

# BIOMIMICRY: LEARNING FROM NATURE

June 2013, Biomimicry 3.8 Institute  
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# WHAT IS NATURE?



Photo Credit: Gord McKenna CC-BY-NC



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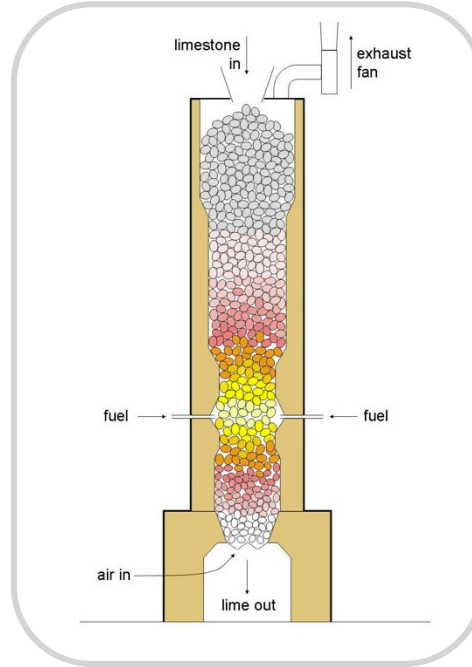
Photo Credit: Wikimedia user Patriotmissile, CC-BY-SA



Photo Credit: Calypso Orchid, CC-BY-NC-ND

BIOMIMICRY 3.8

# HUMAN DESIGN



- Mining – 39 billion tons/yr
- Heat treating – over 1,400 °C (releases 6% of GHG)
- Packaging
- Shipping

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## NATURE'S DESIGN



Stony coral

- Built to shape
- Created on site
- Uses CO<sub>2</sub> as a building block
- Waste-free
- 450 million year old process

Photo Credit: NOAA, public domain



Photo Credit: Wikimedia user Jstuby, public domain

*Instead of mining ancient sea beds, couldn't we learn to make this material the way corals do?*

Fossilized coral

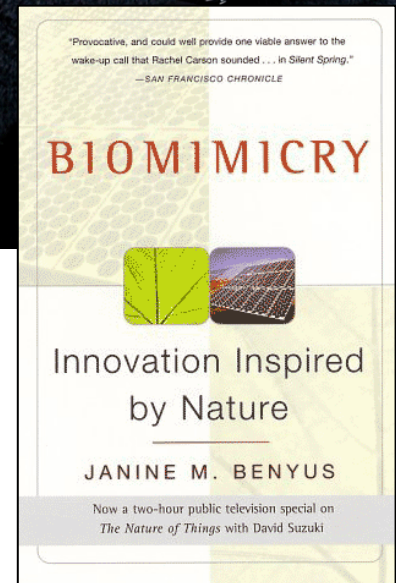


# BIOMIMICRY



“The *conscious emulation of life’s genius* is a survival strategy for the human race, a path to a sustainable future. The more our world functions like the natural world, the more likely we are to endure on this home that is ours, but not ours alone.” – J.B.

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## WELL-ADAPTED DESIGN



“Nature, imaginative by necessity, has already solved many of the problems we are grappling with. Animals, plants, and microbes are the consummate engineers. They have found what works, what is appropriate, and most important, what *lasts* here on Earth.” – J.B.

Photo Credit: NASA, public domain

# A BIT OF PERSPECTIVE

If the history of the earth were compressed into a calendar year...

