Women’s History Month Presentation by
International Studies Capstone Students
(Destiny Parker, Angie Juodagalvis, Hunter Cole, Sarah Claros on March 9, 2020)

“Mother Nature’s a Woman too”
Her Personality, Practices, and Solutions to Human Problems

INST 490 Students
with Dr. Tay Keong Tan
Why Does Nature Exist?
The Character of Mother Nature

1. Adaptive and Evolving
2. Self-Organizing and Self-Sufficient
3. Cooperative and Symbiotic
4. Frugal and Conserving: Recycles and Curbs Excesses
5. Supports Diversity and Innovation: Fits Form to Function
What is Biomimicry?
What is Biomimicry?

• “The design and production of materials, structures, and systems that are modeled on biological entities and processes.”

• Ancient Greek: Bio for life, mimicry for imitation. Humanity look to Nature for answers to problems and copy from Her.

• Living organisms have well-adapted structures and materials over eons of evolution and natural selection. Self-healing abilities, environmental exposure tolerance and resistance, hydrophobicity, self-assembly, and harnessing solar energy.
Four Case Studies on Biomimicry

Destiny Goodwyn

Hunter Cole

Sarah Claros

Angie Juodagalvis
Sunflower-Inspired Solar Plants

Destiny Goodwyn
International Studies Capstone:
INST 490 on Sustainable Development
Spring 2021
01 Defining Biomimicry
What is Biomimicry?
What is a Sunflower?

02 Environmental Challenges
Climate Change
Economic Implications

03 Solution: Helianthus Annuus System
Characteristics of the Sunflower
Technological adoption/diffusion v. Technological Leadership
Kondratiev Waves

04 Real-World Application
Zurich Model: Switzerland
PS10 Model: Spain
Sunflower Model: UNC

05 Sustainable Development
UN Sustainable Development Goals
Collective Action Problem
Defining Biomimicry

"Nothing is invented, for it’s written in nature first."
- Antoni Gaudi
Defining Biomimicry

What is a Sunflower?
02
Environmental Challenges

1. Climate Change
2. Economic Implications
Environmental Challenges

Climate Change

Economic Implications
03
Solution: Helianthus Annum System

1. Characteristics of the Sunflower
2. Technological adoption/diffusion v. Technological Leadership
3. Kondrietive Waves & AI Revolution
Characteristics of the Sunflower

Fibonacci Sequencing
Technological Adoption & Diffusion v Technological Leadership
Kondratiev Waves

![Diagram showing Kondratiev Waves with major technology and economic phases from 1800 to 1990. The phases include: P: prosperity, R: recession, D: depression, E: improvement. Major technological innovations are associated with each wave: steam engine-cotton, railway-steel, electrical engineering-chemistry, petrochemicals-automobiles, information technology.]
04 Real-World Application

1. Zurich Model
2. PS10 Model
3. University of Northern Colorado Solar Flower
IBM Zurich Model in Switzerland

(Airlight Energy and IBM Solar Electricity)
(Solar Power Station in Spain Works at Night)
UNC Solar Flower

*(University of Northern Colorado University Solar Flower)*
Sustainable Development

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

1. UN Sustainable Development Goals
2. Collective Action Problem & Solution
Collective Action Problem vs. UN Sustainable Development Goals

**Collective Action Problem**: A dilemma where all individuals effected would be benefitted from cooperation, however, choose otherwise because of conflicting interests.

