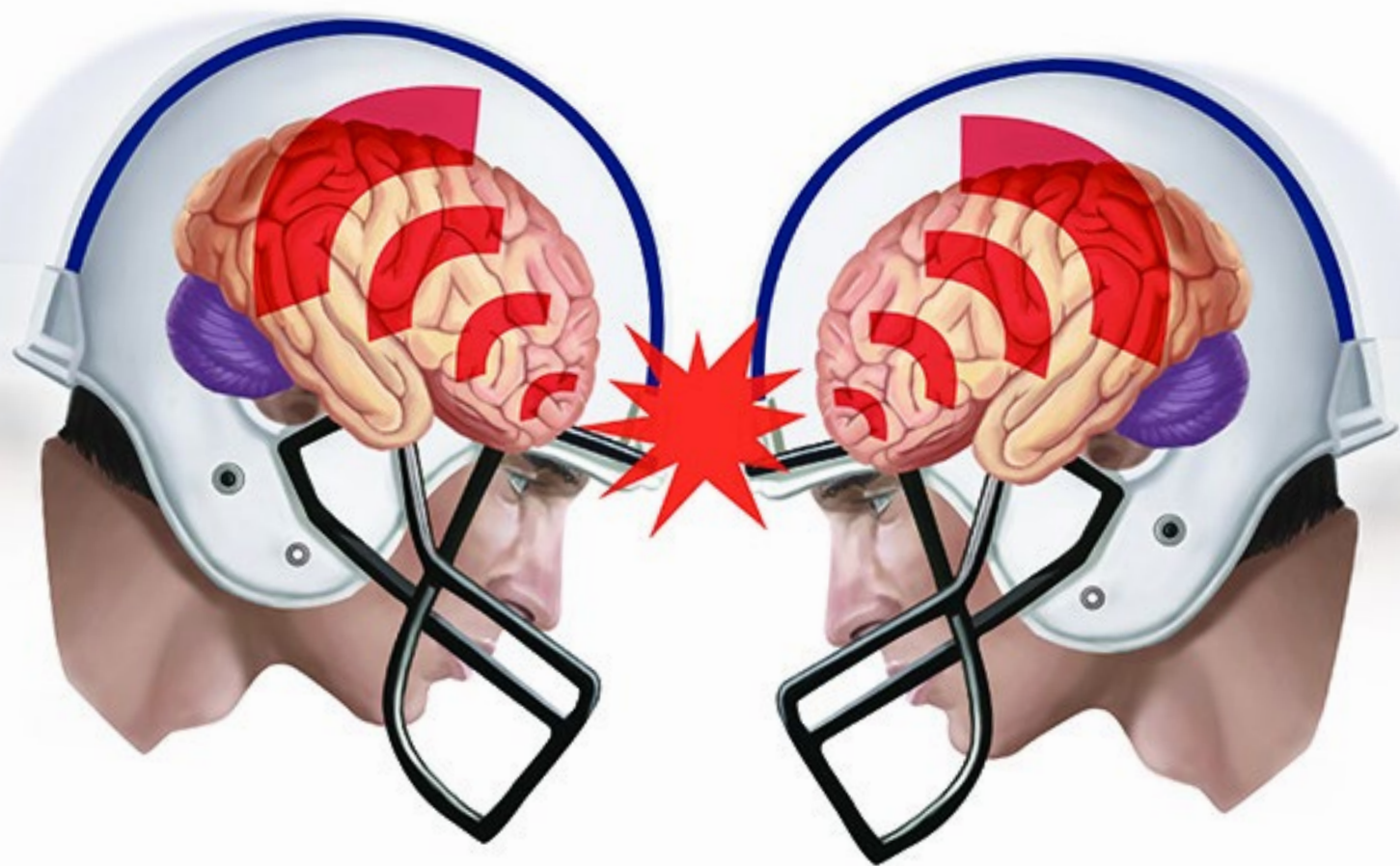
Reto_juego

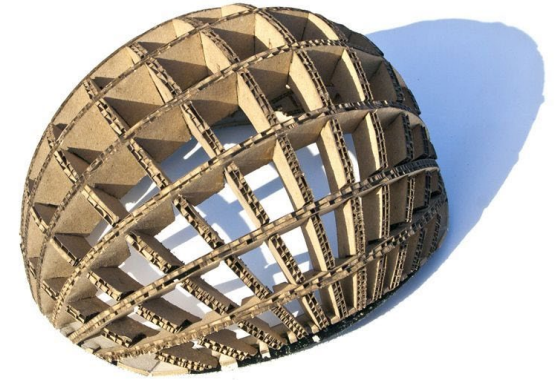
Función y Estrategia



Mercedes-Benz
bionic C





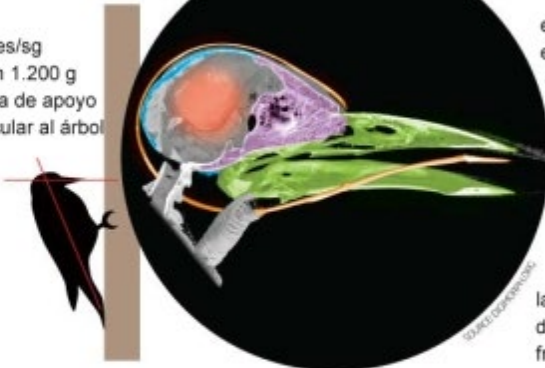


Pico

extraordinariamente duro y resistente,
no se fractura ni requiere afilado

Cerebro

golpea 22 veces/sg
desaceleración 1.200 g
la cola funciona de apoyo
pico perpendicular al árbol



Cráneo

existe un pequeño espacio entre
el cráneo y el cerebro para el fluido
cerebro-espinal que reduce la
transmisión de las vibraciones

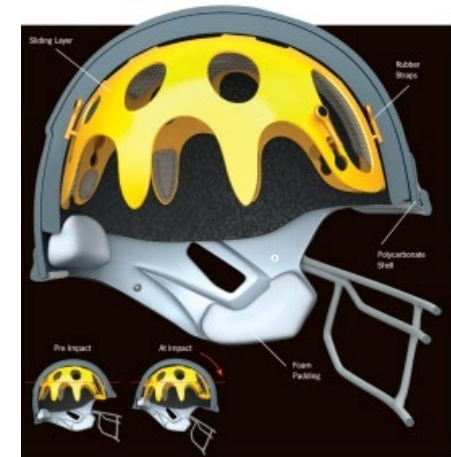
Hueso esponjoso

la estructura del hueso poroso
detiene las vibraciones de baja
frecuencia que no llegan al cerebro

Hueso hioideo

este sólido y flexible hueso
sostiene la lengua, órgano
muy largo y característico
capaz de detectar alimento

modificado de
NewScientist



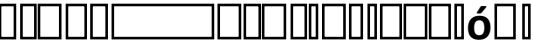
Royal College of Art



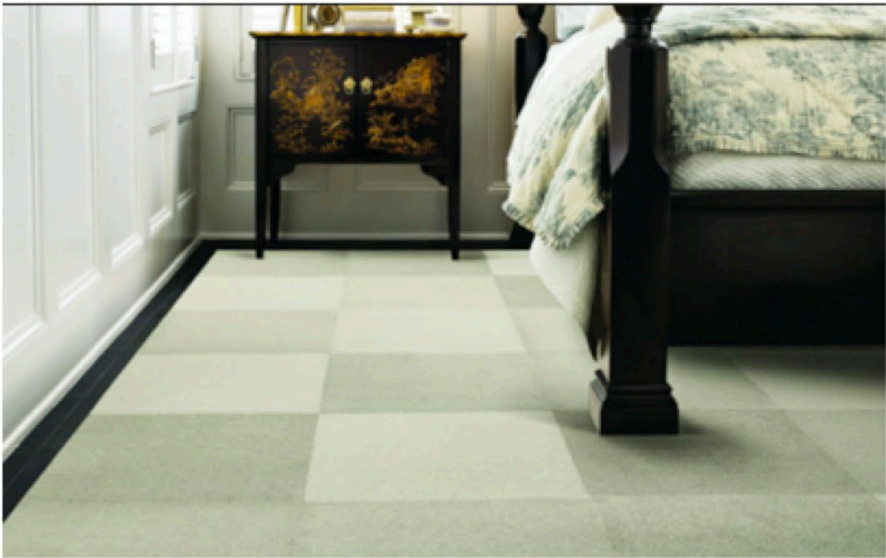




Interface®

- 
- 
- 



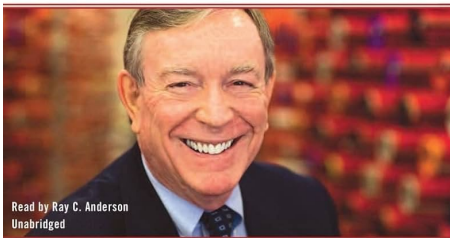




Interface®

CONFESSIONS OF A RADICAL INDUSTRIALIST

PROFITS, PEOPLE, PURPOSE—DOING
BUSINESS BY RESPECTING THE EARTH



Read by Ray C. Anderson
Unabridged

RAY C. ANDERSON
WITH ROBIN WHITE



☐☐☐ energía consumido en Europa LIDER EN EUROPA (80% *versus* 60% en USA HVAC)