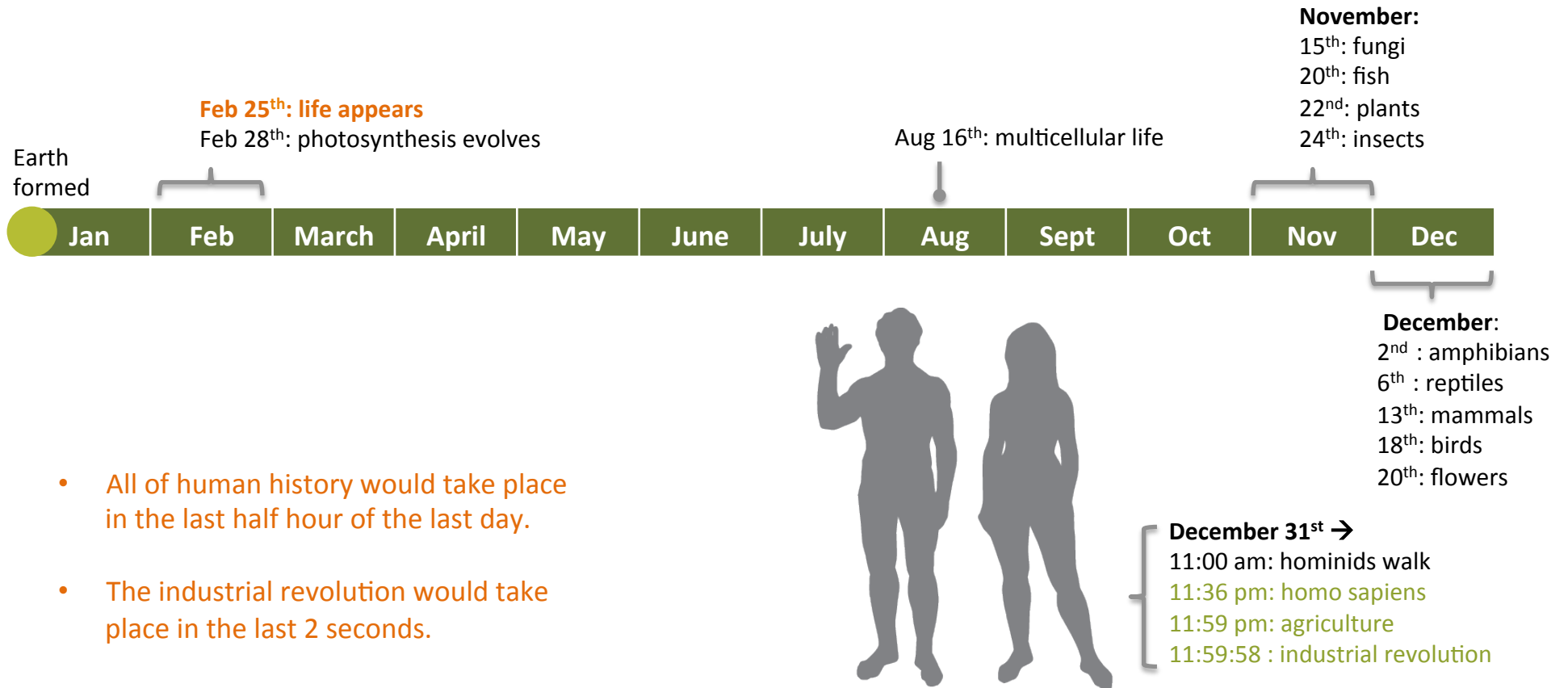


Image of human figures: NASA public domain

# MAL-ADAPTED DESIGN

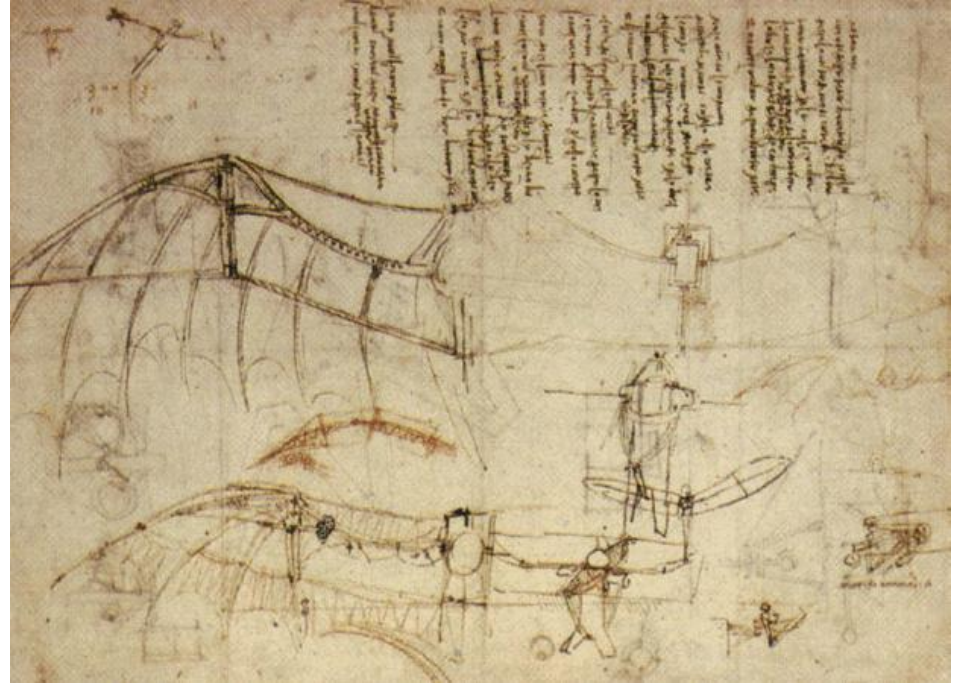


## Heat, beat, and treat

- High temperatures
- High pressures
- Toxic chemical processes

Photo Credit: TJ Blackwell, CC-BY

