STRATEGIC CHALLENGES IN

R&D Talent Management

Liquid Talent: Tools to Embrace a More Fluid Workforce

Recruiting and Retaining Early Career Tech Talent

Career Paths for Innovation

Biomimicry:

Streamlining the Front End of Innovation for Environmentally Sustainable Products

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THOMAS A. MARTING

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IRI Industrial™ Research Institute

Creating Innovation Leadership Solutions

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- Innovation Services and Professional Education with Great Lakes Biomimicry
- PhD in Biomimicry from The University of Akron

Thomas A. Marting

- Facilities and Resource Management Director at GOJO Industries
- 7 years of experience in sustainable design and biomimicry
- BS in Chemical Engineering from Ohio University

University – Industry Partnership

2012-2017
Fellow [Emily]
Sponsor

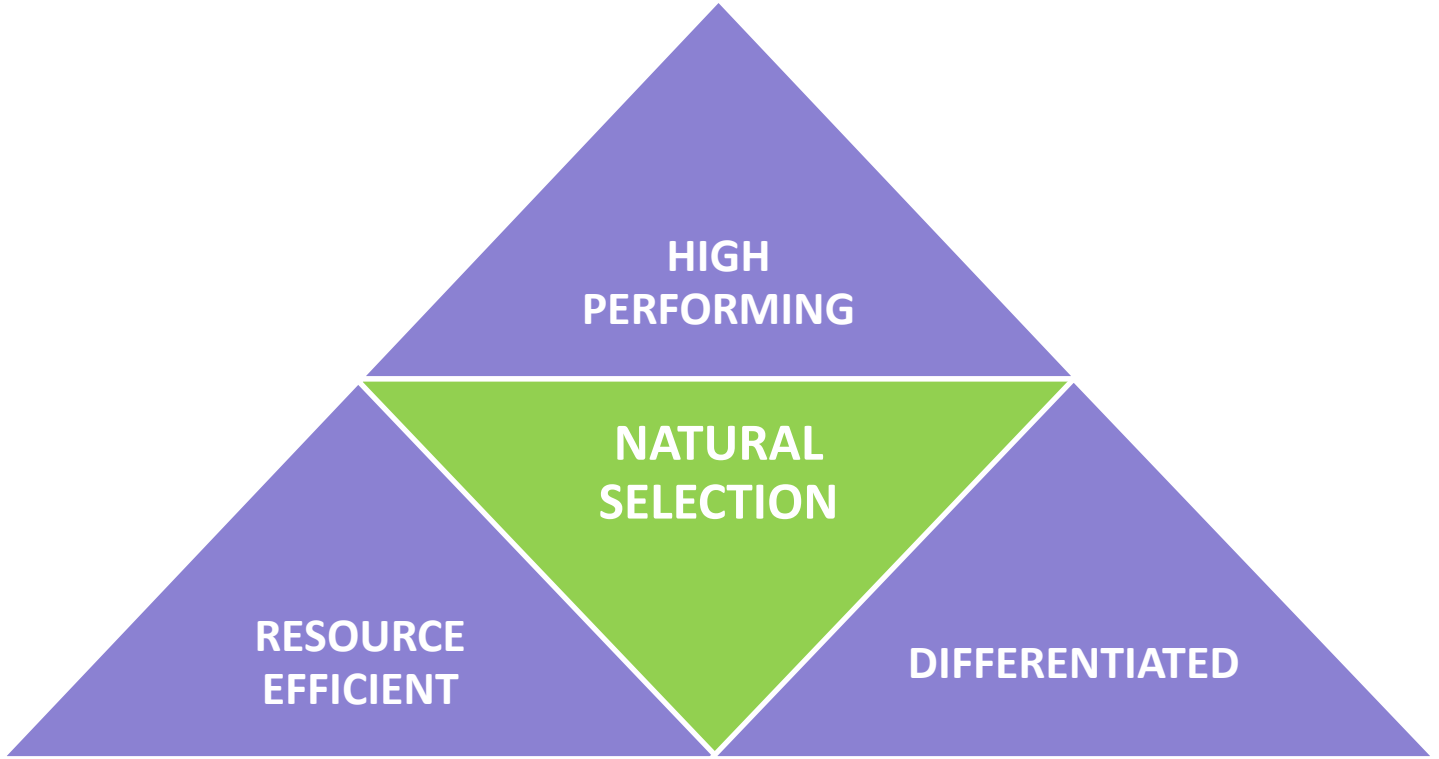
Biomimicry
PhD Fellowship
Program

Secures Sponsorships

University – Industry Partnership

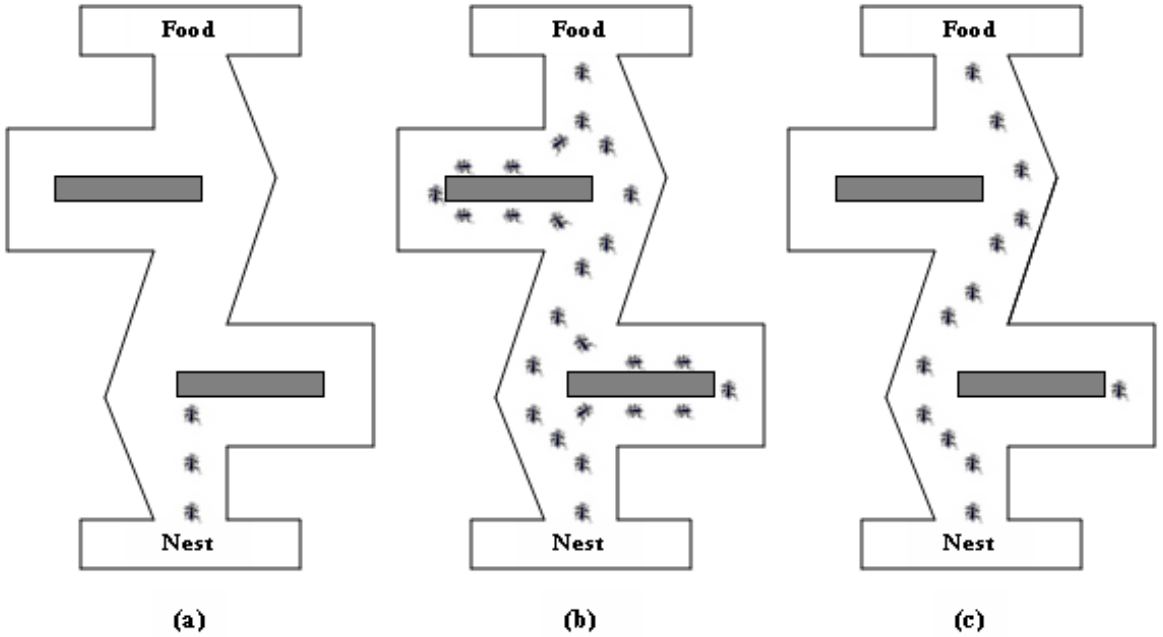
What is biomimicry?

Innovation through emulation of biological forms, processes, patterns, and systems

