SOAK

SUMMER ACADEMY

Biomimicry

2023

nachhaltige-hochschulen.at/SOAK2023

BURGENLAND

Lake Neusiedl Region, Austria

REVIEW

REGINA ROWLAND & ELISABETH KOPF

A transdisciplinary collaboration, initiated by the **COOP Sustainable Universities**, organized and hosted by the COOP Member **University of Applied Sciences Burgenland,** co-organized by COOP Members **University of Applied Sciences FH Campus Wien,** and **FHV – Vorarlberg University of Applied Sciences,** in partnership with and co-organized by **University of Applied Arts Vienna.**

COOP SUSTAINABLE UNIVERSITIES

FH Burgenland

FH CAMPUS WIEN

FHV Vorarlberg University of Applied Sciences

dɪ:'ʌngewʌndtə Universität für angewandte Kunst Wien University of Applied Arts Vienna

SOAK Biomimicry

SUMMER ACADEMY

9–15 July 2023

R E V I E W

Biomimicry Immersion Week Region Lake Neusiedl, Austria

Biomimicry enthusiasts from Austria, China, Germany, Italy, Poland, Slovakia, Switzerland and USA came together to apply Nature's strategies to human problems. This is the story of their learning journey.

Discovery

On 24 December 1968, during the Apollo 8 Mission, astronaut Bill Anders photographed the earth rising on the moon's horizon. *Earthrise* featured the first color photo of Earth taken from outer space. This picture of the *Blue Marble* became one of the most important images in history and is credited with triggering global environmental awareness and the beginning of the environmental movement. *Earthrise* marks the moment when people began to realize that planet Earth is a precious and breathtakingly beautiful spot in the universe, in fact, their only home, in the midst of the vast emptiness surrounding it, worth treasuring and cherishing.

Epiphany

Out of this admiration grew a sense of responsibility to protect Nature and all living beings on Earth. People began to recognize how inextricably linked they are to everything and everybody. From that perspective it was not a far stretch to come to understand that the survival of the human race depends on proper participation in the web of life.

Transformation

For **SOAK Biomimicry 2023,** Nature herself was the teacher and provided a living learning lab that captured people's minds and hearts.

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VISION

About SOAK

SOAK (SOmmer AKademie) is an initiative of the COOP Sustainable Universities—a cooperative of 14 Austrian Universities of Applied Sciences that collaborate with other Austrian and international universities toward sustainable futures. The COOP runs this summer academy every year in different regions.

COOP
SUSTAINABLE UNIVERSITIES

From 2023 to 2025 the focus of SOAK Biomimicry is placed on climate change, one of the greatest challenges for humanity and life-threatening to all species. All living beings, including people and communities, must develop and implement ways to respond to the changing conditions that are present already and will accelerate in the foreseeable future.

In these three years, the SOAK Biomimicry Trilogy is explored through the Biomimicry Innovation Process in order to propose potential solutions to human problems connected to climate change. Biomimicry is a philosophy and praxis for sustainable innovation inspired by Nature. SOAK participants learn about the strategies Nature has developed to survive and thrive on this planet and apply them to human systems.

SOAK Biomimicry 2023

SOAK Biomimicry 2023 was led by the University of Applied Sciences Burgenland and supported by the Universities of Applied Sciences FH Campus Wien and FHV – Vorarlberg. In this effort they also partnered with the University of Applied Arts Vienna.

FH Burgenland
UNIVERSITY OF APPLIED SCIENCES

FH CAMPUS WIEN
UNIVERSITY OF APPLIED SCIENCES

FHV
Vorarlberg University of Applied Sciences

dɪ:'ʌngewʌndtə
Universität für angewandte Kunst Wien
University of Applied Arts Vienna

SOAK Biomimicry 2023 tackled problems climate change poses to villages and cities around Lake Neusiedl. Their economies depend on tourism in its many facets, such as adventures on water and land, cultural events, local wine varieties and regional culinary experiences.

The vision of SOAK Biomimicry 2023 was to co-design for and with local communities ways to re-invent who they want to become in order to meet the challenges ahead. It was about co-creating and sustaining environmental, financial and social viability for future generations to survive and thrive in the region in spite of potentially conflicting perspectives and agendas. For this collaboration to be successful, the COOP was bringing into dialogue a number of disciplines, sustainability experts and innovation facilitators with community representatives. SOAK Biomimicry 2023 evolved into an unforgettable week of learning, experiencing Nature and building community with each other.

Focus of the Biomimicry Immersion Week 2023

Theme

How might Tourism Industries respond to Climate Change?

Design Challenge

The livelihood of communities around Lake Neusiedl is threatened by the environmental impact of climate change. How might they respond to this threat and re-orient themselves and their economies toward sustainable futures? How might they adapt, in the short run, to the new situation and evolve, over time, to guarantee life-giving conditions for future generations?

Working Language

English. German was spoken, for instance, when communicating with local stakeholders. The SOAK team supported with translating between languages.

Participants

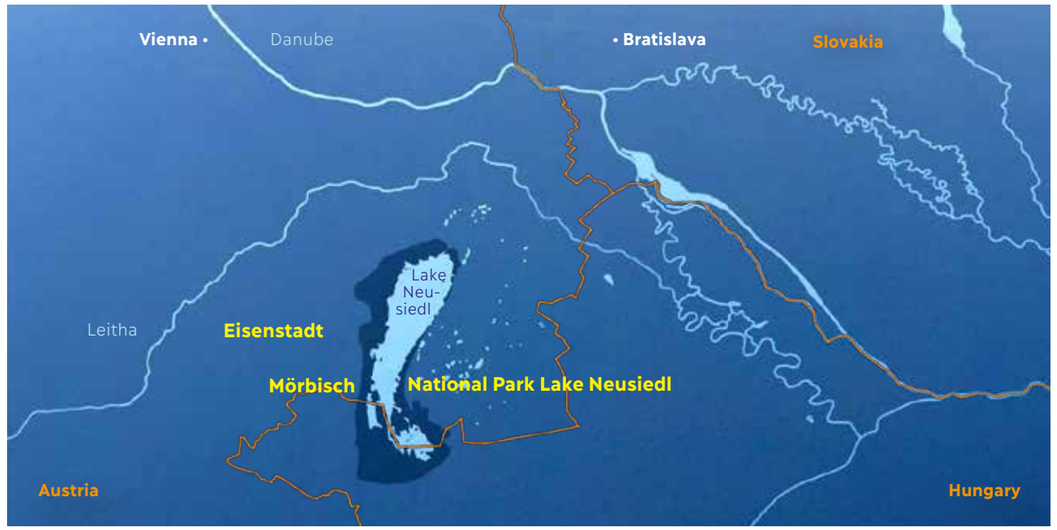
The Biomimicry Innovation Process works best with a diverse group of participants. Hence different levels of education, disciplines, generations, work and life experiences needed to be present. Participants were selected according to this notion. Participants and the crew counted 32 Biomimicry enthusiasts who came from 8 countries and represented 17 different universities / institutions / organizations.

Location

General Region Lake Neusiedl
Burgenland, Austria


Photo: Wikimedia Commons


Photo: Stefan Schindler



FOUNDATION

EVOLUTION ALS ÜBERLEBENSSTRATEGIE
ANPASSUNG AN VERÄNDERUNGEN
Reagiere angemessen auf die dynamischen Rahmenbedingungen.
LOKAL- UND BEDARFS-ORIENTIERUNG
Passe dich an die direkte Umgebung an und gliedere dich ein.
KOPPLUNG VON WACHSTUM UND ENTWICKLUNG
Investiere bestmöglich in Strategien, die sowohl Wachstum als auch Entwicklung fördern.
RESSOURCENEFFIZIENZ (ENERGIE UND MATERIALIEN)
Diversität integrieren
Inkludiere mehrere Formen, Prozesse oder Systeme, um funktionelle Erfordernisse zu erfüllen.
Funktionsfähigkeit durch Selbsterneuerung bewahren
Erhalte, repariere und verbessere das System durch ständiges Hinzufügen von Energie und Materie.
Wiederkehrende Prozesse zunutze machen
Nutze Phänomene, die sich wiederholen.
Unmittelbar zur Verfügung stehende Materialien und Energie verwenden
Arbeite mit Materialien, die reichlich vorhanden sind, und nutze frei verfügbare Energie.
Selbstorganisation fördern
Schaffe Bedingungen, die die Interaktion von Komponenten ermöglichen, um das System anzureichern.
Feedback-Loops nutzen
Beteilige dich an wiederkehrenden Informationsflüssen, um Reaktionen passend zu modifizieren.
Bottom-up-Bauprinzipien nutzen
Baue Komponenten eine nach der anderen zusammen.
Modulare und geschachtelte Komponenten kombinieren
Füge mehrere Einheiten schrittweise von einfach zu komplex ineinander.
Multifunktionales Design einsetzen
Erfülle durch eine einzige elegante Lösung mehrere Anforderungen.
Alle Materialien wiederverwenden
Halte alle Materialien in einem geschlossenen Kreislauf.
Produkte in unschädliche Komponenten zerlegen
Verwende Chemikalien, deren Zersetzung keine schädlichen Stoffe erzeugen.
Alphabet des Lebens — Frag die Natur

Some Facts about the Climate and Biodiversity Crises

The first steps of learning included developing a basic understanding of the planetary boundaries, in particular the dynamics of global warming and the loss of biodiversity.

Pathway to Unsustainability

Contemporary civilization is based on social and economic systems that require ever-increasing productivity of throw-away products and ever-increasing monetary profits, resulting in ever-growing extraction and use of finite resources.

Origin and Consequences

This system emerged from a mechanistic way of thinking that has yielded, over time, a variety of benefits to society, leading to technological advancements and the progress of science. It has also enabled a healthier, safer and more self-determined life for many people in the Western world. Yet this orientation has also created much suffering among billions of people around the world and other living beings, as well as caused significant damage to the environment.