☐☐☐ de la contribución a los GEI extracción-transporte-maquinaria)

☐☐☐ contaminación del agua

?% contaminación del aire

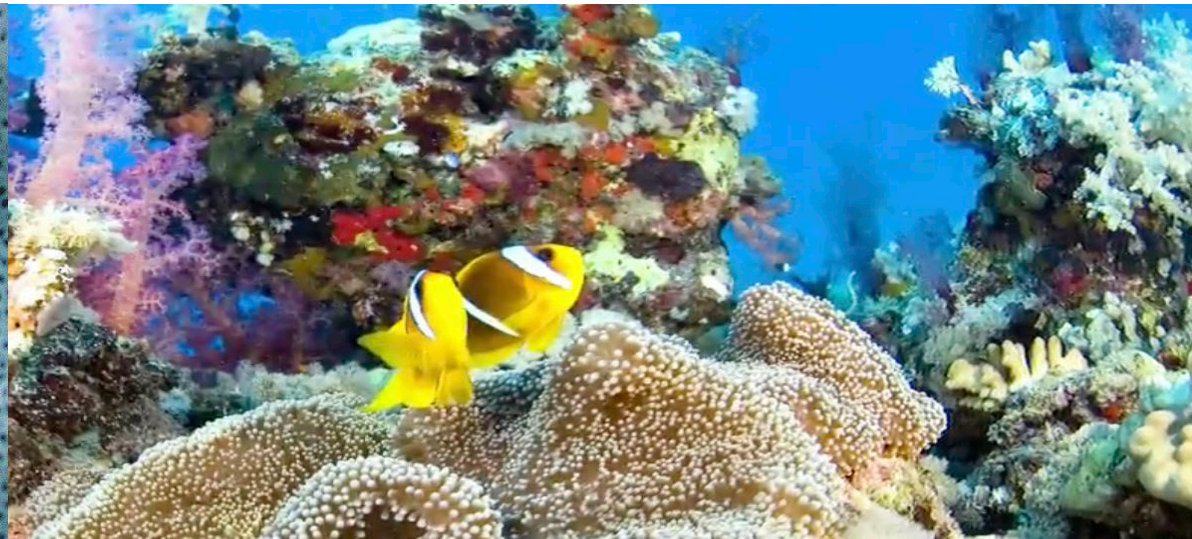
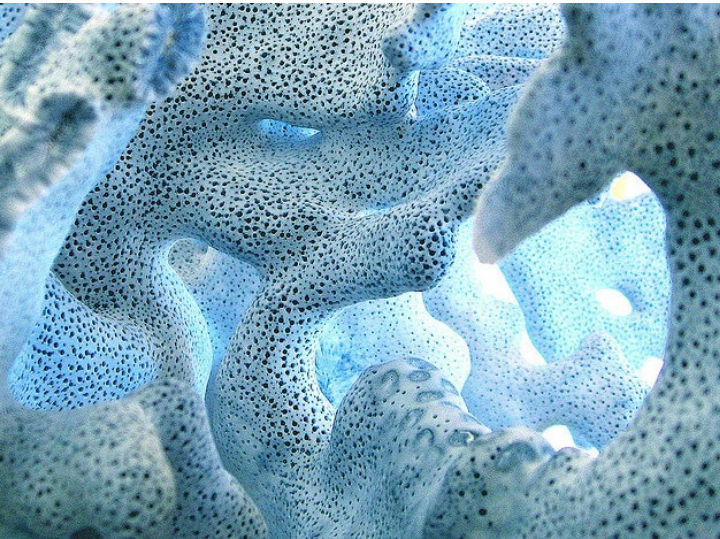
☐☐☐ residuos en vertederos

35% mas que hace 50 años

☐☐☐ ineficiente energéticamente

Enorme dependencia de recursos naturales renovables y no renovables

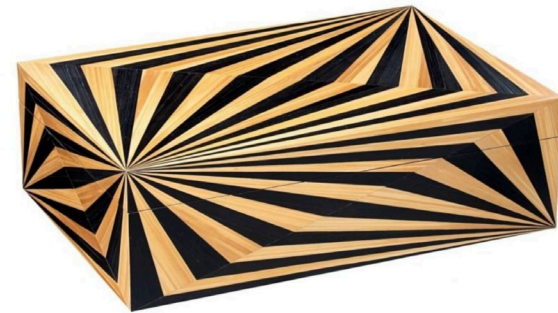
Sector que contribuye con el 9% PIB + 18 millones de empleos