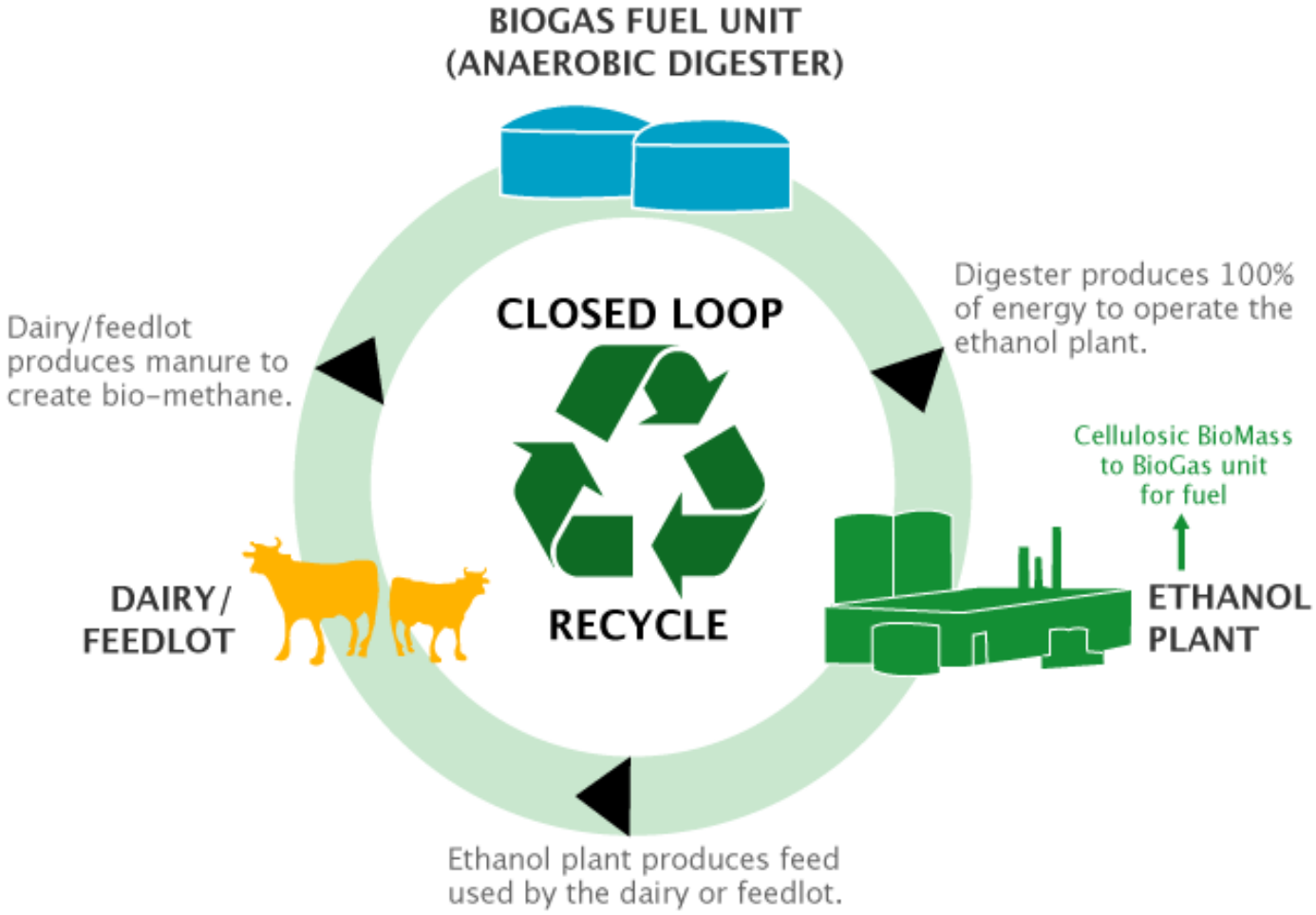


Biomimicry of Form

Biomimicry of Process



Biomimicry of System



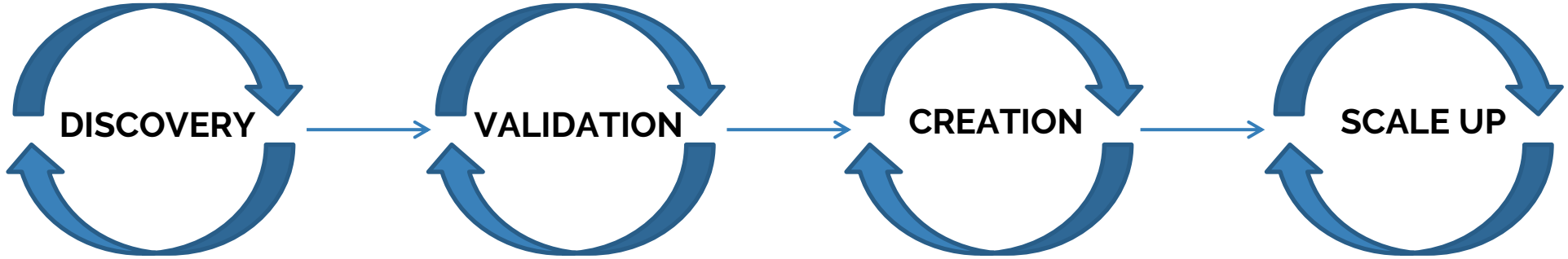
Environmental Sustainability

- Increases competitive advantage
- Generates business value
- Enhances customer relations

For more info about GOJO sustainability visit:
http://www.gojo.com/en/Sustainability

Eco-design Tools

- Conventional tools used to validate vs. generate
- Need front end, solution discovery tool



Simplified illustration of the NPD Process