The Era of the Anthropocene

The assumption of infinite growth on a finite planet has caused humans to change the surface of the earth so much that scientists now speak of the era of the “Anthropocene,” an epoch characterized by humanity’s significant impact on earth’s climate and ecosystems. Biodiverse areas are being replaced by huge fields of crop monocultures, pastureland for cattle and sealed with concrete.

Mass Extinction in Progress

Human presence on earth is actively changing the habitat conditions of flora and fauna—causing mass extinction of many species as they cannot adapt fast enough to survive. Extinction rates are estimated to be astronomically higher than before the Anthropocene. As such, the currently dominant way of living and resulting economic systems are not conducive to life, in fact, represent a threat to life as currently known.

Human Impact

Life on earth has been around for almost four billion years. Compared to this long history of life on earth, the species homo sapiens has only been around for a few hundred thousand years and began settling and engaging in agriculture only about 10.000 years ago.

The beginning of the unsustainable lifestyle described is usually placed in the middle of the 18th century, the onset of the Industrial Revolution. However, the devastating results of being driven by the mechanistic worldview began to spread exponentially across the world only after the end of WWII, less than 100 years ago. On a geological timescale one could say that humans—at an infantile age—have already ushered in their own potential extinction and that of many other species, which “life” has been building for four billion years over countless iterations. Let that sink in for a moment!

In defense of humanity, it is well recognized that today's problems emerged from yesterday’s solutions. Even mechanistic worldviews were once very useful. Today’s task for humanity is to evolve, to switch from mechanistic into systemic thinking, so that they can foresee, understand, feel and calculate the consequences of their actions into the far future.

Interdependence

When studying the dynamics of Nature, one might realize that life on earth, including human life, depends on a certain interplay of relationships among all actors in the system. Nature as the space holder for these interdependent networks of relationships could be recognized as a most helpful teacher when it comes to understanding and fostering life-giving conditions and dynamics that facilitate the survival and further evolution of humans as conscious participants in the web of life—because outside of this web, humans cannot exist! ...and this is where the Biomimicry philosophy can foster a deeper understanding of life as an evolutionary process.

Scientific Perspectives

To learn more about the status quo of the climate crises and biodiversity loss on planet Earth, please visit scientific statistics in the Appendices (page 188).

Biomimicry Framework

As an introduction to the Biomimicry Immersion Week, participants reviewed the philosophy of Biomimicry as a framework and the Biomimicry Innovation Process steps.

Biomimicry is the conscious emulation of Nature's genius. It is a transdisciplinary approach that brings together two often disconnected worlds: Nature and technology (or whichever discipline is needed for the defined challenge), biology and innovation, life and design.

The practice of Biomimicry involves bringing time-tested wisdom of life to the design table to inform human solutions that create conditions conducive to life. At its most practical, Biomimicry is a way of seeking sustainable solutions by borrowing life's blueprints, chemical recipes, and ecosystem strategies.

At its most transformative, Biomimicry connects us in ways that fit, align, and integrate the human species into the natural processes of Earth.

Source: Biomimicry DesignLens www.biomimicry.net/the-buzz/resources/biomimicry-designlens

Biomimicry Thinking

Biomimicry Thinking steps provide context to where, how, what, and why Biomimicry fits into the process of any discipline or any scale of design. While akin to a methodology, Biomimicry Thinking is a framework that is intended to help people practice Biomimicry while designing anything. There are four areas in which a Biomimicry lens provides the greatest value to the design process (independent of the discipline in which it is integrated): SCOPING, DISCOVERING, CREATING and EVALUATING. Following the specific steps within each phase helps ensure the successful integration of life's strategies into human innovation.

Two Distinct Approaches to the Biomimicry Innovation Process

Biology To Design

Biology to Design is a specific path through Biomimicry Thinking. This path is most appropriate when the process initiates with an inspirational biological insight (including Life Principles) that should be manifested as a design. Those who might follow this path include inventors and entrepreneurs, students who don't yet have their own design process, those interested in discovering strategies that might inform new innovations, and educators interested in sharing biology in ways that generate interest with non-biologists.

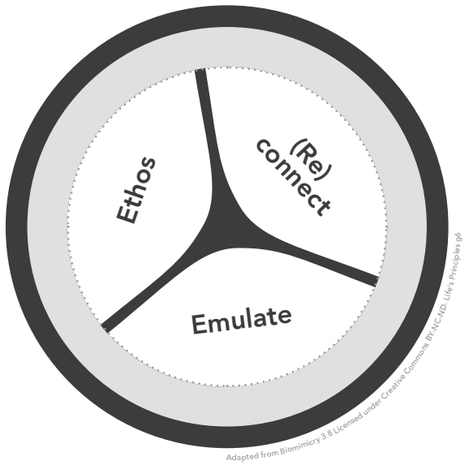
Challenge To Biology

Challenge to Biology is another specific path through Biomimicry Thinking, and was the process used for SOAK Biomimicry 2023. This path is useful for scenarios when a specific problem is at hand for which biological insights are sought for solving it. It is particularly useful for a "controlled" setting, such as a classroom, or for creating an iterative design process. Not surprisingly, the best outcomes occur when practitioners navigate the path multiple times.

Source: Biomimicry DesignLens www.biomimicry.net/the-buzz/resources/biomimicry-designlens

Essential Elements of Biomimicry

The three Essential Elements of Biomimicry represent the foundation of the Biomimicry meme. By combining the essential elements, bio-inspired design becomes Biomimicry.



Adapted from BIOMIMICRY 3.8 | Biomimicry.net

The **(re)connect** element reinforces the understanding that, while seemingly "separate," people and Nature are actually deeply intertwined. (Re)connecting is a practice and a mindset for exploring and deepening this relationship.

The **emulate** element brings the principles, patterns, strategies, and functions found in Nature to inform design. Emulation is about being proactive in achieving the vision of humans fitting in sustainably on earth. To emulate means to mimic the strategies of life and to abstract them into design principles that guide the creative process.

The **ethos** element forms the essence of people's ethics, intentions and underlying philosophy for practicing Biomimicry. Ethos represents people's respect for, responsibility to and gratitude for fellow species and Earth as the home for all living beings. The ethos of Biomimicry is embedded in the Biomimicry Life Principles.

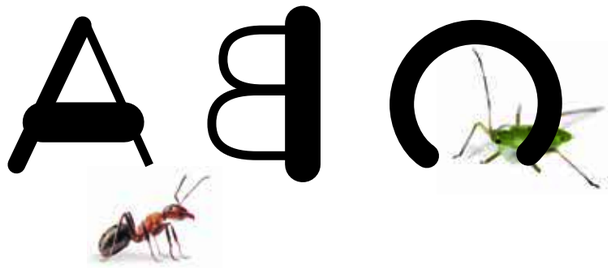
Source: Biomimicry DesignLens www.biomimicry.net/the-buzz/resources/biomimicry-designlens

The 26 Biomimicry Life Principles

The Biomimicry Life Principles are design lessons from Nature. Life on Earth is interconnected and interdependent, and subject to the same set of operating conditions. Life has evolved strategies that have sustained for over 3.8 billion years because they have proven to be evolutionarily successful. The Biomimicry Life Principles represent these overarching patterns found amongst the species surviving and thriving on Earth. Life integrates and optimizes these strategies to create conditions conducive to life.

By learning from these deep design lessons, designers can model innovative strategies, measure their designs against these sustainable benchmarks and allow themselves to be mentored by Nature's genius using the Biomimicry Life Principles as their aspirational ideals.

The 26 Biomimicry Life Principles are organized into 6 categories of which each includes a main principle and several thematically associated sub principles—accumulating into 6 sets of principles, totaling 6 main principles and 20 sub principles.



26 Biomimicry Life Principles—an Alphabet of Life

Each of the 26 principles can be assigned to one of the 26 letters in the Roman alphabet, metaphorically mapping them as an alphabet of life. The 6 sets are color-coded in **"The Alphabet of Life"** which makes them more memorable for Biomimicry students and practitioners.

Life Creates Conditions Conducive to Life

In the Biomimicry Life Principles Wheel, the 26 principles are organized around six major categories: **Evolution**, **Change**, **Response**, **Development & Growth**, **Resources** and **Chemistry**.

A **Evolve to Survive**
All living beings are subject to transformative processes of evolution that determine their potential survival. Transformations that sustain over ten thousand generations are considered evolutionarily relevant.

Sub Principles
B, C, D

E **Adapt to Changing Conditions**
Life is intrinsically interconnected. Changes in the environment require organisms to (co-)develop strategies for strengthening resilience in order to cope and adapt to the dynamics in the systems in which they take part and upon which they depend.

Sub Principles
F, G, H

I **Be Locally Attuned and Responsive**
The mutually beneficial exchange with the immediate environment and fellow living beings as well as appropriate reactions to the prevailing conditions promote the flourishing of life.

Sub Principles
J, K, L, M

N **Integrate Development with Growth**
Growth (in size) and development (in depth) are interlinked and evolve in proportion to the given conditions in the system. This coupling fosters the level of complexity in life.