Low CO₂ Cement Inspired By Nature



OBJET
PARTICULER





Applications



Shopping bags



Food packaging



Cardboard

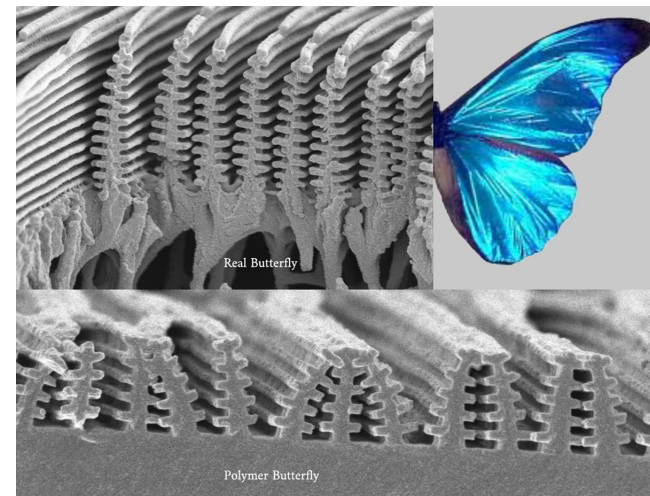
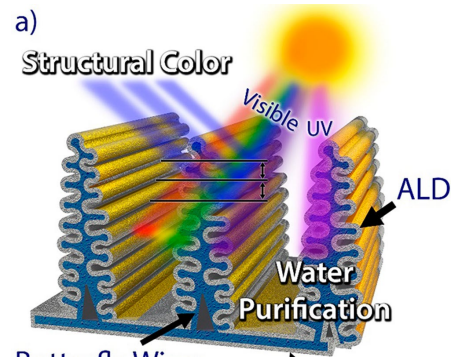
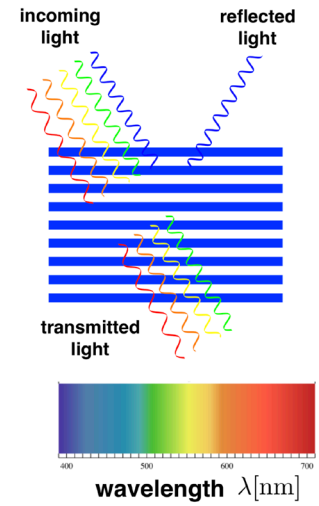
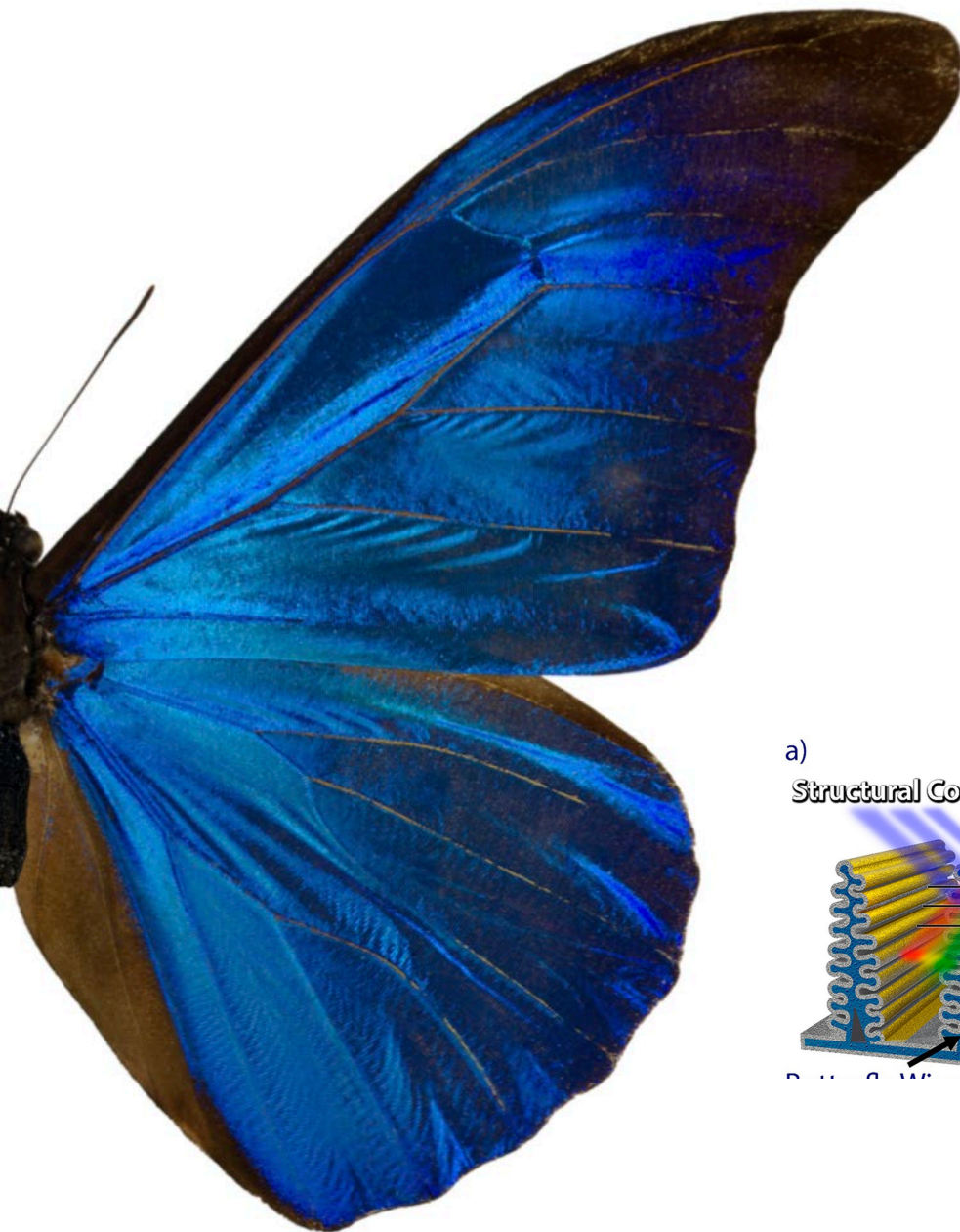