Source: Steve, and Bob Dorf. 2012. *The Startup Owner's Manual: The Step-By-Step Guide for Building a Great Company*. K&S Ranch.

Biomimicry for Eco-design

Manmade Systems	Biological Systems
Simple, disconnected	Complex, interconnected
Linear, wasteful	Closed loop, zero-waste
Resistant to change	Adapted to constant change
Long-term toxins	No long-term toxins
Fossil-fuel dependent	Current solar income
Maximize one goal	Optimized as whole system
Extractive	Regenerative

Source: Janine Benyus, 2014 Disruptive Innovation Festival

Biomimicry at GOJO

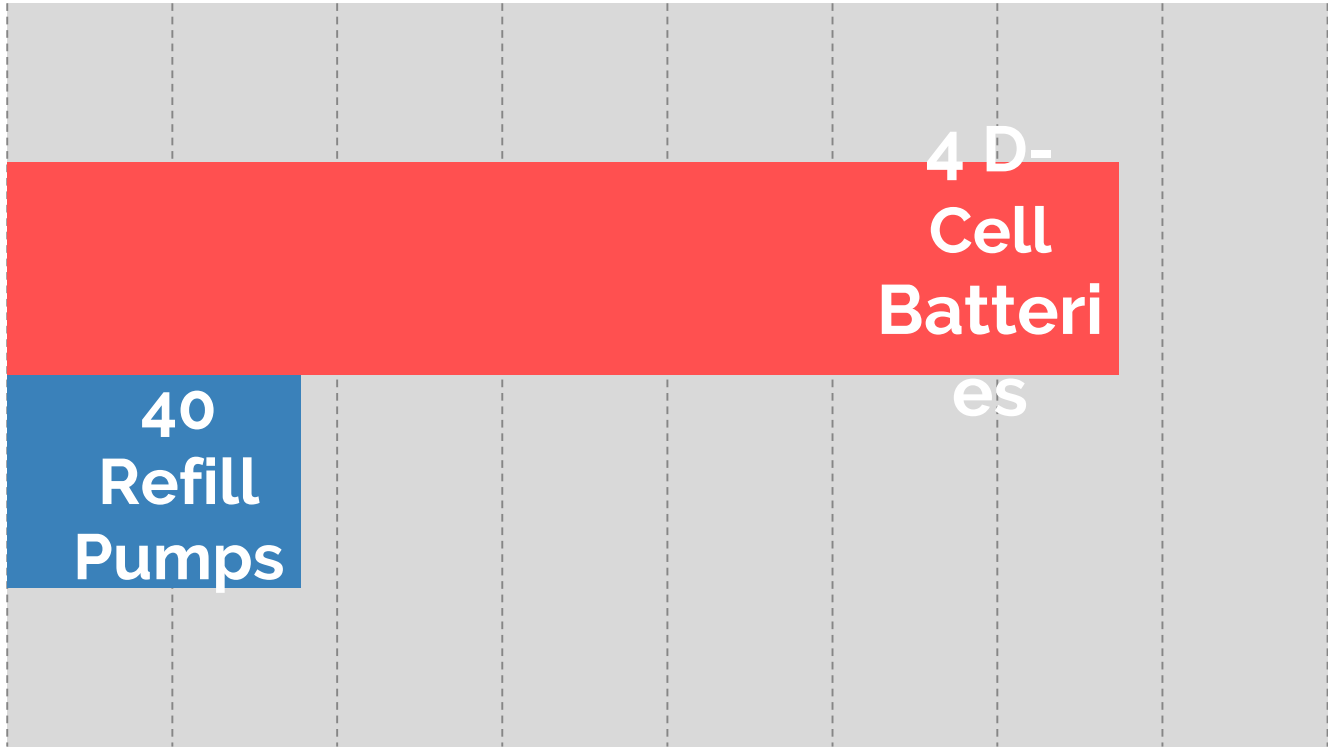
Touch-Free Soap and Sanitizer Dispensing