Sub Principles
O, P, Q

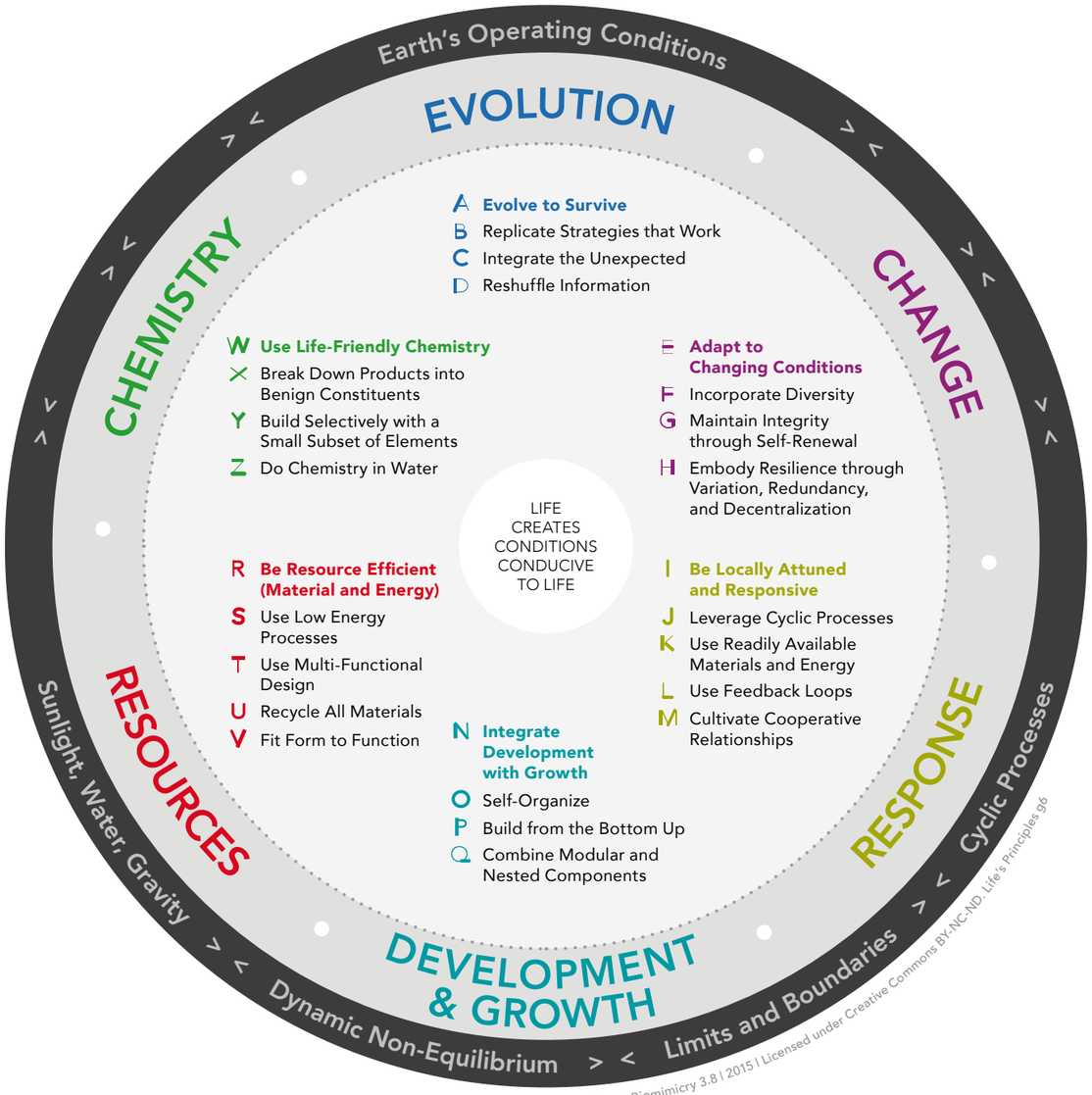
R **Be Resource Efficient (Material and Energy)**
The sustainable use and circulation of resources are essential for life. All designs of Nature apply strategies for efficiency, multifunctionality, reusability and low-energy processes.

Sub Principles
S, T, U, V

W **Use Life-Friendly Chemistry**
All life is built from chemistry. Nature creates an abundance of substances by combining chemical elements so that the composition is conducive to life, and assembly and decomposition of materials is easily accomplished.

Sub Principles
X, Y, Z

Biomimicry Life Principles Wheel



Adapted from Biomimicry 3.8 | 2015 | Licensed under Creative Commons BY-NC-ND. Life's Principles gb

Adapted from BIOMIMICRY 3.8 | Biomimicry.net | AskNature.org | Alphabet-des-Lebens.net

Details of the Biomimicry Life Principles

A

EVOLVE TO SURVIVE
Continually incorporate and embody information to ensure enduring performance.

B

Replicate Strategies that Work
Repeat successful approaches.

C

Integrate the Unexpected
Incorporate mistakes in ways that can lead to new forms and functions.

D

Reshuffle Information
Exchange and alter information to create new options.

E

ADAPT TO CHANGING CONDITIONS
Appropriately respond to dynamic contexts.

F

Incorporate Diversity
Include multiple forms, processes, or systems to meet a functional need.

G

Maintain Integrity through Self-Renewal
Persist by constantly adding energy and matter to heal and improve the system.

H

Embody Resilience through Variation, Redundancy, and Decentralization
Maintain function following disturbance by incorporating a variety of duplicate forms, processes, or systems that are not located exclusively together.

I

BE LOCALLY ATTUNED AND RESPONSIVE
Fit into and integrate with the surrounding environment.

J

Leverage Cyclic Processes
Take advantage of phenomena that repeat themselves.

K

Use Readily Available Materials and Energy
Build with abundant, accessible materials while harnessing freely available energy.

L

Use Feedback Loops
Engage in cyclic information flows to modify a reaction appropriately.

M

Cultivate Cooperative Relationships
Find value through win-win interactions.

N

INTEGRATE DEVELOPMENT WITH GROWTH
Invest optimally in strategies that promote both development and growth.

O

Self-Organize
Create conditions to allow components to interact in concert to move toward an enriched system.

P

Build from the Bottom Up
Assemble components one unit at a time.

Q

Combine Modular and Nested Components
Fit multiple units within each other progressively from simple to complex.

R

BE RESOURCE EFFICIENT (MATERIAL AND ENERGY)
Skillfully and conservatively take advantage of resources and opportunities.

S

Use Low Energy Processes
Minimize energy consumption by reducing requisite temperatures, pressures, and/or time for reactions.

T

Use Multi-Functional Design
Meet multiple needs with one elegant solution.

U

Recycle All Materials
Keep all materials in a closed loop.

V

Fit Form to Function
Select for shape or pattern based on need.

W

USE LIFE-FRIENDLY CHEMISTRY
Use chemistry that supports life processes.

X

Break Down Products into Benign Constituents
Use chemistry in which decomposition results in no harmful by-products.

Y

Build Selectively with a Small Subset of Elements
Assemble relatively few elements in elegant ways.

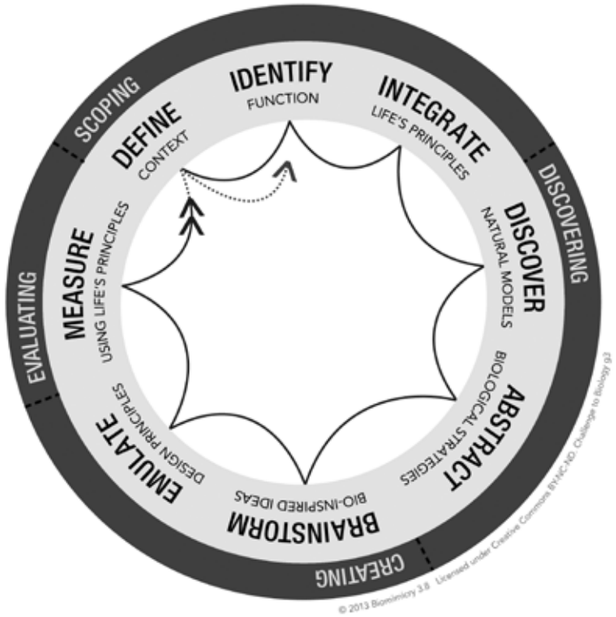
Z

Do Chemistry in Water
Use water as solvent.

Adapted from BIOMIMICRY 3.8 | Biomimicry.net | Licensed under Creative Commons BY-NC-ND. Life's Principles g6

The Four Phases of the Biomimicry Innovation Process

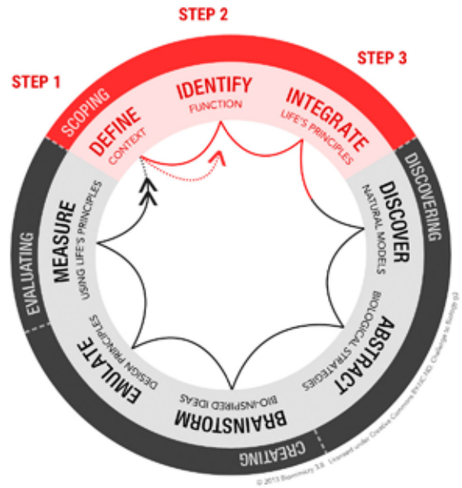
The Biomimicry Innovation Process "Challenge to Biology" evolves over four distinct phases in a particular order. Each includes specific choreographed steps that guide designers toward the desired outcomes.



Adapted from BIOMIMICRY 3.8 | Biomimicry.net

PHASE I

SCOPING



STEP 1

Define Context

During the scoping phase, the given design challenge is contexualized—meaning the design challenge is investigated in the context in which it arises as a problem.

STEP 2

Identify Function

The design challenge is stated in the form of a function—meaning verb(s) that communicate what the desired design should “do” (design criteria).

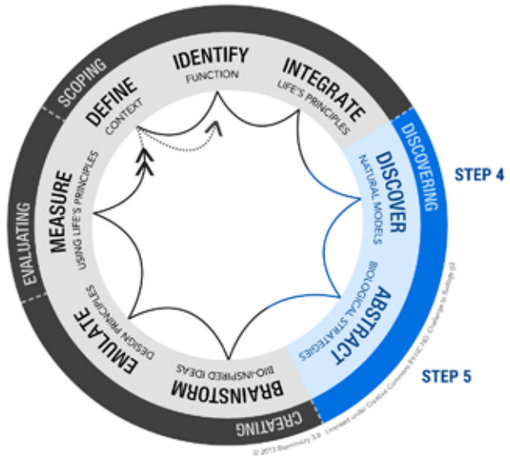
STEP 3

Integrate Biomimicry Life Principles

A vision statement summarizes the desired outcome(s) in a design statement. Those Biomimicry Life Principles most relevant for the design challenge are added to the list of design criteria.

PHASE II

DISCOVERING



STEP 4:

Discover Natural Models

During the discovering phase the desired function(s) are turned into biologized research question(s). This research into biology should yield strategies that organisms use to fulfill the desired functions.