Egg trays

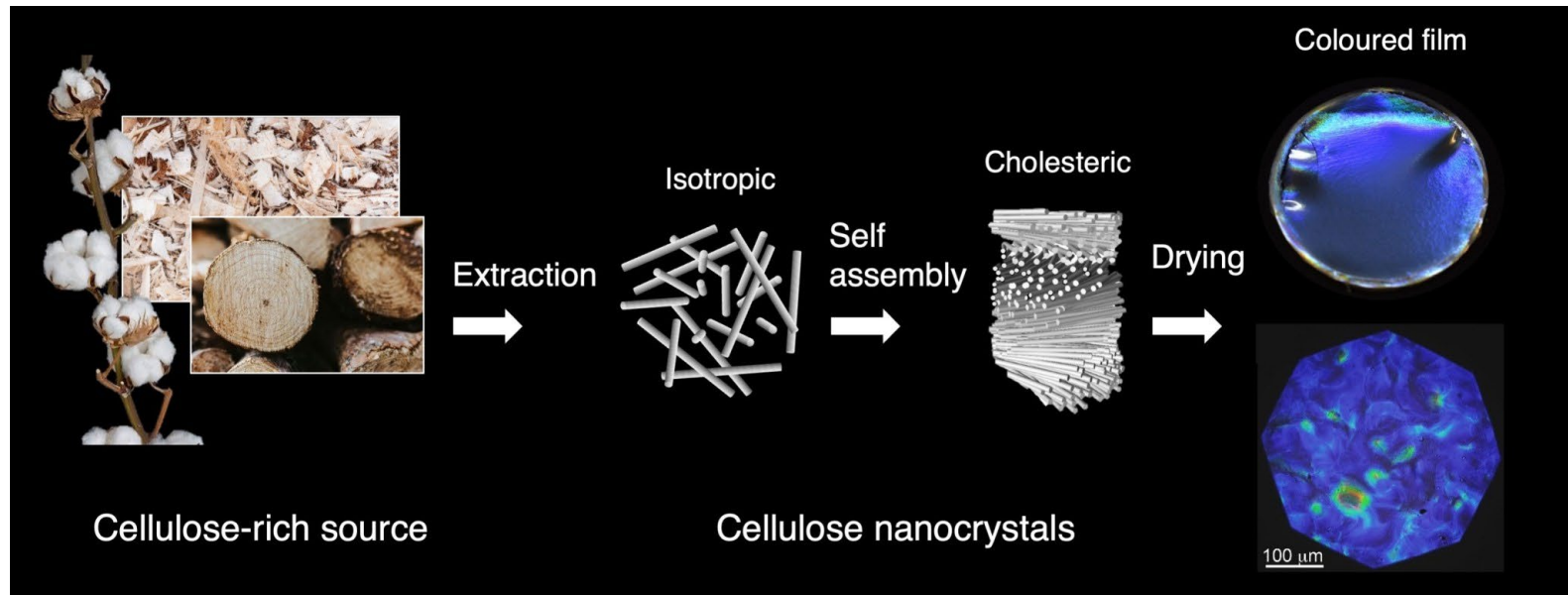


Corrugated boxes





Sparxell



COSMETICS & PERSONAL CARE



FILM & FOIL



PACKAGING



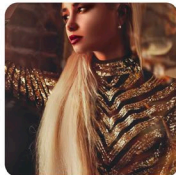
ARTS & CRAFTS



DECORATION



FASHION

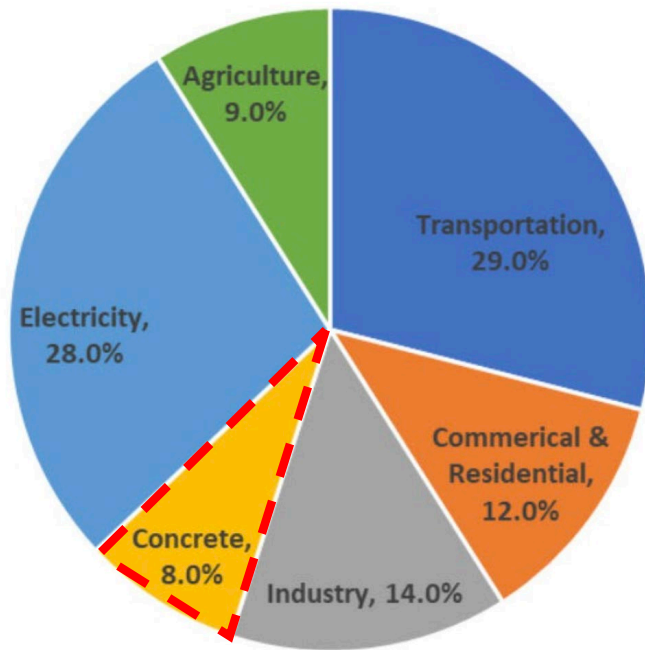


COATINGS & PAINT

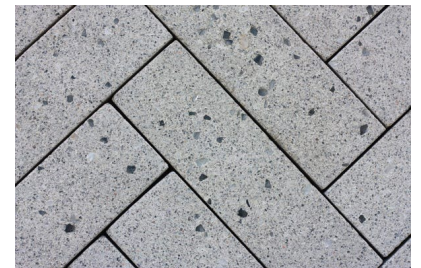
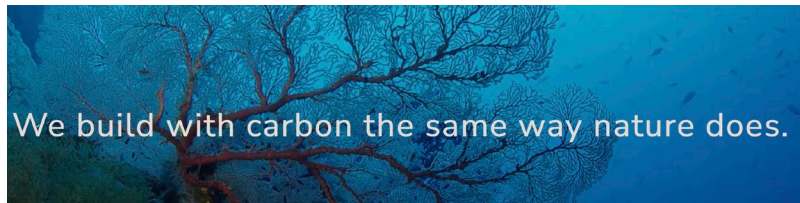
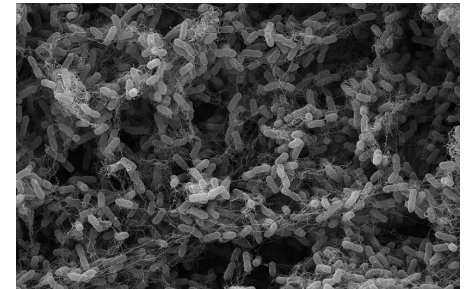
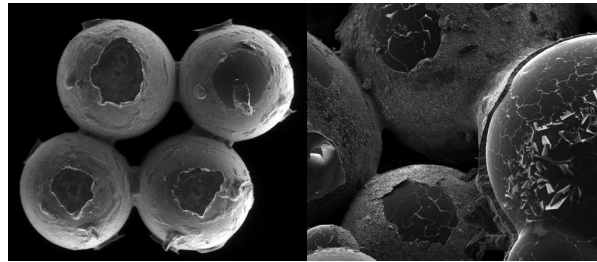
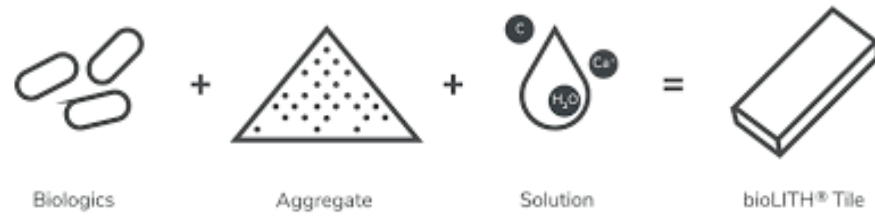


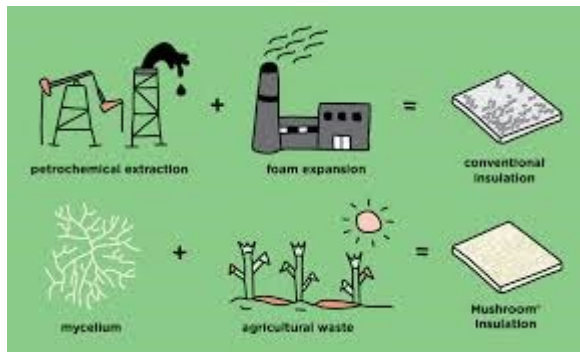
FOOD & BEVERAGES





BIOMASON





micelio fúngico

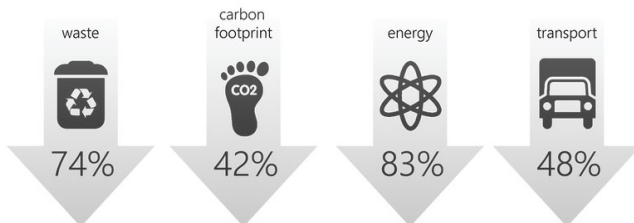
REVESTIMIENTOS
IGNIFUGOS
RESISTENTES
LOCALES

...

AISLANTES
LIGEROS
NO TOXICOS
BIODEGRADABLES

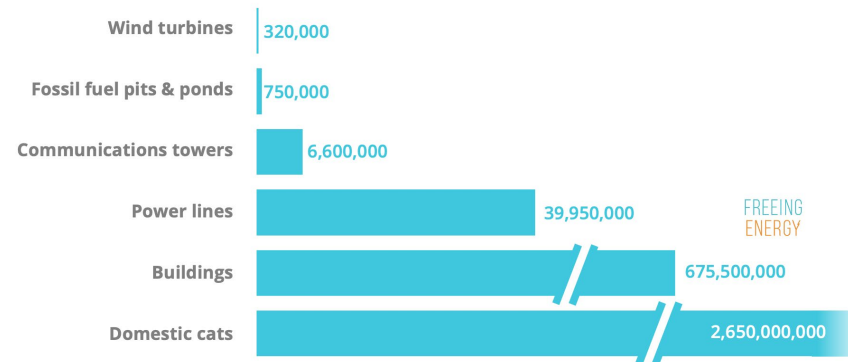


materiales de construcción
biodegradables
y que absorben toxinas

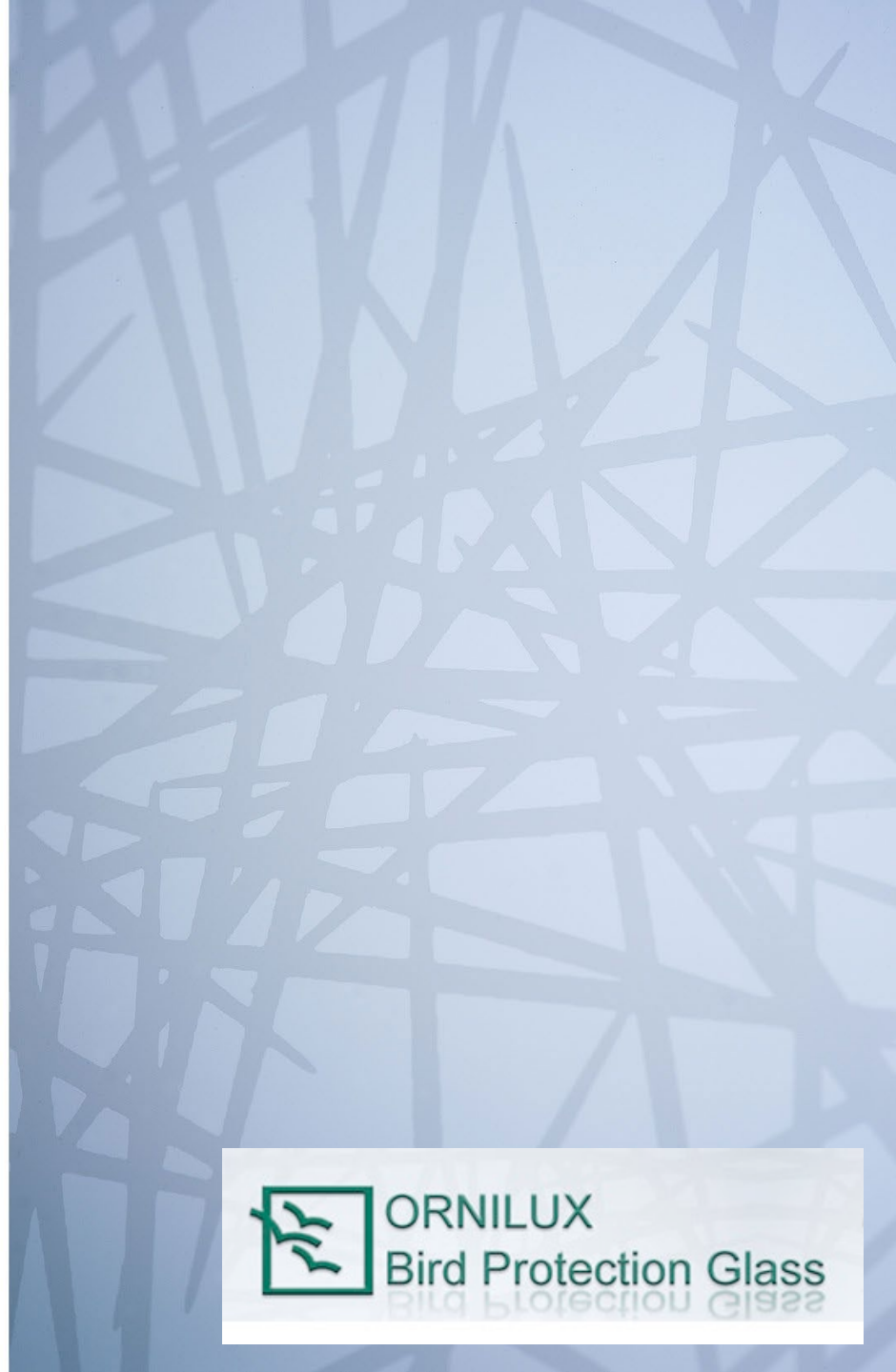




Causes of US bird deaths



sources: Median values from US Fish and Wildlife Services | Graph by Freeing Energy | <http://fep.link/g103>