## A RECURRING THEME

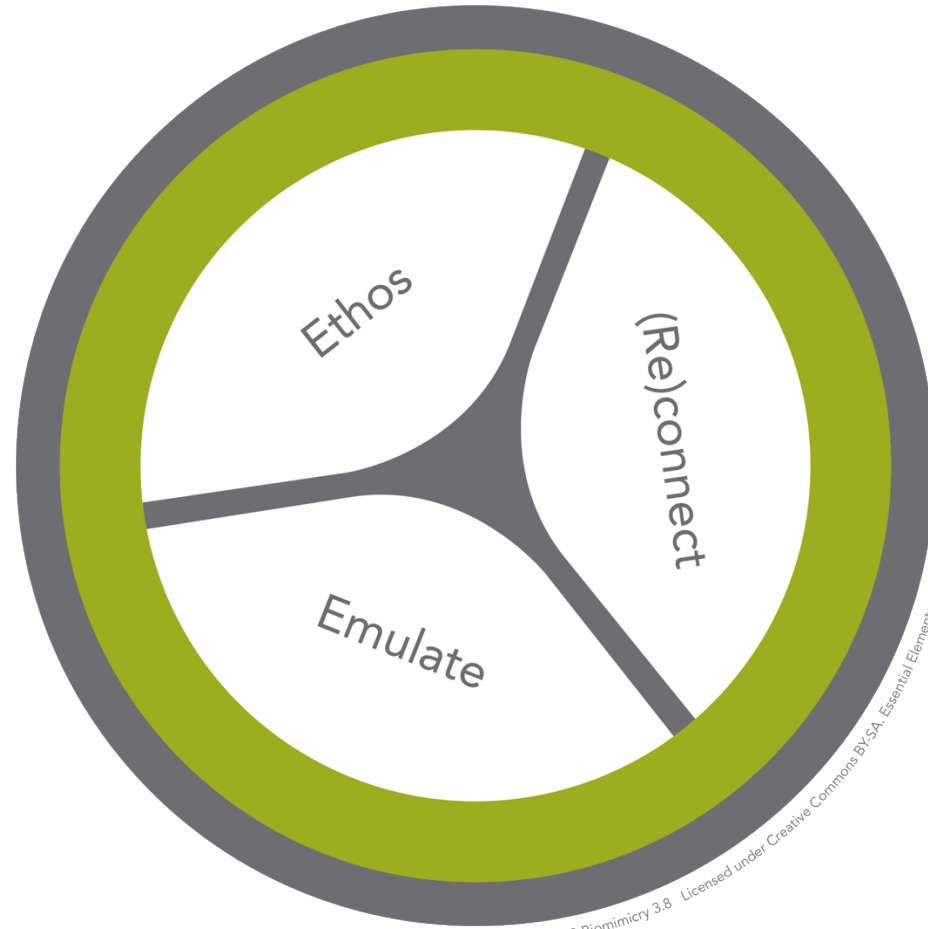


“Human ingenuity may make various inventions...but it will never devise any inventions more beautiful, nor more simple, nor more to the purpose than Nature does; because in her inventions nothing is wanting and nothing is superfluous.”