STEP 5:

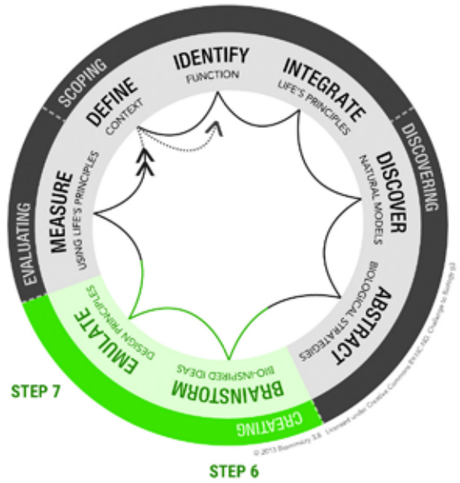
Abstract Design Principles

These strategies are then abstracted into design principles that are included in “function cards” that guide designers through the creating phase. Components of function cards include

- the scientific and common name of the chosen organism, often called “champion” (or, on a system level, the relationship between organisms at play)
- biologized function
- image of the organism
- short description of the strategy applied to fulfill the function
- details about the mechanisms of the strategy
- infographic that demonstrates how the strategy works
- abstracted design principle

PHASE III

CREATING



STEP 6

Brainstorm Bio-inspired Ideas

During the creating phase, a variety of collaborative brainstorming activities lead a group of designers from initial ideas to refined design concepts that address the defined design challenge and offer potential solutions.

STEP 7

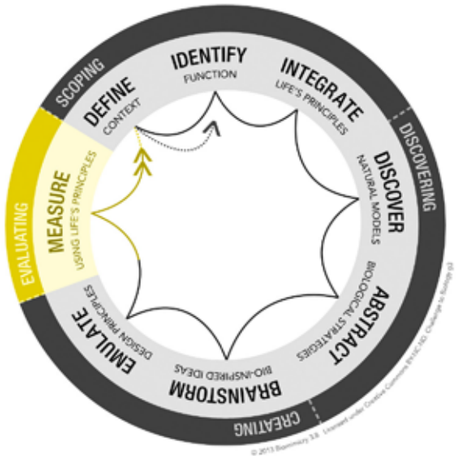
Emulate Design Principles

Eventually, design concepts turn into prototypes that can be brought to market. During the creating phase it is useful to re-visit, often, the design criteria defined during scoping and discovering phases, but in particular, the Biomimicry Life Principles that are supposed to be applied and tracked throughout, so that the design evolves step by step to pass the Biomimicry Sustainability Mandate (26 Biomimicry Life Principles) during the following evaluating phase.

PHASE IV

EVALUATING

STEP 8



STEP 8

Measure Design Specifications and Biomimicry Life Principles

During the evaluating phase, the final prototype is formally assessed, again, and on a much deeper level, against all of the 26 Biomimicry Life Principles and all the earlier defined design criteria. Often, this last phase requires designers to return to earlier steps to adjust and refine research aspects and/or design concepts to meet the Biomimicry Sustainability Mandate. For this task, the Biomimicry Evaluation Matrix is a useful tool.

Evaluation Matrix Template

Evaluation Criteria	YES HOW met?	Partially HOW met?	NO Why not met?	How to improve...	What is needed for this improvement?	What issues remain open/ unresolved?
Design Specifications • ..... • ..... • ..... • ..... • ..... •						
26 Biomimicry Life Principles • ..... • ..... • ..... • ..... • ..... • ..... •						
How would nature do it?						
How would nature not do it?						
How is this design sustainable?						
How is this innovation a "real innovation" and not just an improvement of existing (potentially unsustainable) solutions?						

Biomimicry links and tutorials see Appendices (page 194).

BIOMIMICRY IMMERSION WEEK

WELCOME EVENING

Registration & Movie Night

Location — University of Applied Sciences Burgenland
Eisenstadt

Participants and the SOAK Team arrived on Sunday evening, registered, visited an SDG exhibition at the university, met each other and enjoyed a meal together. They watched the documentary "Guardians of the Earth" to usher them into the problematique of moving toward sustainable futures as a global community.

Putting Theory into Practice

DAY 1

Program — **Introducing the Basics**

Location — SOAK Workshop Barn “Fisch & Vogel”
Mörbisch am See

Connecting with Each Other
Thiagi's Hello Game

Biomimicry Lecture
Philosophy / Design Process / (Re-)Connecting to Nature (Life Principles)
Regina Rowland, Biomimicry Expert

Climate Change Lecture
Globally and in the Lake Neusiedl Region
Daniel Bayer, Biomimicry Scientist

SCOPING / Nature

Program — **Exploring Biomimicry Life Principles in Nature**

Location — SOAK Nature Lab
Martinsplatz'l in the Wine Hills
Mörbisch am See

Excursion — Diving into Biomimicry and Nature
After reviewing some of the dynamics of the climate and biodiversity crises and the Biomimicry Basics, the group embarked on its first field trip into the surrounding environment where the Biomimicry Life Principles came to life in hands-on activities. The day concluded with a communal dinner that brought the group closer together.

DAY 2

Program — **Exploring Design Challenge in Nature**

Location — SOAK Nature Lab
National Park Lake Neusiedl—Seewinkel
Illmitz

Excursion — The second day took participants on a ferry ride across the lake to explore the specific region of the National Park Lake Neusiedl—Seewinkel where they could observe, first hand, and discuss the impact of climate change to the region and to the ecological system.

DAY 3

SCOPING / Culture

Program — **Scoping the Project**

Location — SOAK Workshop Barn “Fisch & Vogel”
Mörbisch am See

Workshop — Regional Stakeholder Meeting in Mörbisch
This day began with an informative stakeholder meeting in Mörbisch where participants learned about the problems the locals face as consequences of climate change. This meeting brought clarity to the core issues and was a pivotal moment during the learning journey.

Refining Project Scope and Refining Function(s)
During the scoping phase, the design challenge is contextualized and further (re-)defined into concrete function(s)—expressed in active verbs—that a potential solution must fulfill. A vision statement for the desired outcome and impact is created, and Biomimicry Life Principles are chosen for their relevance to the specific type of design challenge.

The information gathered from the local stakeholders aided the refining of the project’s scope, and the participant group broke into teams according to their interests in specific scoping functions.

DISCOVERING / Models in Nature

Program **Asking Nature**

Location
SOAK Nature Lab
Observation Deck “Gemeindeschutzgebiet Seewiesen”
Mörbisch am See

Excursion

Biologizing the Research Question

Refining the scope of the project was then followed by biologizing the defined function(s) into a research question that could be researched within the disciplines of biology and ecology. For this step the Biomimicry Taxonomy worksheet is always helpful.

Searching for Models in Nature

Teams returned to the outdoors to look for models in Nature that fulfill the functions they had defined during the process of biologizing their research questions. Additional research online and in the library is often necessary in this step.

DISCOVERING / Abstracting Design Principles

Program **Abstracting Strategies into Design Principles**

Location
SOAK Design Studio
University of Applied Sciences Burgenland
Eisenstadt

Workshop

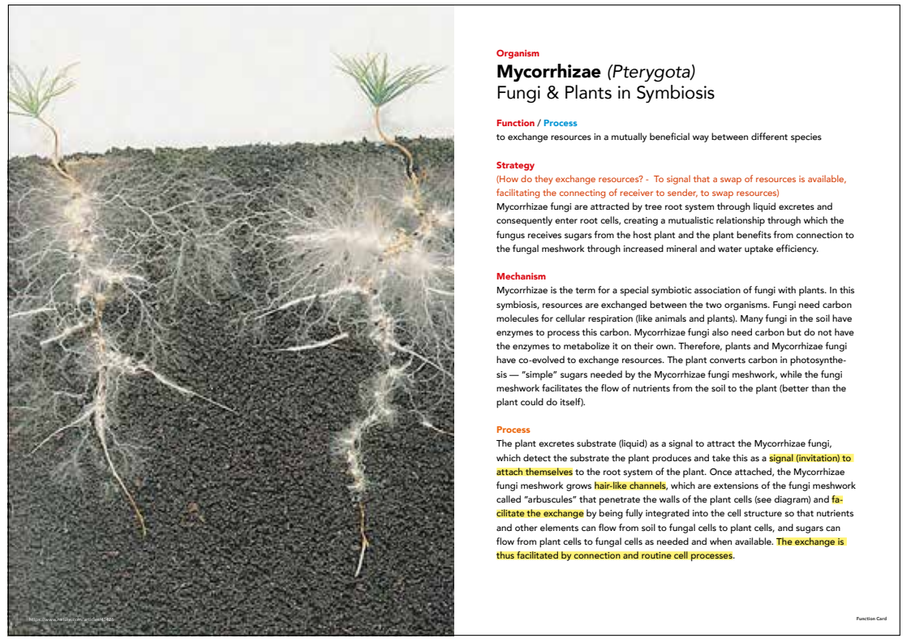
Function Cards

During the discovering phase participants developed what is called “function cards.” This step involves determining particular champions (or ecosystem dynamics) that fulfill the biologized functions and researching the strategies they use to do so. This deep research into the strategies leads directly to abstracted design principles that embed the detailed mechanism of the strategies.

This process of creating useable function cards presents often challenges to participants who are not familiar with the patterns of Nature or the natural sciences literature. The Scientist at the Design Table plays a particularly important role in this step.

For starters, researching on the website www.asknature.org leads directly from function to strategies and provides an array of further research sources that take the user deeper into the mechanism of the strategies they need to understand in order to translate them into design principles that guide the next phase.