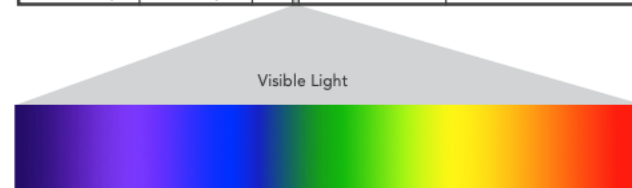
ORNILUX
Bird Protection Glass

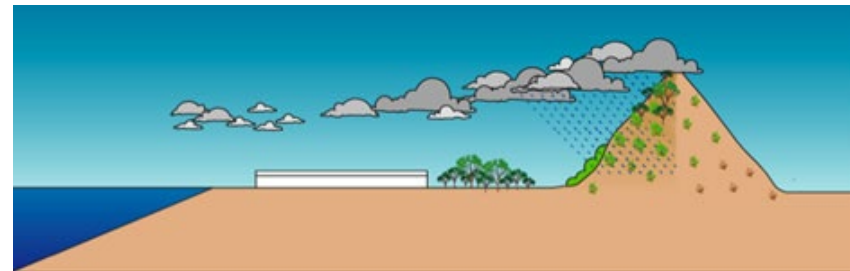
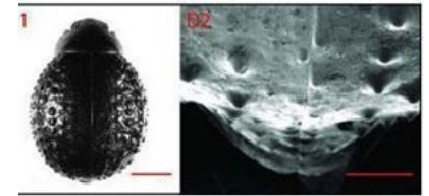
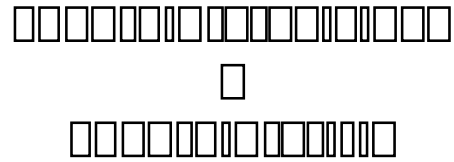
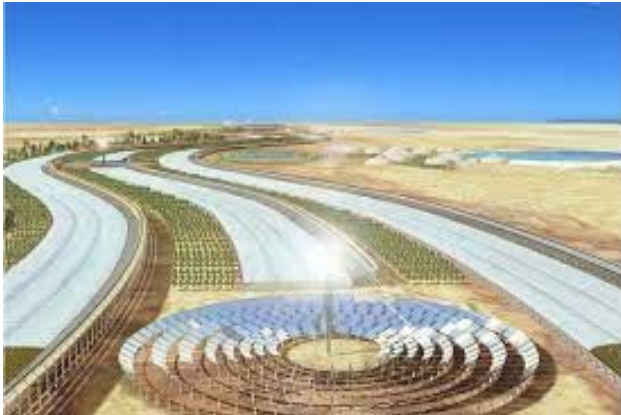