Biomimicry Process

- Problem definition
- Function specification
- Biological model identification
- Extraction of design principles
- Concept generation & refinement

Problem Definition

Innovation Objective: Further increase energy efficiency of dispensers



Function Specification

Biomimicry Taxonomy*

Get, Store, or Distribute Resources → Distribute → Distribute Fluid

Engineering-to-Biology Thesaurus**

Dispense = Excrete, Transfer

Desired function: Fluid distribution/transfer

*Sourced from The Biomimicry Institute's AskNature.org

**Nagel, J. K. S., R. B. Stone, and D. A. McAdams. 2010. "An Engineering-to-Biology Thesaurus for Engineering Design." In: 2010 ASME IDETC/CIE, Montreal, Quebec, Canada.

Biological Model Identification

Spitting Cobra

Bladderwort

Squid

Horned Lizard

Xylem

Skunk

Rove Beetle

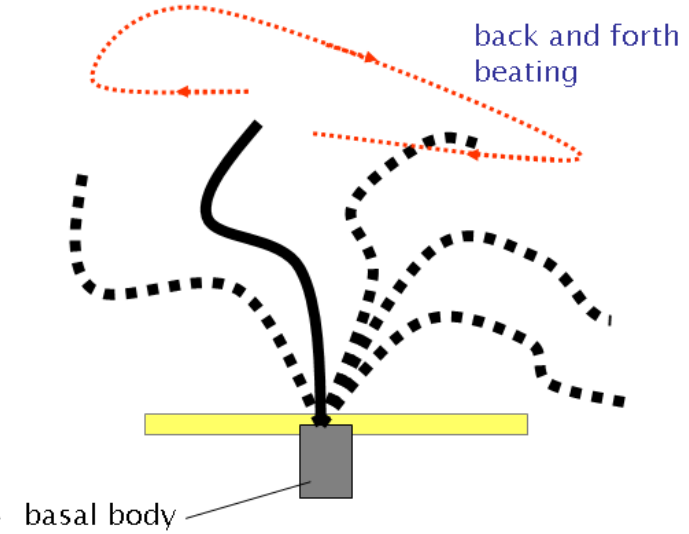
Extraction of Design Principles

- Biological Model: Archerfish

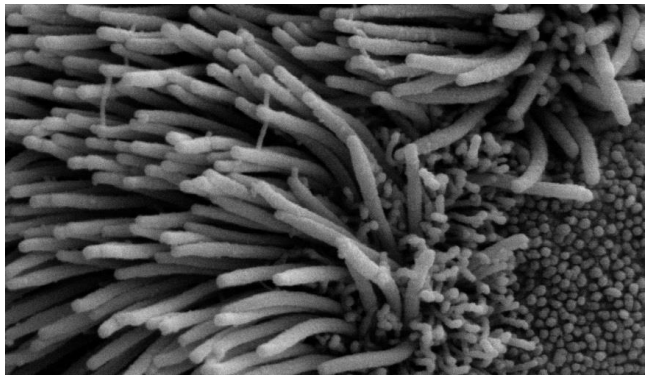
- Design Principle: An elongated liquid that is in motion tends to amass and accelerate due to surface tension

Extraction of Design Principles

- **Biological Model: Cilia**
- **Design Principle: A flexible appendage with optimized row stroke can produce a net propulsive force**