Example of a Function Card



Organism
Mycorrhizae *(Pterygota)*
Fungi & Plants in Symbiosis

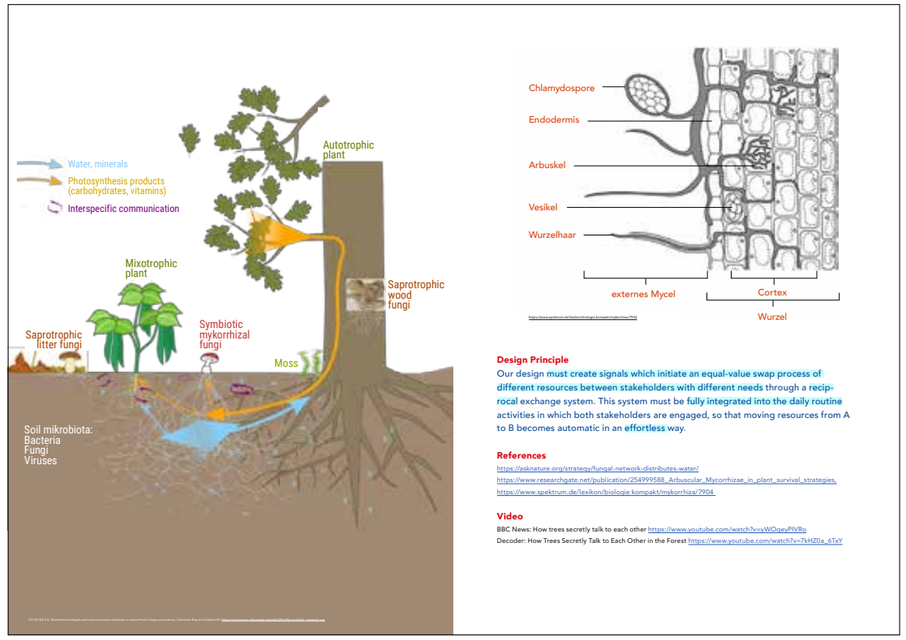
Function / Process
to exchange resources in a mutually beneficial way between different species

Strategy
(How do they exchange resources? - To signal that a swap of resources is available, facilitating the connecting of receiver to sender, to swap resources)
Mycorrhizae fungi are attracted by tree root system through liquid excretes and consequently enter root cells, creating a mutualistic relationship through which the fungus receives sugars from the host plant and the plant benefits from connection to the fungal meshwork through increased mineral and water uptake efficiency.

Mechanism
Mycorrhizae is the term for a special symbiotic association of fungi with plants. In this symbiosis, resources are exchanged between the two organisms. Fungi need carbon molecules for cellular respiration (like animals and plants). Many fungi in the soil have enzymes to process this carbon. Mycorrhizae fungi also need carbon but do not have the enzymes to metabolize it on their own. Therefore, plants and Mycorrhizae fungi have co-evolved to exchange resources. The plant converts carbon in photosynthesis — “simple” sugars needed by the Mycorrhizae fungi meshwork, while the fungi meshwork facilitates the flow of nutrients from the soil to the plant (better than the plant could do itself).

Process
The plant excretes substrate (liquid) as a signal to attract the Mycorrhizae fungi, which detect the substrate the plant produces and take this as a signal (invitation) to attach themselves to the root system of the plant. Once attached, the Mycorrhizae fungi meshwork grows hair-like channels, which are extensions of the fungi meshwork called “arbuscules” that penetrate the walls of the plant cells (see diagram) and facilitate the exchange by being fully integrated into the cell structure so that nutrients and other elements can flow from soil to fungal cells to plant cells, and sugars can flow from plant cells to fungal cells as needed and when available. The exchange is thus facilitated by connection and routine cell processes.

Function Card



Reviewing and Evolving Research Steps

In order to learn from each other and potentially share ideas and research outcomes participants gathered, as a whole, multiple times in front of each team space to discuss findings and next steps in the process.

DAY 5

CREATING / Brainstorming Activities

Program

Creating Nature-Inspired Design Concepts

Brainstorming Activities
After the project had been scoped in its proper detail, researched for particular functions, and strategies had been abstracted so that they could be used during the creating phase, initial design concepts emerged through a variety of brainstorming activities.

Kinesthetic Modeling | Storyboarding | Improv Theater
Brainstorming began with a multi-sensory collaborative 3D model-building activity that is completed in silence in order to engage all senses. Once the model was finished, the meaning of the work was teased to the surface through cross-team discussions and put to paper in storyboards that demonstrate how the model works in real life. Eventually, the emerging story was performed as a short improv theater skit, and ideas began to crystalize into concepts.

Benchmarking against Sustainability Mandates
Throughout the process, proper emulation of Nature's strategies into human designs and the adherence to Biomimicry Life Principles was tracked and designs adjusted accordingly. At the very end, once a concept was chosen for further development, an entire phase is dedicated to benchmarking against the Biomimicry Sustainability Mandate.

Crystallizing Initial Ideas into Concepts
By the end of the day, concrete design concepts had been formed.

DAY 6

CREATING / Refining Design Concepts

Program

Refining & Seeking Stakeholder Feedback

Reviewing, Refining and Combining Design Concepts
The morning of the last day was spent bringing it all together and preparing presentations of the proposed solutions. This part was also a sifting process that brought the essence of the concepts to the forefront. While some details fell away, others would be left to be (re-)thought and or (re-)integrated according to the feedback from the stakeholder groups for whom the solutions were designed.

Stakeholder Feedback
Stakeholder Feedback is important for improving design concepts, ideally sought out multiple times throughout the entire process.

NEXT STEPS

EVALUATING

Program

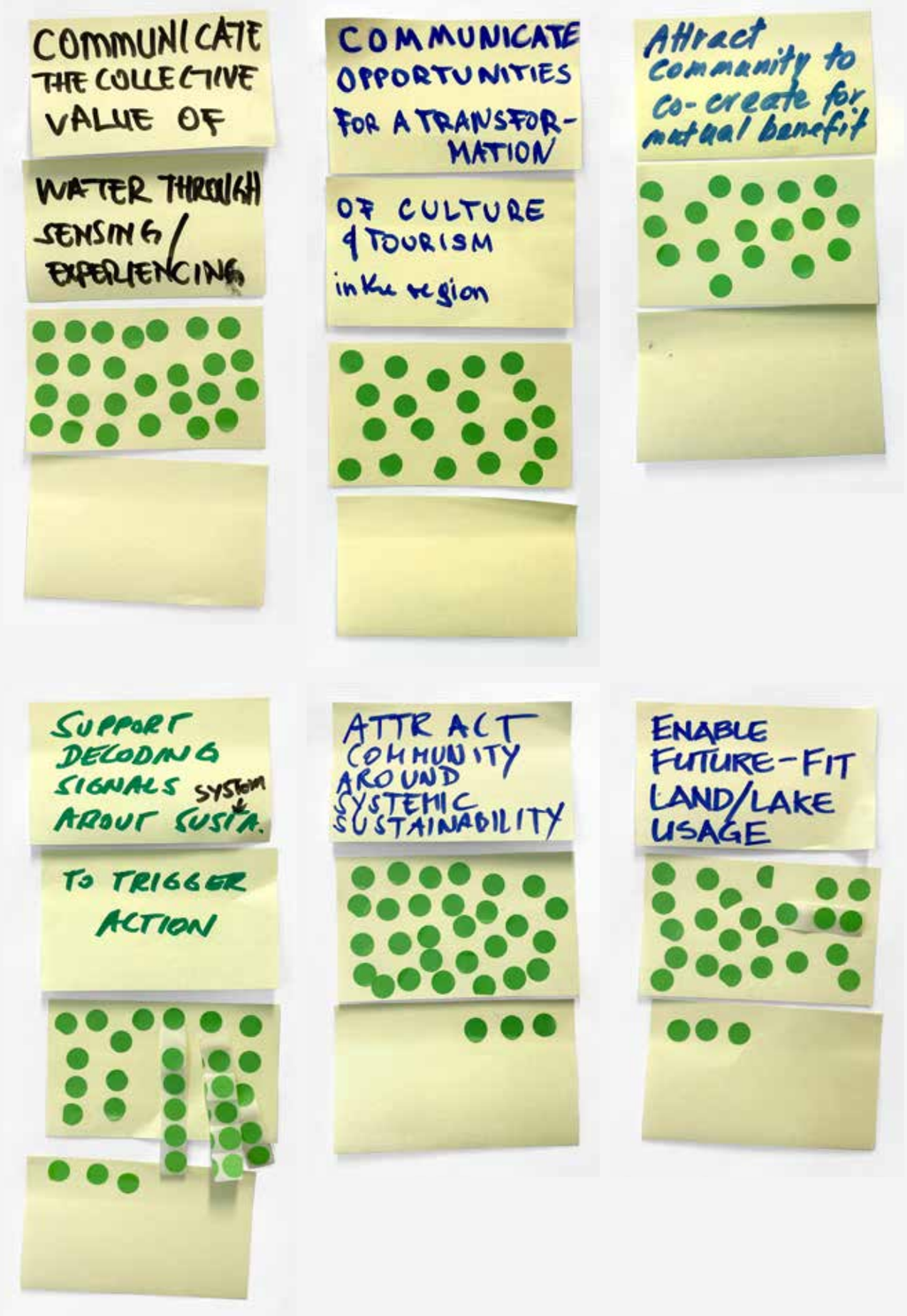
Benchmarking against Biomimicry Sustainability Mandate

Independent (self-study)

Evaluation Matrix
SOAK ended with the stakeholder feedback session. However, there was a formal last step to do that participants were to complete on their own. During the evaluating phase, all design criteria, including feedback received from the stakeholders and including all 26 Biomimicry Life Principles, are to be checked again. Most often, this checking leads to re-addressing some design aspects and refining the design concept further.

From Concept to Innovation: Bringing Innovation to Market
Once the final design is complete and vetted by the client, the group would then develop a roll-out plan and/or business model for bringing the design concept to market.

Theoretically, this is the first moment in the process when a "design concept" might turn into an "innovation."



PROJECT OUTCOMES

During the scoping phase the innovation team first researches the context for which they should design and further (re-)define the function the solution should fulfill in the end. The post-its on the left show the final outcomes of six teams and the common thread they all picked up from an intensive stakeholder engagement process.