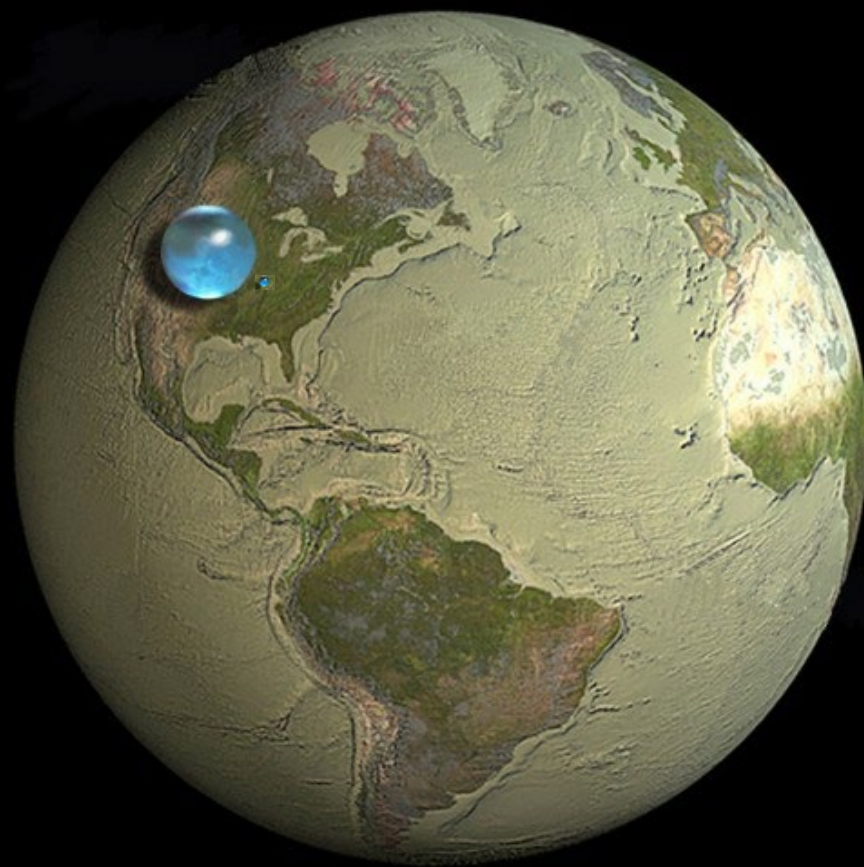
lo que ven
las aves



lo que
vemos
nosotros



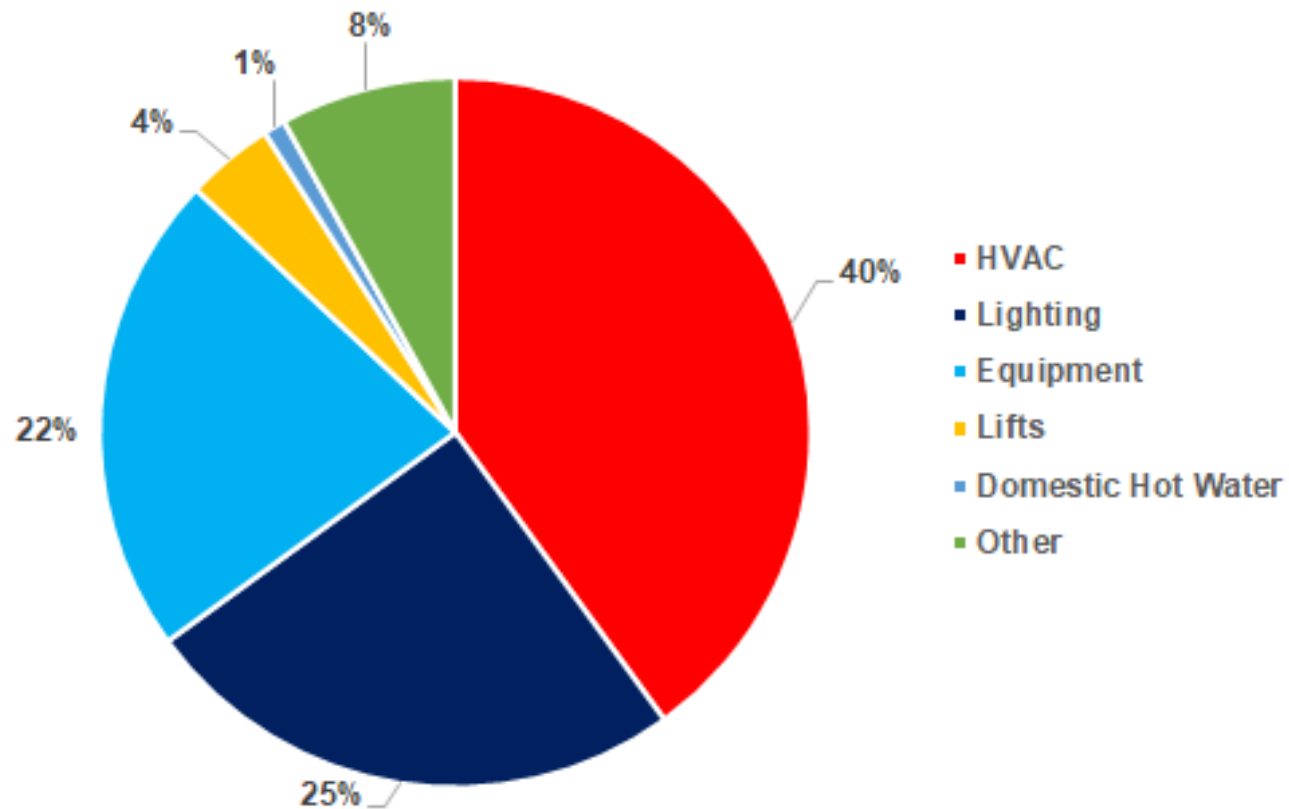




SAHARA FOREST PROJECT



HVAC typical energy consumption

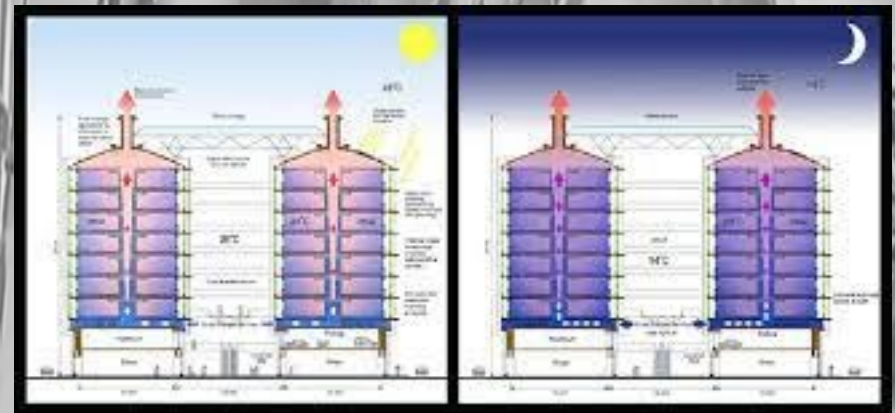


████████████████████ Harare, Zimbaue

5.600 m² alquiler, 26.000 m² oficinas, 450 parking

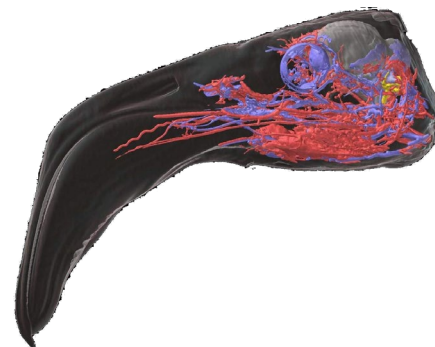
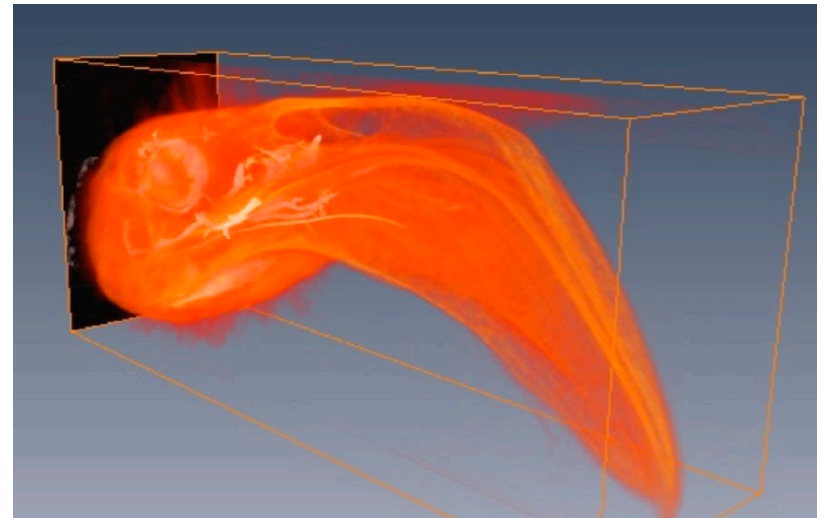
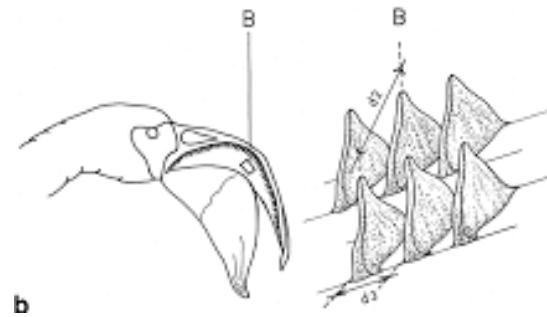
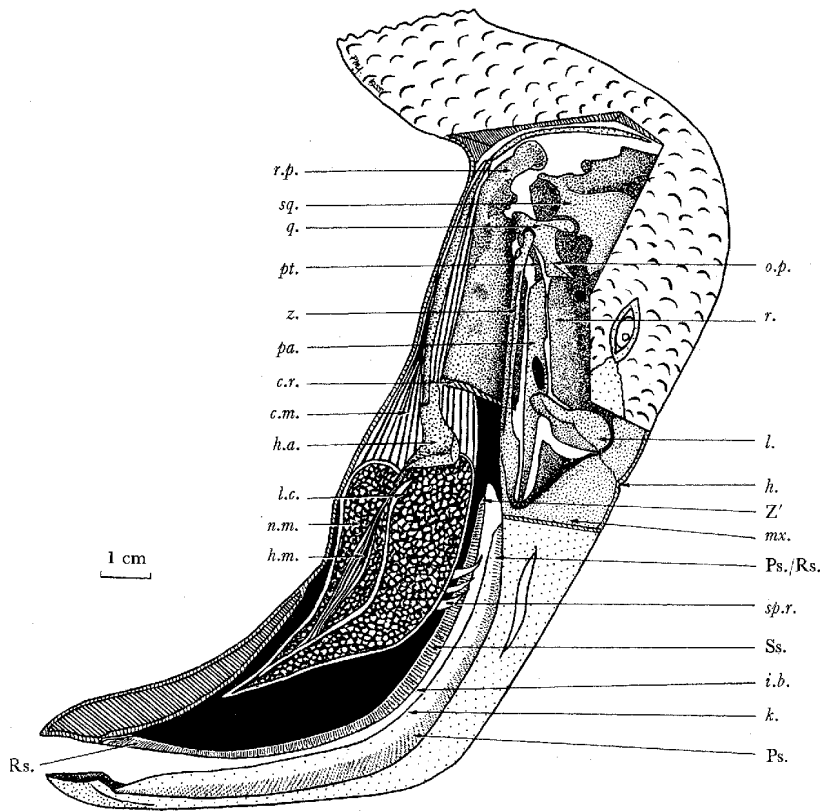
M.Pierce arquitecto

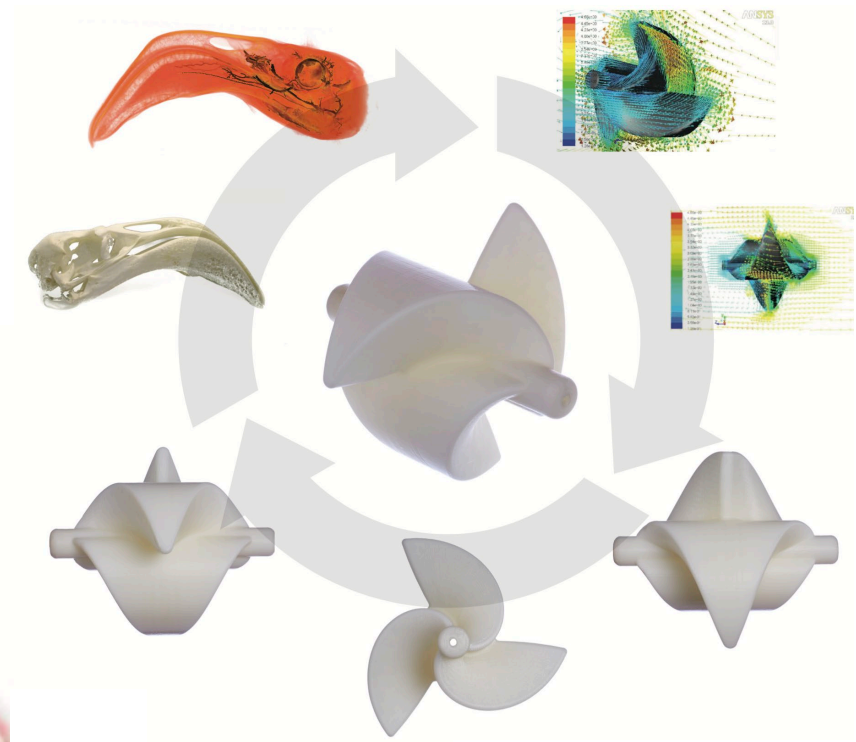
35% menor consumo de energía (exterior a **+ 50 °C**)
mas espacio alquiler al no haber ventilación