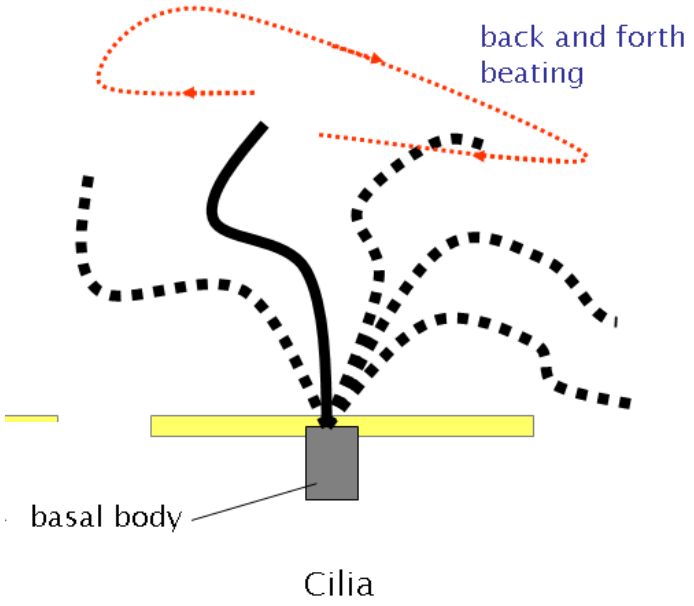


Cilia

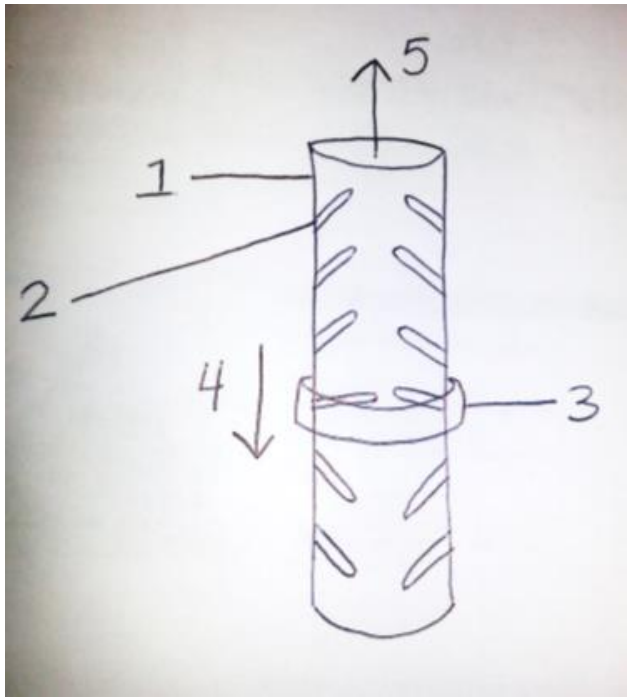


Concept Generation

BIO MODEL → DESIGN PRINCIPLE → CONCEPT



A flexible appendage with optimized row stroke can produce a net propulsive force