6 Ideas—3 Innovation Concepts

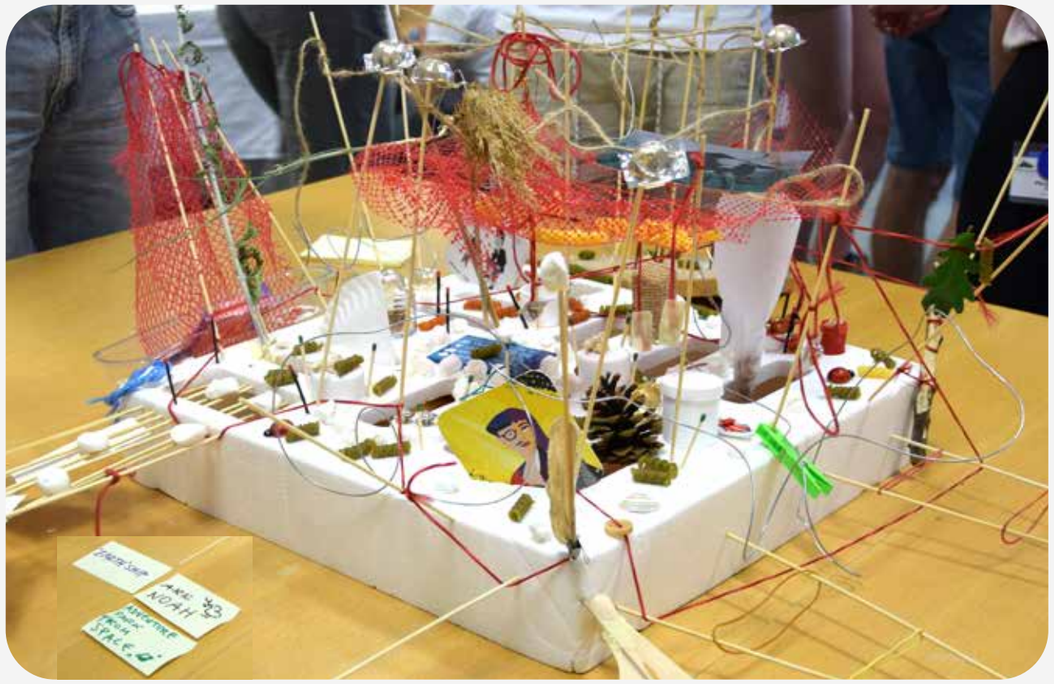
In essence, six teams developed six initial ideas that eventually merged into three refined design concepts. All three final concepts connect, unintentionally, through the core element of “collaboration.” Potentially, the three projects could be integrated into one huge system of opportunities for the region to thrive through sustainable living and sustainability-oriented collaborative economic models and activities—involving regional inhabitants, temporary workers as well as tourists. The key element for all three projects is thus embedded in the Biomimicry Life Principle "Cultivate Cooperative Relationships (M)."

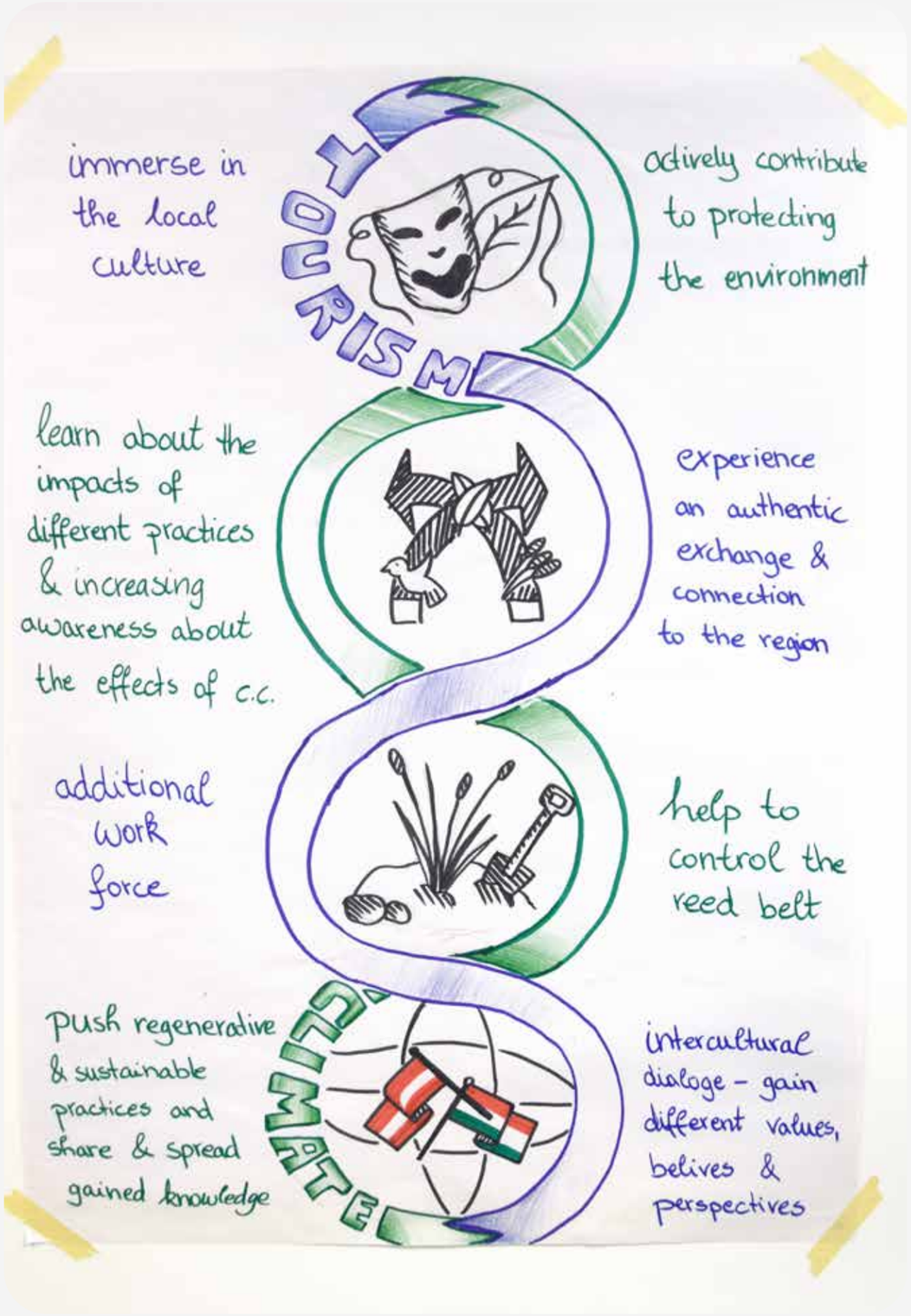
Natural models involved mutualistic relationships between trees & fungi and plants & bacteria that trade various nutrients; flowers that follow the movement of the sun to attract pollination; animal noses that manage counter-current heat exchange to condense the moisture in the air they breathe to get water into their system; and slime mold’s function to send parts of itself into the surrounding environment to find and explore food sources for the benefit of the whole organism.

Project “Common Ground”

The basis of this project is the availability of open land in the region that land owners, in particular vintners who no longer work the land, had converted into fallow land (a common practice that is supported by the government). In this project, the proposal focuses on using these uncultivated properties for collaborative self-organized activities for mutual benefit—a form of a physical platform for co-constructed “happenings” that would be restorative to nature, involve locals (potentially also tourists) of different generations, the arts and all kinds of engagement formats. Happenings might offer repeating or temporary (seasonal) activities, such as growing something on the land together, or multi-sensory installations that facilitate learning, and would be wandering from place to place, engaging young and old all year around and sparking interest in the region. Happenings should also have a learning effect and draw attention to critical issues, such as, for instance, the importance of water and managing its use sustainably. At the core lies a commitment to restoring nature and nurturing culture in the region, based on an orientation of deep collaboration for mutual benefit.