– Mancur Olson
References


Manford, G. (RestorethePlanet) Understanding the Fibonacci Spiral. https://www.youtube.com/watch?v=8A3JnWzgXGk
Women’s History Month Presentation by International Studies Capstone Students Tuesday, March 9, 2020: 9.30 – 10.45 am

The Honeybees’ Hexagonal Honeycomb Structure

Angie Juodagalvis
INST 490 International Studies Capstone: Senior Seminar on Sustainable Development, Spring 2021
Wasteful Architecture
Beehives’ Honeycomb Structure

Why Hexagon? Bees Know Best.
Wasted Spatial Gap
Fully Utilized Space

(a)

(b)
THE HONEYBEE AND THE HEXAGON
Real-Life Architecture Application

MAD Sinosteel Skyscraper
Structural Strength and Efficient Use of Space

FUNCTION

CAPTURE & FILTER

STORE

DISTRIBUTE

AquaWeb
- Specific Goals: 11, 12, 13, 15, 17
References


THE MEDICAL APPLICATIONS OF SPIDER SILK

By: Hunter Cole
The Biology of the Spider

- Lone wolves
- Different species evolved to solve different problems
- Webs are homes and traps
- Two different kinds of silk
What is so special about Spider Silk?

- It's Tough
- It doesn't inflame human internals
- It's biodegradable
How can it be applied to the Medical Field?

- Can be used for artificial skin and stitches
- Can be used to coat antibiotics and deliver them in a safe way
- Can be used to help treat broken bones
- Much much more!
How does this improve Sustainable Development?

- What is Sustainable Development?

- Feeds into UN Sustainable Development Goals (SDG) 3, 9, 6, 14, 8
What challenges will the application of Spider Silk entail?

- The chemicals used to make it are hard to replicate
- We don't understand the spinning process
- The spiders aren't being cooperative
What does this have to do with women?

-Female spiders are the main source of spider silk right now
Sources


Women’s History Month Presentation by International Studies Capstone Students

The Lotus Leaf Effect

Sarah Claros, INST 490
International Studies Capstone, Spring 2021
Agenda

1. Issues to be solved
2. The lotus effect
3. Current applications
4. Potential future applications
5. Implications for global sustainability
Chemical pollutants found in cleaning agents damage the environment

80% of the Tidal Chesapeake Bay is partially or fully impaired by toxic contaminants.
The Problem of High-Touch Surfaces during a Pandemic
“No Mud, No Lotus”: The Hindu Scriptures, The Bhagavad Gita, considers it a metaphor for detachment
The lotus leaf can cleanse itself of dirt, bacteria, and fungi.
The lotus effect causes water to bead on the surface while collecting debris.
Current applications of the lotus effect
Potential implications for global sustainability

- Reduce chemical pollutants
- Reduce medical waste
- Waterproofing nanotechnologies
Collective Action Problem Associated With Further Development
References


*Chesapeake Bay Program*, www.chesapeakebay.net/state/pollution.


THANKS FOR LISTENING
Conclusion

1. Nature offers humanity all it needs to survive and thrive, but She has limits.
2. Her designs and practices are always sustainable, created from eons of evolution and natural selection.
3. Humans defy the rules and boundaries of Nature at our own peril.
Women’s History Month Presentation by Leadership Capstone Students
Thursday, March 18, 12.30 – 1.45 pm
(See Women’s Studies Program Website for Zoom Link to the Event)

“Wonder Woman Won’t Wait!”
Women’s Issues and Challenges in a Male-Dominated World

POSC 410 Students
with Dr. Tay Keong Tan
Nothing is invented, for it's written in nature first.

— Antoni Gaudí

There are no straight lines or sharp corners in nature. Therefore, buildings must have no straight lines or sharp corners.
Women’s History Month Presentation by International Studies Capstone Students
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Sunflower-Inspired Solar Panels
Destiny Parker
International Studies Capstone: INST 490 Seminar on Sustainable Development, Spring 2021
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“Mother Nature’s a Woman too”

Industrial Applications of Spider Silk

Hunter Cole, INST 490 International Studies Capstone: Senior Seminar on Sustainable Development, Spring 2021
The Honeybees’ Hexagonal Honeycomb Structure

Angie Juodagalvis
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The Lotus Leaf Effect

Sarah Claros, INST 490
International Studies Capstone, Spring 2021
La Sagrada Familia
Works of Antonio Gaudi
Esthetics, Functionality, and Sustainability

http://bostongreenfest.org/biomimicry.html
THANKS FOR LISTENING