Concept Generation

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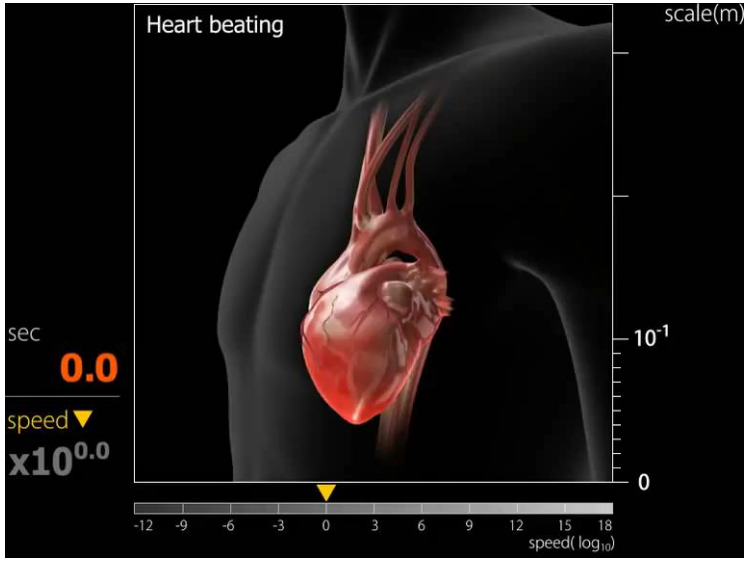
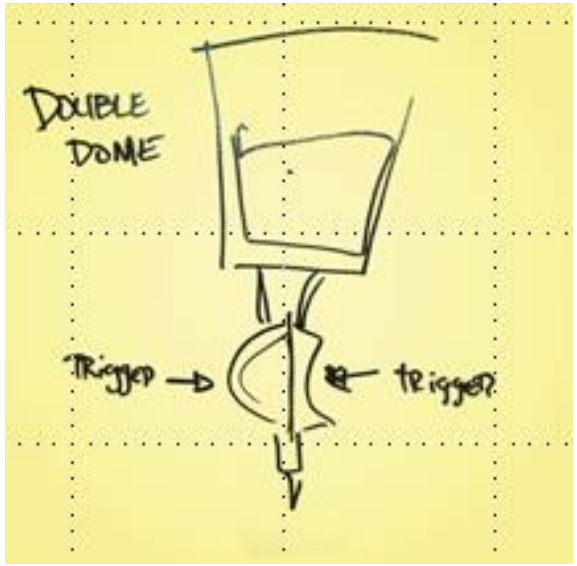
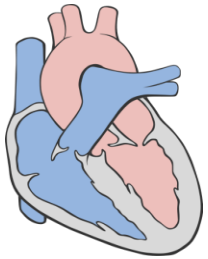
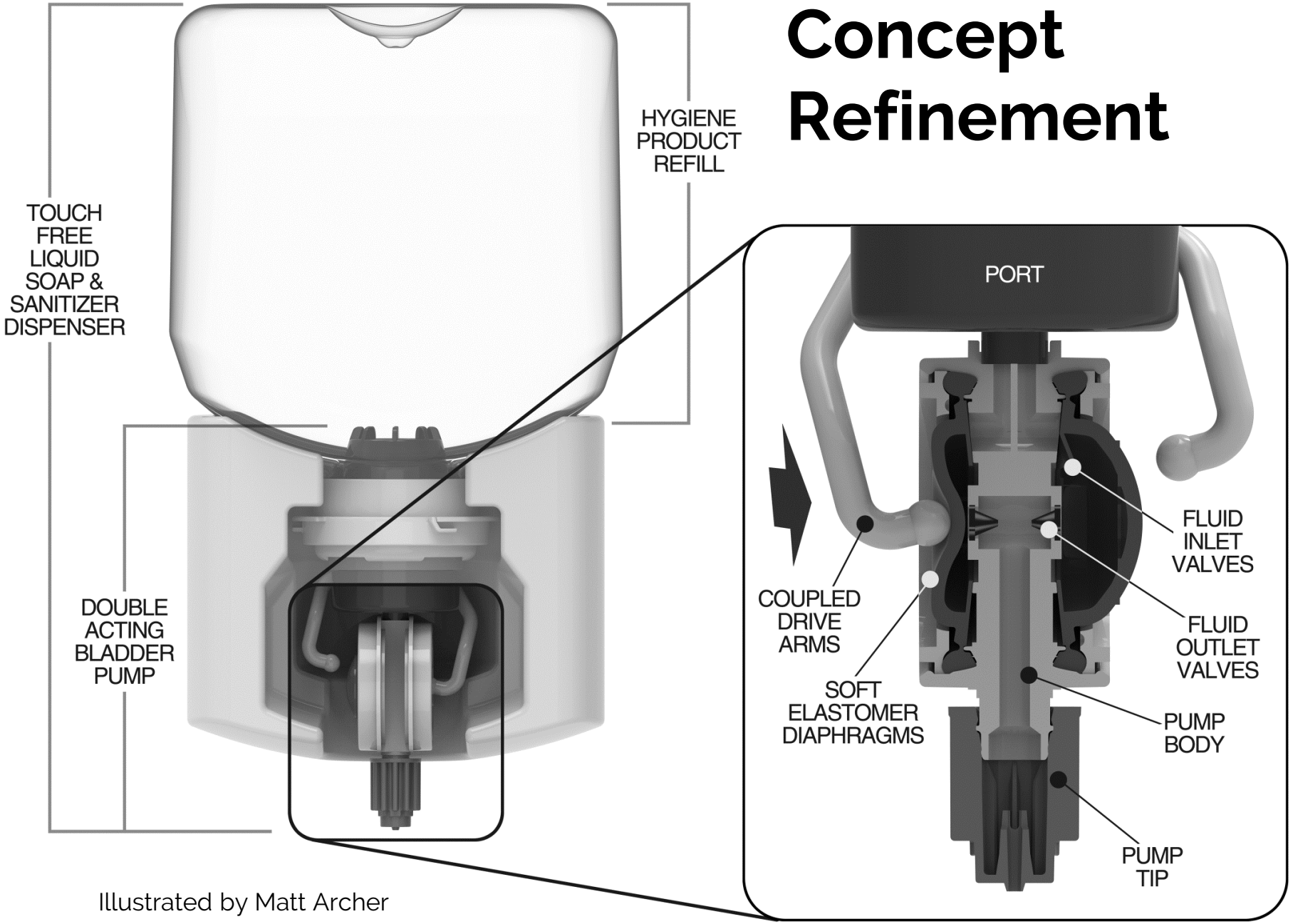