NITROGEN
ISOLATION
Benefits for Tourism
TO ESTAB
COMMUNI
SUFFIG



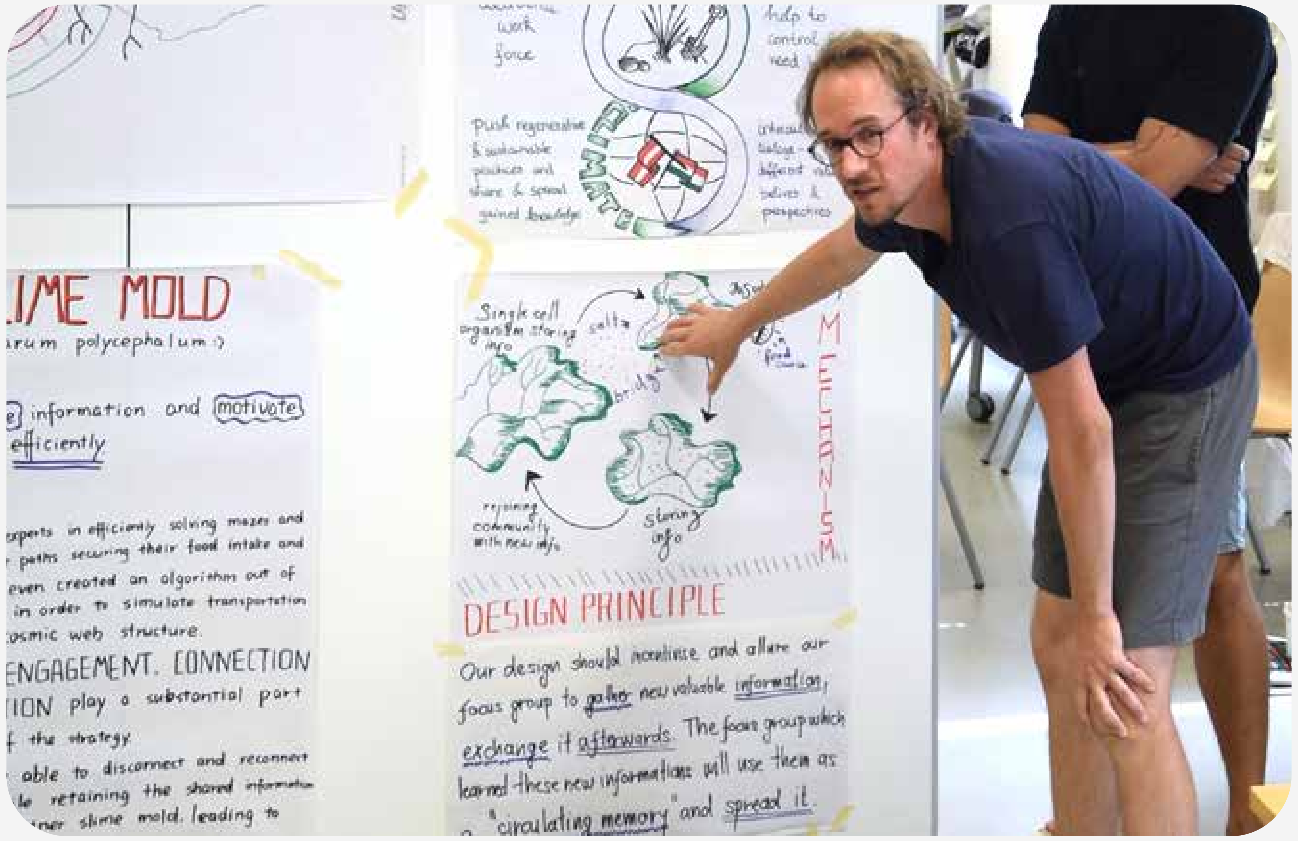


Project “Network Neusiedl”

This project would involve a system of exchanging visiting volunteer workers, similar to another project “Worldwide Opportunities on Organic Farms (WWOOF)”—a movement to link visitors with organic farmers, promoting cultural and educational exchanges, and building a global community conscious of ecological farming and sustainability practices. Network Neusiedl is thus also based on collaboration whereby desired learning is exchanged with a much needed service in the region, and eventually spread around into other areas when volunteers return home to apply their learnings there or in other places.


NORTHERN ELEPHANT SEAL


DESIGN PRINCIPLE
rejoining community with new info
storing info


LIME MOLD
ENGAGEMENT, CONNECTION
Single cell organism storing info
bridge
rejoining community with new info
storing info
MECHANISM
DESIGN PRINCIPLE
Our design should incentivise and allow our focus group to gather new valuable information, exchange it afterwards. The focus group which learned these new informations will use them as a "circulating memory" and spread it.

Project “Points of Opportunities”

This project outlines the concept of a walkway in the reeds all around the lake with various stations for learning about the region and enjoying its history and products. The stations would involve the locals, in particular seniors who would tell about the history in various forms and invite the visitors to want to know more. Stations might show-case culinary products and crafts while others would offer playful learning opportunities about the nature of a steppe lake and sustainability practices. The main point is that locals and tourists alike would enjoy each other’s company, learn together and engage in meaningful conversations and activities. Seniors would find a purpose in sharing their experience and deep knowledge about the region, children and adults alike would learn and play together, experience a health benefit by slowing down in the “reed belt” and finding new perspectives about living sustainably.

To exemplify potential outcomes of a Biomimicry Innovation Process, this project is show-cased on the following pages. This case demonstrates the steps from design challenge to innovation concept. The outcomes are listed step by step and amplified with images of the group’s work in progress.

"POINTS OF OPPORTUNITIES"

PROJECT DEMONSTRATION

SCOPING

Define Context

The livelihood of communities around Lake Neusiedl is threatened by the environmental impact of climate change. How might they respond to this threat and re-orient themselves and their economies toward sustainable futures? How might they adapt, in the short run, to the new situation and evolve, over time, to guarantee life-giving conditions for future generations?

This team's vision provided a roadmap for their design task:
Local habitants and businesses cooperate in harmony with each other and with Nature, leading to a state of well-being for all.

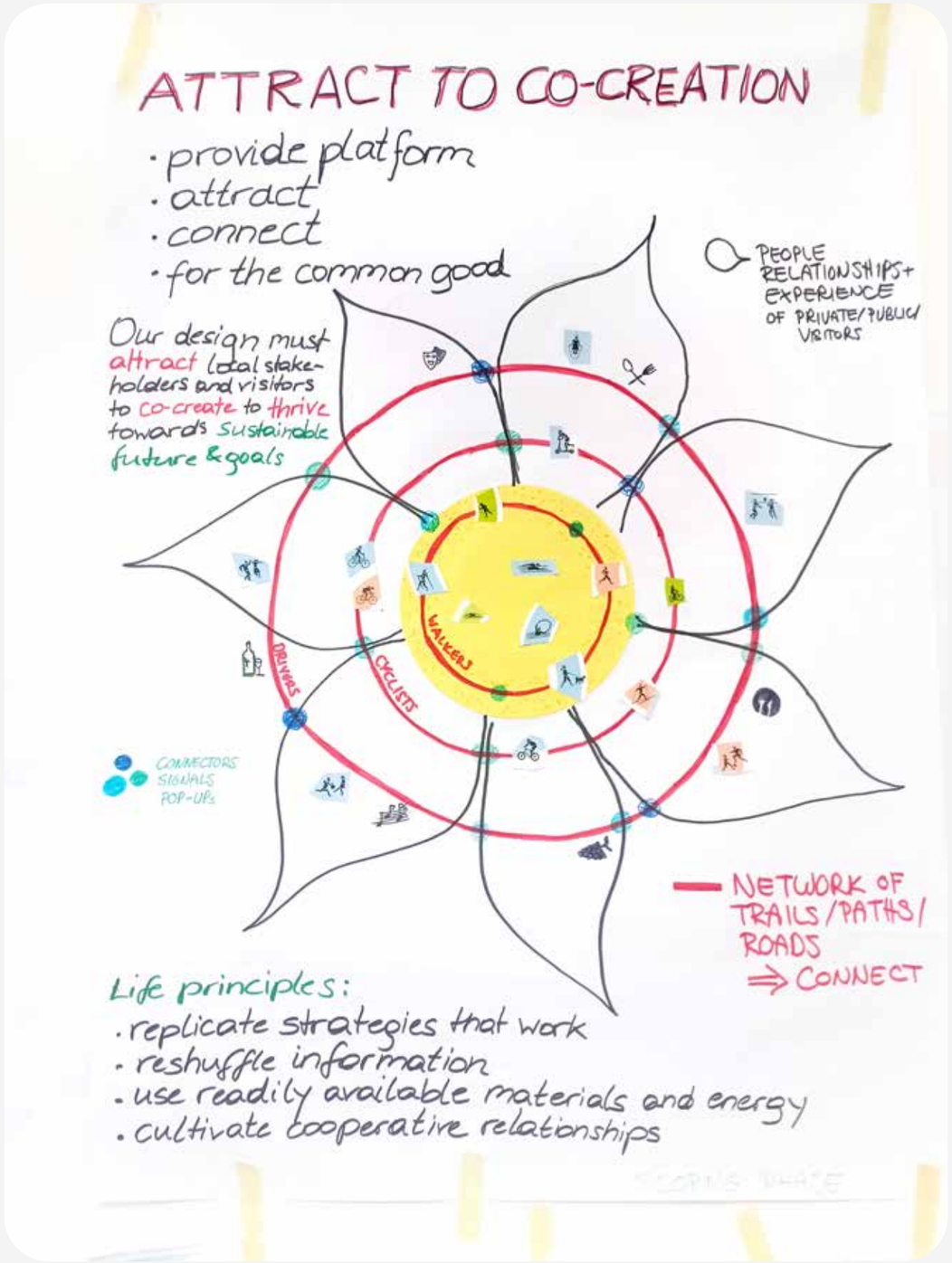
Identify Function

The team refined the design challenge further.
Three potential avenues rose to the forefront:
—to provide a platform
—to attract
—to connect

Integrate Biomimicry Life Principles

They determined the below listed Biomimicry Life Principles to be most important to track throughout the development of potential solutions:
—Replicate Strategies that Work (B)
—Reshuffle Information (D)
—Use Readily Available Materials and Energy (K)
—Cultivate Cooperative Relationships (M)

