Biomimicry

Innovation for the Future
(Brought to You by the Past)

David Socha  William Rowden
Japanese Shinkansen Train

No more “boom”
15% less electricity
10% faster
Interface Carpets
Ant Pheromones
Ant Pheromones
Stigmergy

A mechanism of indirect coordination between agents or actions.

Traces left in the environment stimulate self-organization.
Stigmergy Examples
## Stigmergy Examples

![Image of a whiteboard with a table and post-it notes](image)

The whiteboard features a table titled "Stigmergy Examples" with columns for "Proposed," "Analysis," "Development," and "Resolved." Each column contains multiple rows with post-it notes containing various comments and details. The notes are color-coded, and the table is designed to illustrate the process of stigmergy in project management or software development.
You Could Do That!
During the Quarantine Period, every child suffering from Whooping Cough must wear one of the Health Department's arm bands.
Stigmergy Examples

No Interruption Wear (NIW)

Sacred Zones
What are examples of stigmergy?

<table>
<thead>
<tr>
<th>in organizations</th>
<th>?</th>
<th>?</th>
</tr>
</thead>
<tbody>
<tr>
<td>in software</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>has been used</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>could be used</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>
How to do Biomimicry?
Biomimicry Design Spirals

Problem to Solve

Challenge to Biology

Biology to Design
Who Studied a Life Science?

• Biology
• Botany
• Zoology
• Molecular Biology
• Cellular Biology
• Physiology
• Ecology
• Microbiology
• Genetics
• Biochemistry

• Health Sciences
• Environmental Science
• Neuroscience
• Computational Neuroscience
• Bioinformatics
• …
LIFE’S PRINCIPLES

Nature’s Operating Conditions
- Earth is in a state of dynamic non-equilibrium
- Earth is water-based
- Earth is subject to limits and boundaries

Cellular and nested
Shape rather than material
Simple, common building blocks
Resourceful and opportunistic
Free energy
Antenna, signal, response
Feedback loops
Learns and imitates
Locally attuned and responsive (runs on information)
Integrates cyclic processes
Cross-pollination and mutation
Diverse
Resilient
Decentralized and distributed
Redundant

Fitting form to function
Using multi-functional design
Optimizing rather than maximizing
Leveraging interdependence
Self-organizing
Using benign manufacturing
Using life-friendly materials
Using self-assembly
Using water-based chemistry
Recycling all materials

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What are **Software** & **Organizational** Analogues to each Life Principle?

**Software**

**Organizational**
BIOMIMICRY

Innovation Inspired by Nature

JANINE M. BENYUS

Being cool just got a lot easier.