A multi-chambered pump with common walls is an efficient embodiment

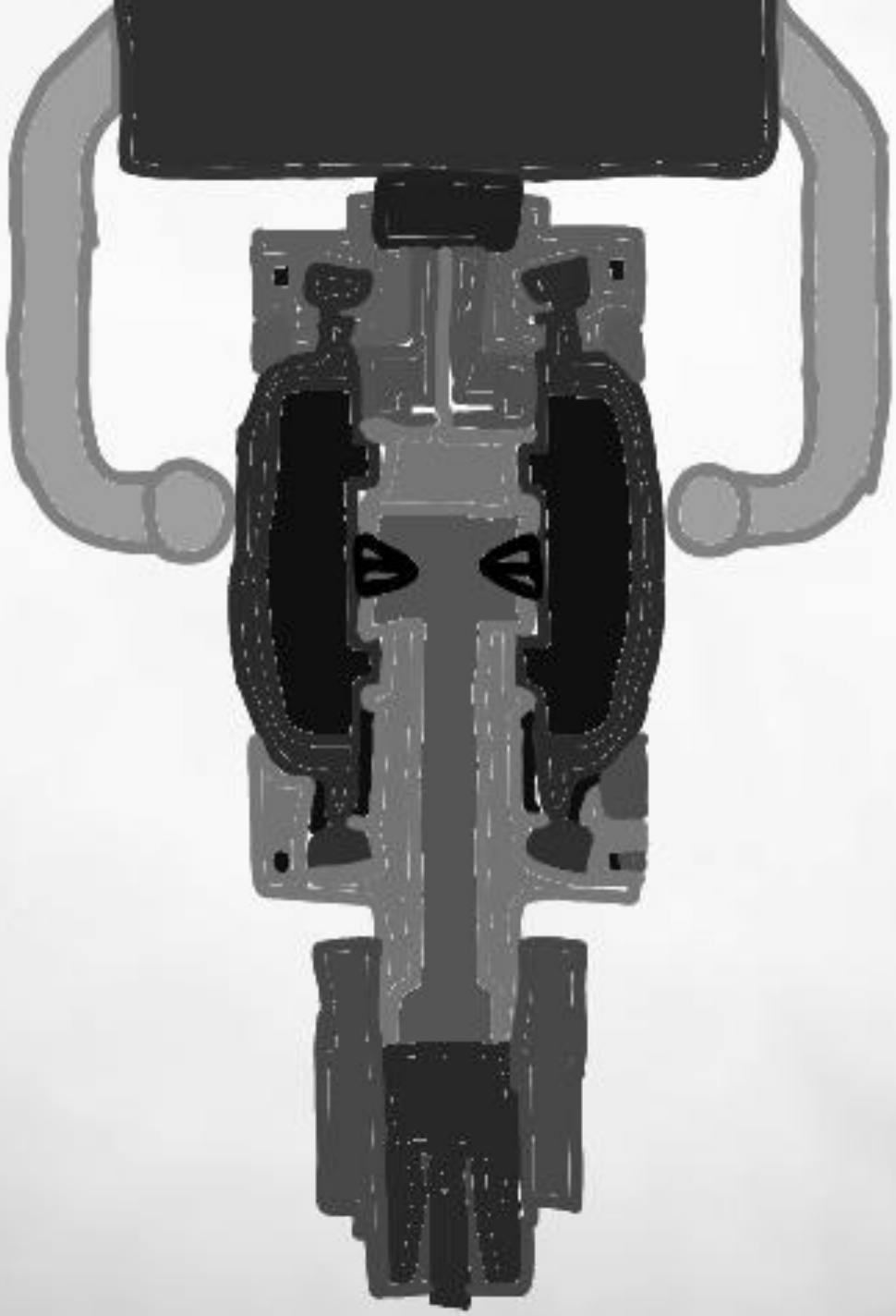


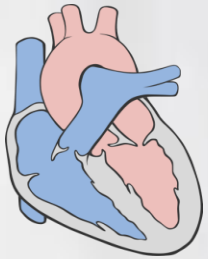
Concept Refinement





Illustrated by Matt Archer

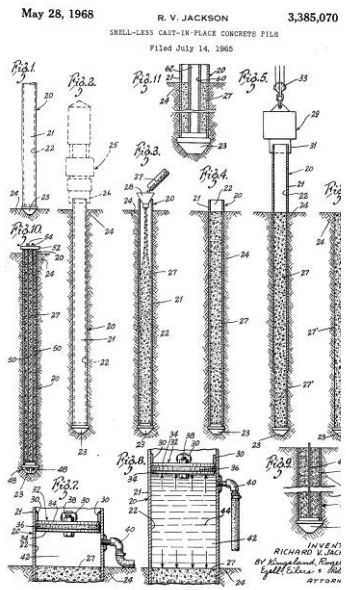


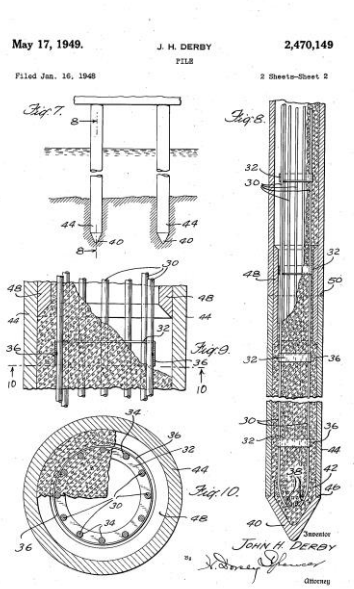


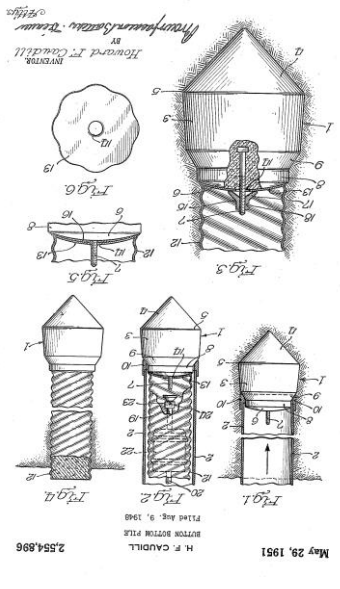
Animated by
Albert Marting

FlipaClip

Biomimicry vs. Patent Landscaping







1/6 the resources

Personnel and financial

2x intellectual property

Higher NOI to patent application conversion rate

2-4x energy savings

More environmentally sustainable

The stimuli were completely different and allowed for completely unique ideas rather than building upon prior art.

[Biomimicry] pushed us to look beyond the initial project scope and not just look at the pump technology but look at the overall system—the packaging, the actuation—in order to optimize the whole product.

This is fun!

Follow-on Research

Impact of industrial vs. biological analogies on creativity

Spring-loaded Phone Mount

Window Cleaning Clamp

Vine

Opposable Thumb

Follow-on Research

Compared to Industrial Analogies, Biological Analogies…

…Increased NOVELTY (i.e. originality) of ideas

Novel solutions offer fundamentally new perspective on the problem

…Increased ELEGANCE of ideas

Elegant solutions strike the beholder as well-executed, beautiful, refined, harmonious