<https://youtu.be/Q5H5ueHDpO0?feature=shared>





© 1+D Innovación

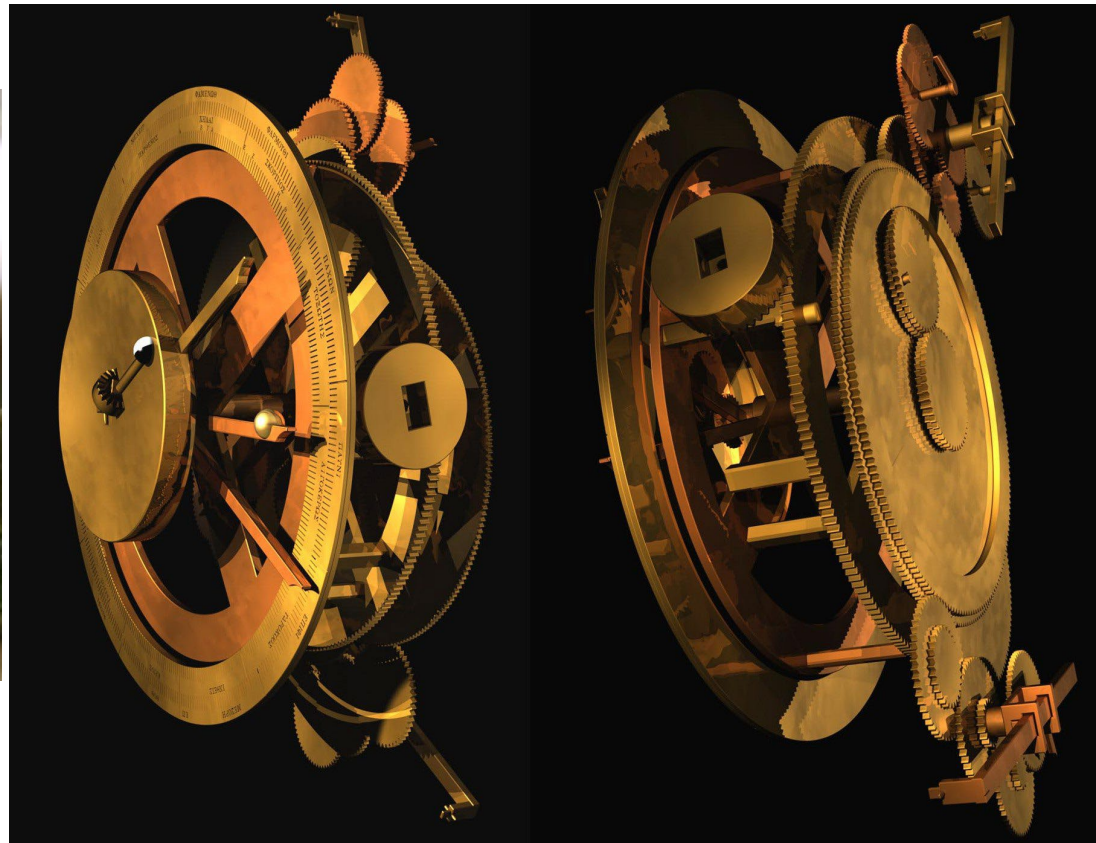
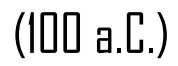
repsol news