– Leonardo da Vinci

Photo Credit: Leonardo da Vinci, public domain

# ESSENTIAL ELEMENTS



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# ESSENTIAL ELEMENTS

**Ethos**

Photo Credit: Mark S. Elliot, CC-BY-NC

# ESSENTIAL ELEMENTS



(Re)Connect

Photo Credit: Denali National Park, CC-BY



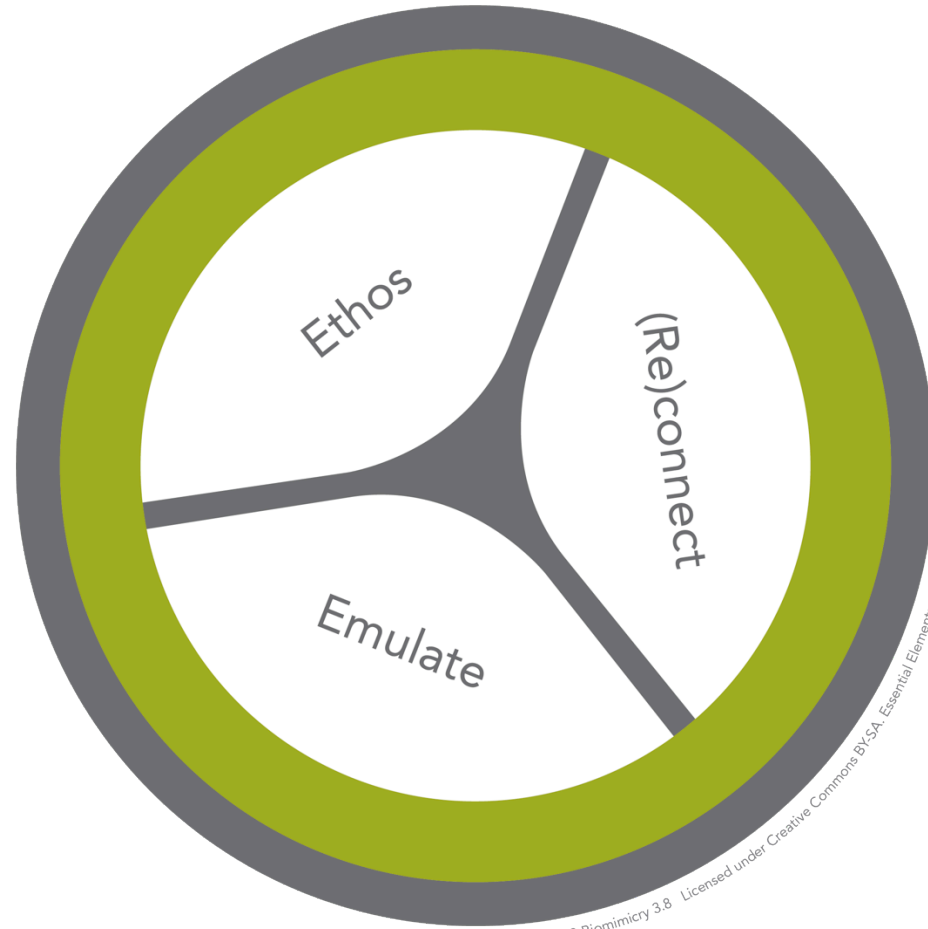
# ESSENTIAL ELEMENTS



Emulate

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# ESSENTIAL ELEMENTS



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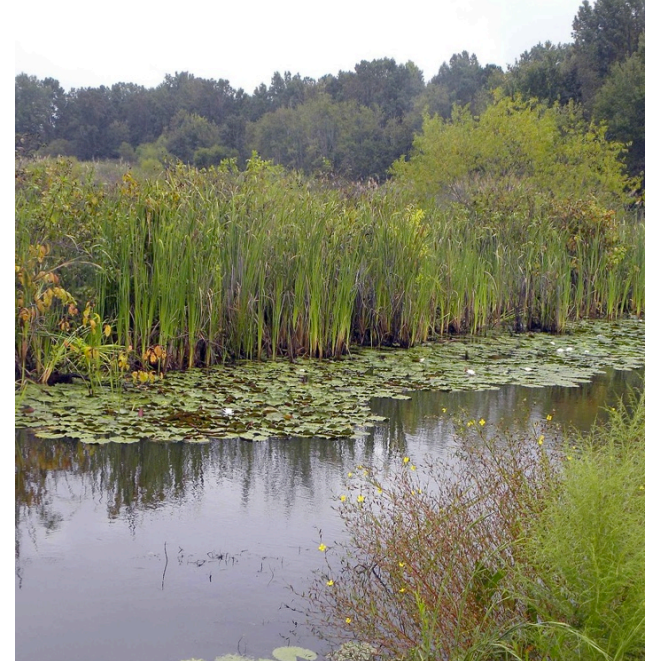
# A MATTER OF SCALE



*Form - shape, surface, texture*



*Process - a series of operations*



*Ecosystem – a network operating together in an ongoing cycle*

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## CASE STUDY - FORM

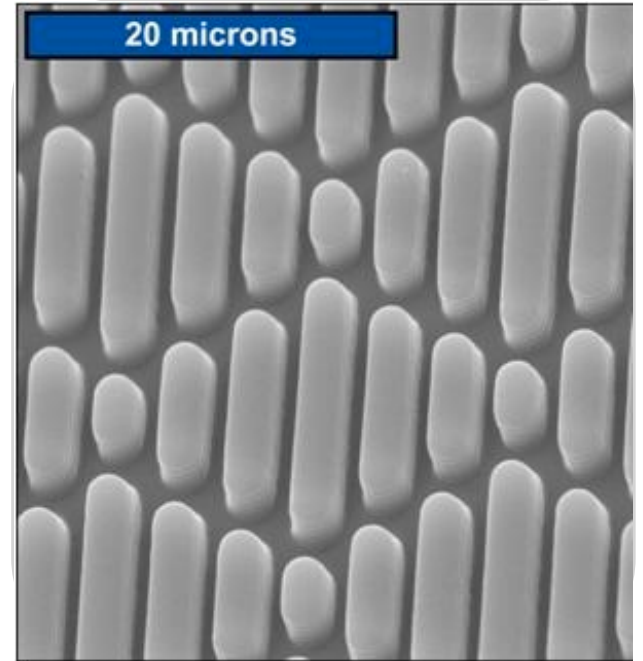


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## CASE STUDY - PROCESS



Photo Credits L-R: NOAA, public domain; Calera logo; Mark Dumont, CC-BY



# BIOMIMICRY IN EDUCATION



- Project-based and experiential learning
- Teamwork
- NGSS Crosscutting concepts



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# BIOMIMICRY IN EDUCATION



Research has demonstrated:

“four days of immersion in nature, and the corresponding disconnection from multi-media and technology, increases performance on a creative problem-solving task by a full 50%.”

--Atchley RA, Strayer DL, Atchley P (2012) Creativity in the Wild: Improving Creative Reasoning through Immersion in Natural Settings. PLoS ONE

Photo Credit: North Cascades National Park, CC-BY-NC-SA



# BIOMIMICRY IN EDUCATION



Photo Credit: 350.org, CC-BY-NC-SA

# SEEING DIFFERENTLY

## LEARNING ABOUT:

- Scientific name:  
*Pinus ponderosa*
- Found in low - mid elevations throughout the U.S.
- USDA Hardiness Zones 3-7
- Important U.S. timber species
- Needles 5-10” long, in clusters of 3



Ponderosa Pine

Photo Credit: J Stephen Conn, CC-BY-NC

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Ponderosa Pine

## LEARNING FROM:

- Leaves create solar energy without toxins
- Xylem transports water hundreds of feet without fuel.
- Canopy re-humidifies air
- Uses CO<sub>2</sub> as a building material
- Expertly light-weighted materials

Photo Credit: J Stephen Conn, CC-BY-NC



# THANK YOU

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with your students.

Visit [ben.biomimicry.net](https://ben.biomimicry.net) to access  
additional teaching resources.

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