Follow-on Research

Follow-on Research

Compared to Industrial Analogies, Biological Analogies…

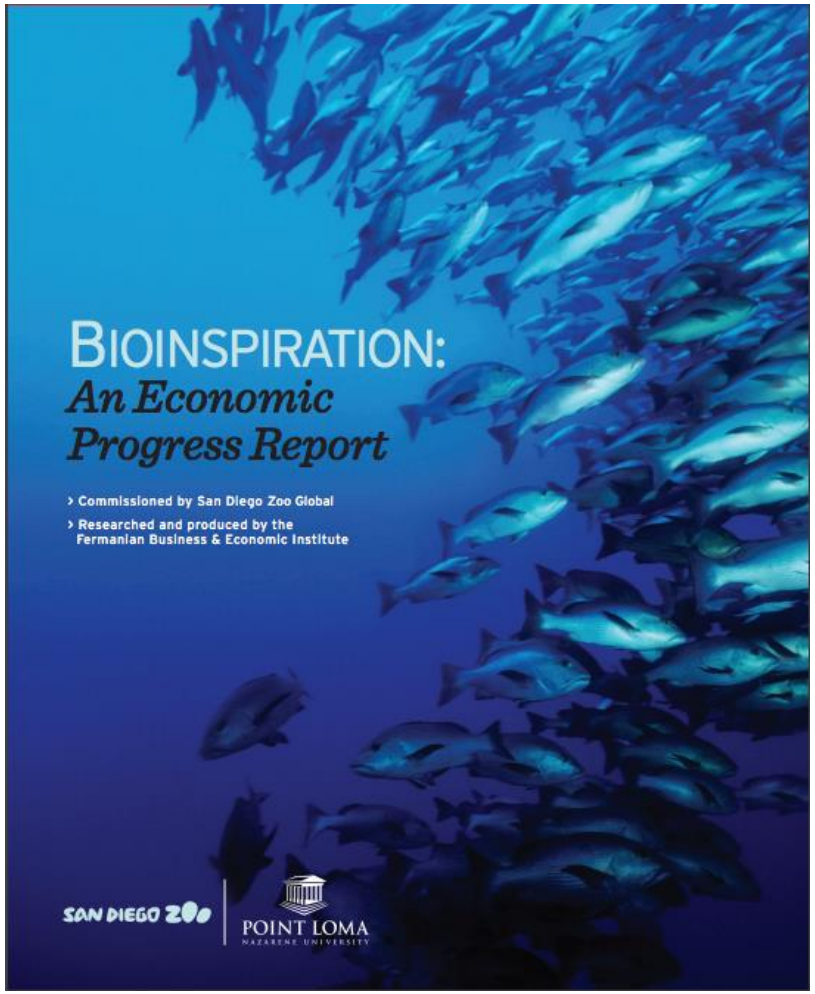
…Increased USE OF POSITIVE EMOTION WORDS

Mood boost →intrinsic motivation → creativity

When we stare this deeply into nature's eyes…we realize that all our inventions have already appeared in nature in a more elegant form and at a lot less cost to the planet.

–Janine Benyus

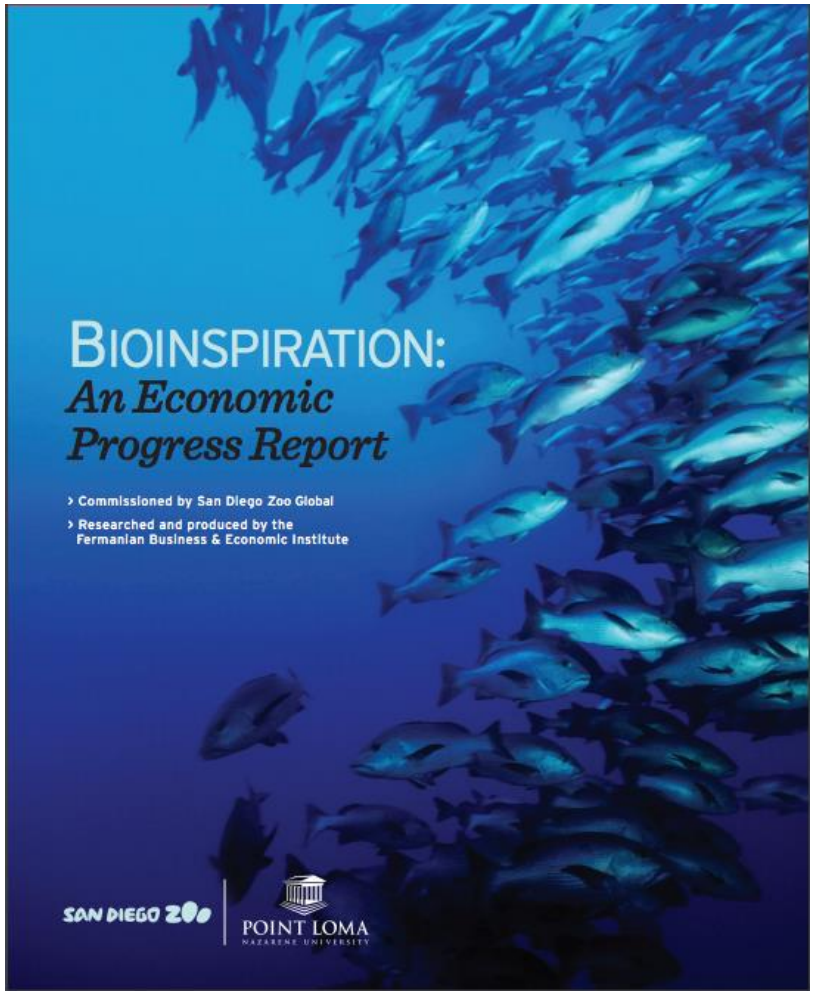
Economic Benefits



In the next decade, biomimicry is expected to:

- **Contribute $425 billion to US GDP, and $1.6 trillion to global GDP**

Environmental Benefits



In the next decade, biomimicry is expected to:

- **Provide $65 billion national savings and $500 billion international savings in terms of reduced resource depletion / CO_2 pollution**

If you're not incorporating the most brilliant ideas from the natural world into what you sell, you're leaving money on the table.

-Verne Harnish, FORTUNE MAGAZINE

Thanks!

Questions?

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Get involved by joining the newly launched IRI Bionspired Design Industry Group