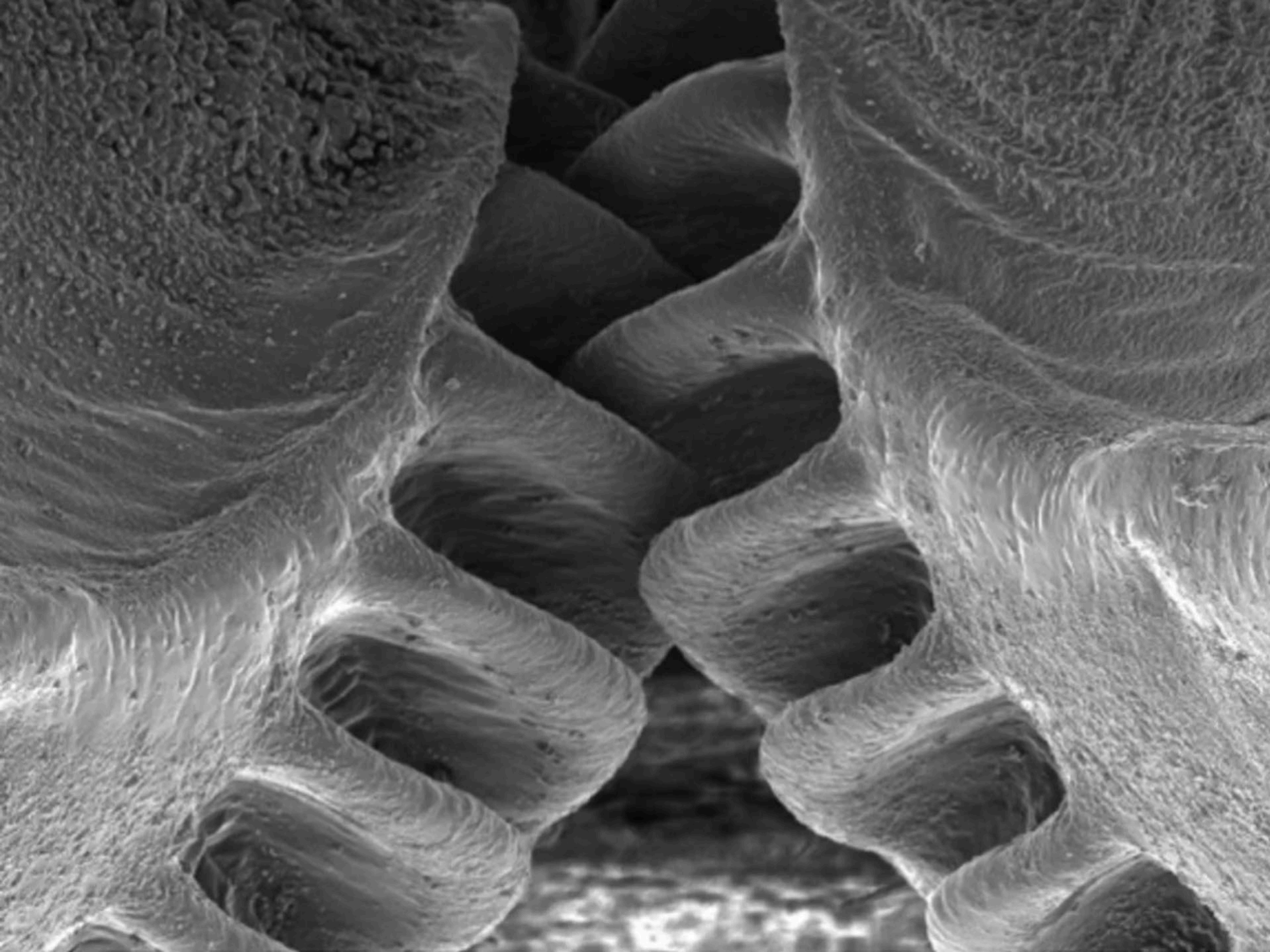


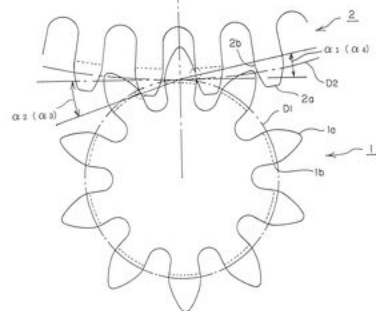
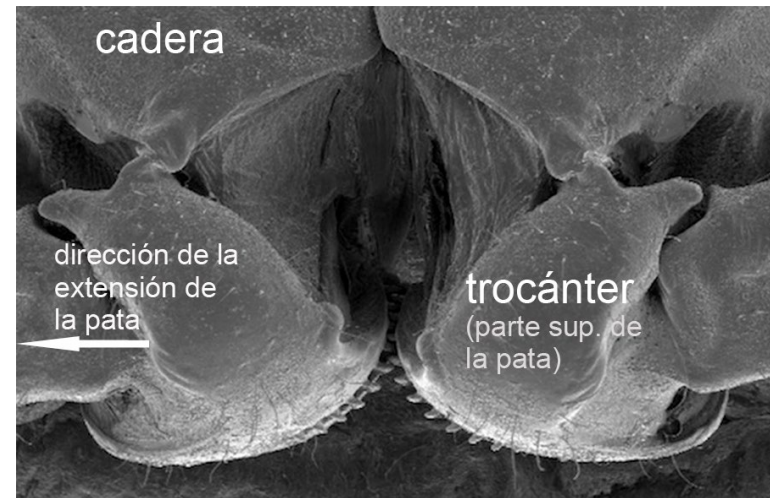
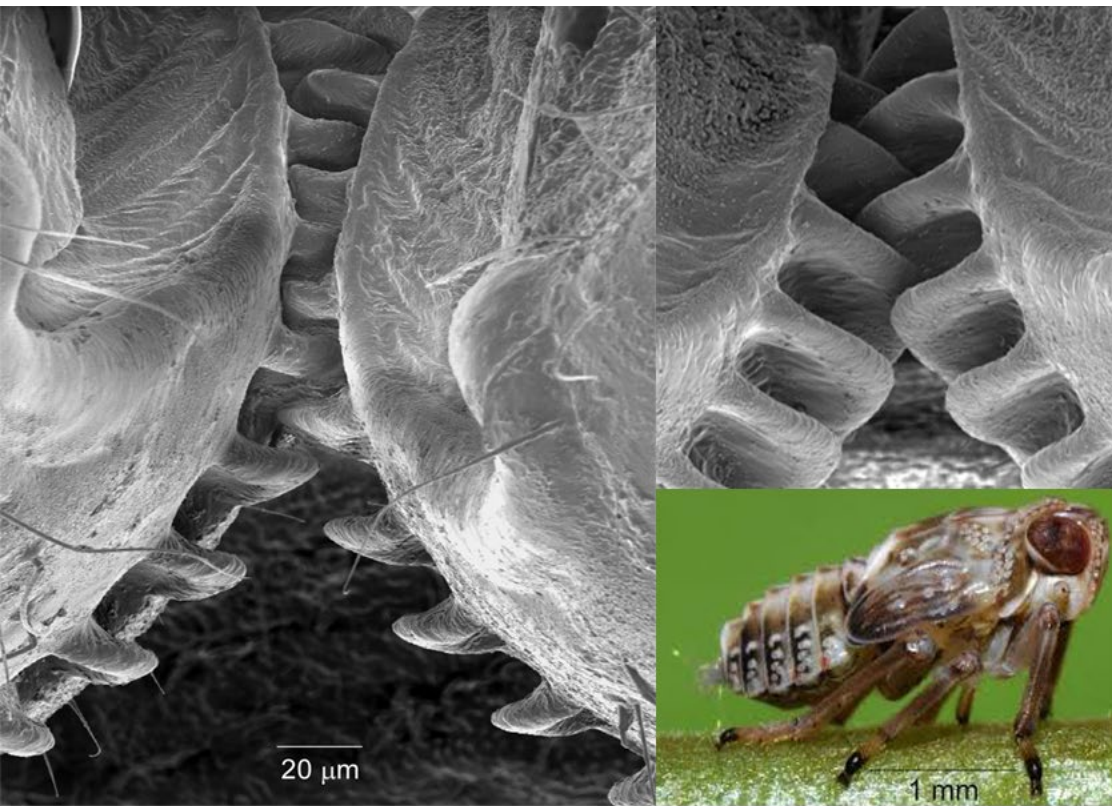
CASOS DE EXITO BIOINSPIRADOS

¿Que nos enseñan los insectos sobre engranajes?





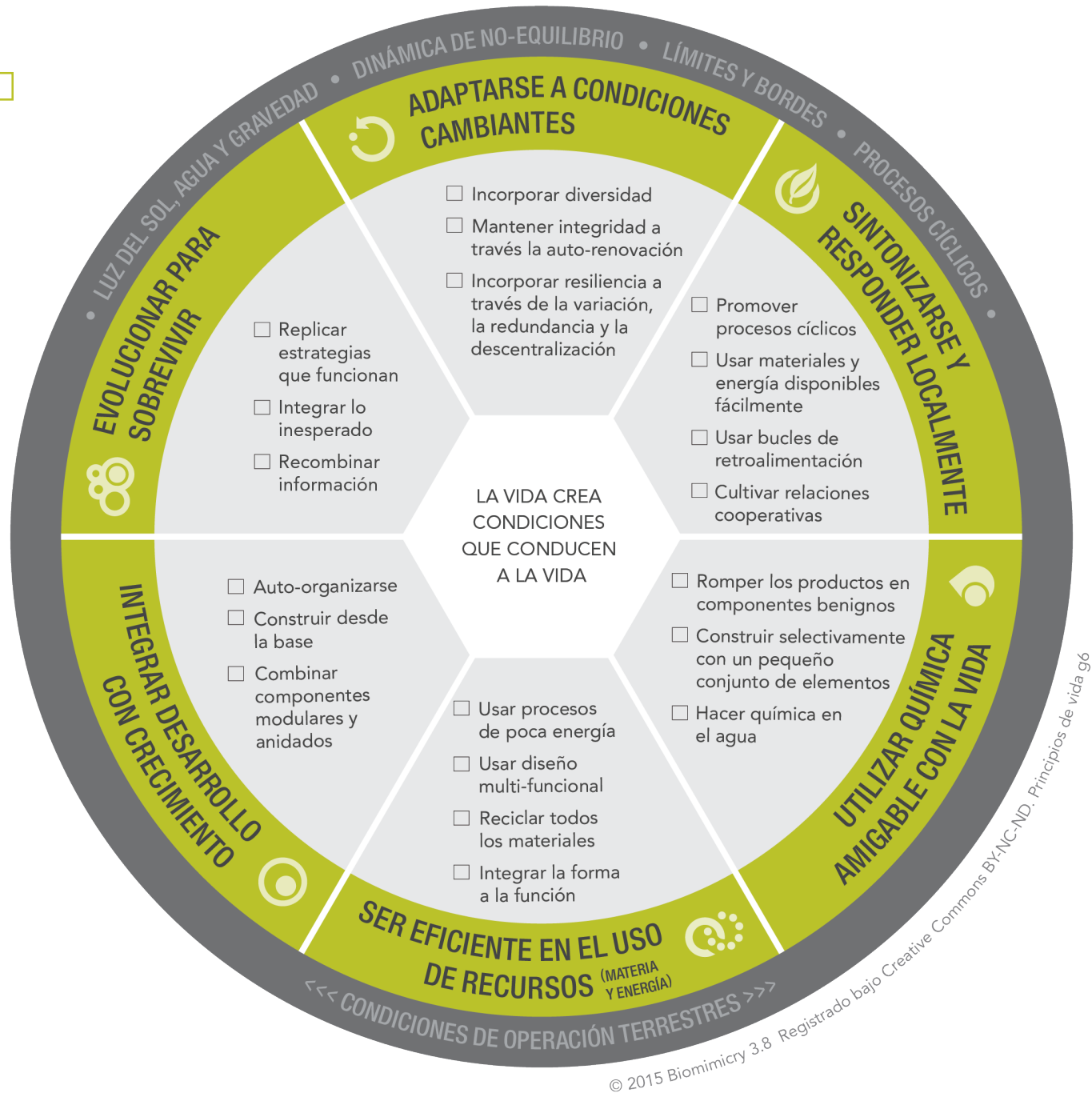
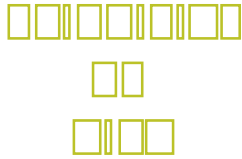






<https://www.youtube.com/watch?v=xQk-IP2R04Y&t=3s>

<https://www.youtube.com/watch?v=xQk-IP2R04Y>





Dr. Manuel Quirós

info@natureinspireus.com

natureinspireus.com