Scoping Poster



DISCOVERING

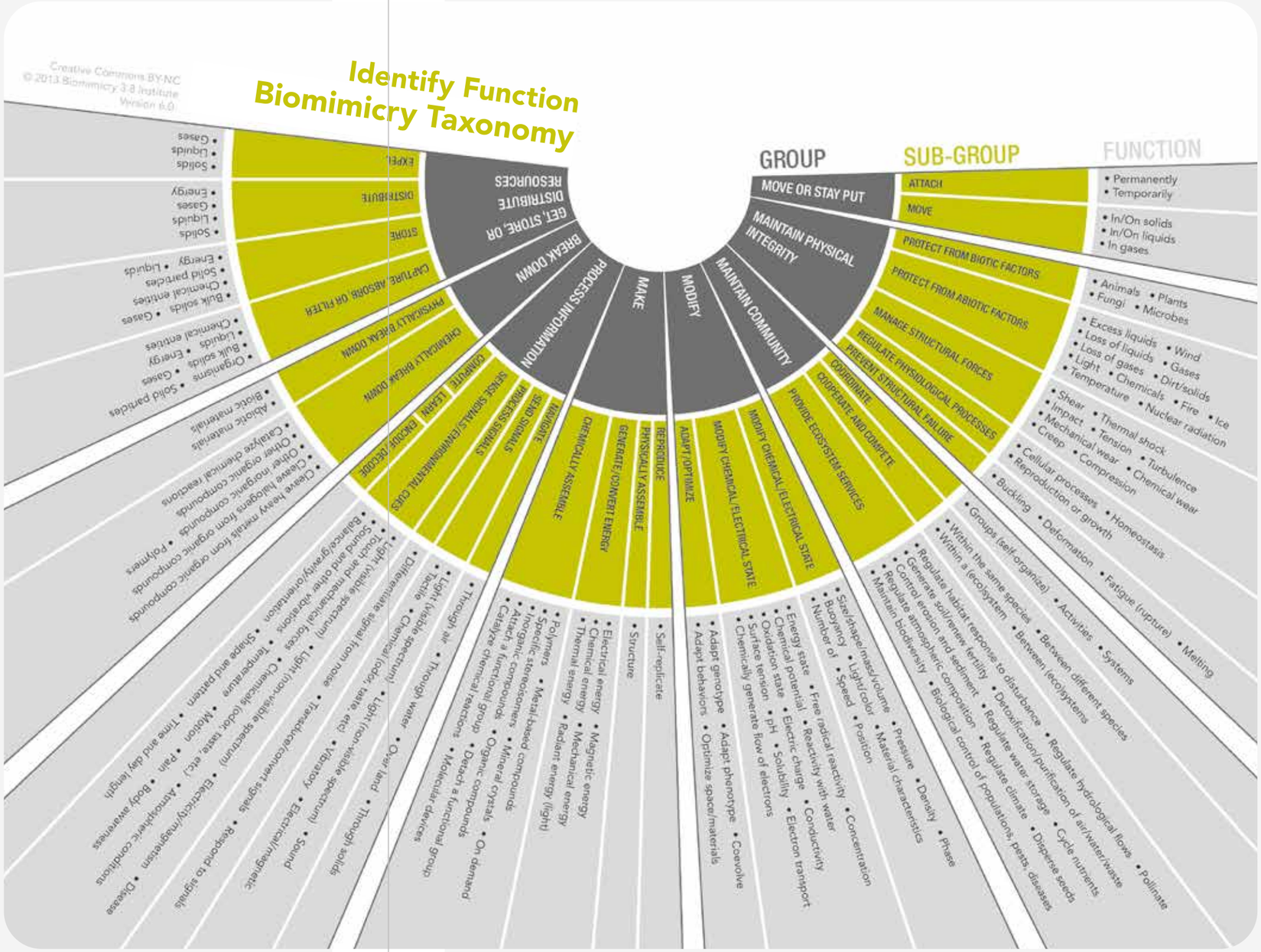
Discover Natural Models

Through the use of the tool, the Biomimicry Taxonomy Sheet, the team biologized the functions that they had identified during the scoping phase into four research questions:

BIOLOGIZED RESEARCH QUESTIONS (FUNCTIONS TO BE RESEARCHED)

(1) How does Nature follow?
(2) How does Nature thrive?
(3) How does Nature communicate?
(4) How does Nature network?

Based on these four questions the team found two natural models that fulfill the identified functions.



Functions (1) + (2)
Natural Model on a Process Level:

Sunflowers
Process of Sun Tracking

STRATEGY

(1) Sunflowers use the hormone "auxin" to cause the movement of the bloom to follow the sun.
(2) Sunflowers face the sun to
  (a) warm the bloom and
  (b) to increase the hue of the colors.

MECHANISMS

(1) Phototropically-driven auxin triggers faster growth of the shaded side of the stem over the illuminated side. This difference in growth causes the stem to curve which, in turn, tilts the bloom towards the sun—seemingly following the sun. The sunrays hitting the bloom increase the intensity of the colors which signals insects to land on the flower. Additionally, the flower is also warmed by the the sun which provides, in turn, thermal energy to the insects. Thus sunflowers are visited by more pollinators when their blooms shine bright and are warm. (2) More pollination means more opportunities to thrive.

REFERENCES

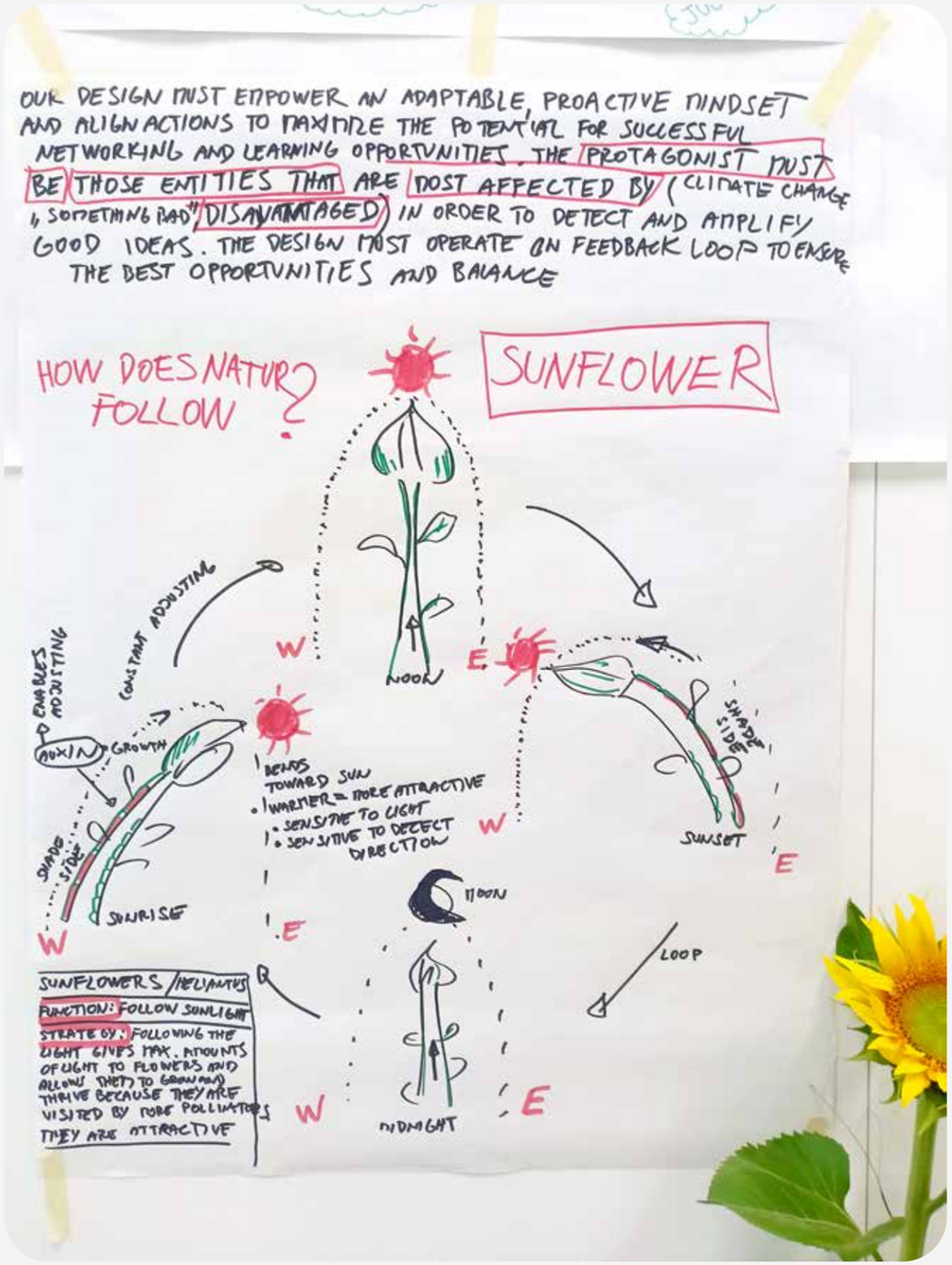
Briggs, W. R. (2016). How do sunflowers follow the Sun—and to what end?. Science, 353(6299), 541-542.
Atamian, H. S., Creux, N. M., Brown, E. A., Garner, A. G., Blackman, B. K., & Harmer, S. L. (2016). Circadian regulation of sunflower heliotropism, floral orientation, and pollinator visits. Science, 353(6299), 587-590.

Abstract Design Principles

Design Principles derived from sunflowers tracking the sun:

Our design must empower an adaptable proactive mindset (movement of the sunflower) and align actions to maximize the potential for successful networking (pollinator) and learning opportunities. The protagonists must be those entities that are most affected by climate change or somehow disadvantaged to detect and amplify good ideas. The design must operate through feedback loops to ensure the best opportunities and balance.

Function Poster



Functions (3) + (4)
Natural Model on a System Level:

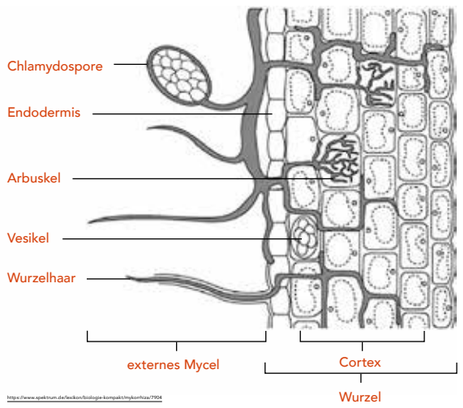
Mycorrhiza
Symbiotic Relationship between Trees and Fungi

STRATEGY

In the mycorrhiza symbiosis, resources are exchanged between the two organisms. Fungi need carbon molecules for cellular respiration (like animals and plants). Many fungi in the soil have enzymes to process this carbon. Mycorrhiza fungi also need carbon but do not have the enzymes to metabolize it on their own. Therefore, plants and mycorrhiza fungi have co-evolved to exchange resources.

MECHANISM

Trees convert carbon during photosynthesis, producing sugars. The mycorrhiza fungi meshwork needs sugar that it cannot produce itself. Trees need nutrients from the soil that in exchange for the sugar they receive from the fungi meshwork. This symbiosis increases the potential access and flow of nutrients within the soil to the tree roots. Trees excrete liquid substrates as signals to attract mycorrhiza fungi that—as a result—attach themselves to the root system of the plant. Once attached, the mycorrhiza fungi grow hair-like channels, called “arbuscules,” that penetrate the walls of the plant cells (see diagram) and facilitate the exchange by being fully integrated into the cell structure, so that nutrients and other elements can flow from soil to fungal cells to plant cells, and sugars can flow from plant cells to fungal cells as needed and when available. The exchange is thus facilitated by connecting cell processes in a mutually beneficial way.



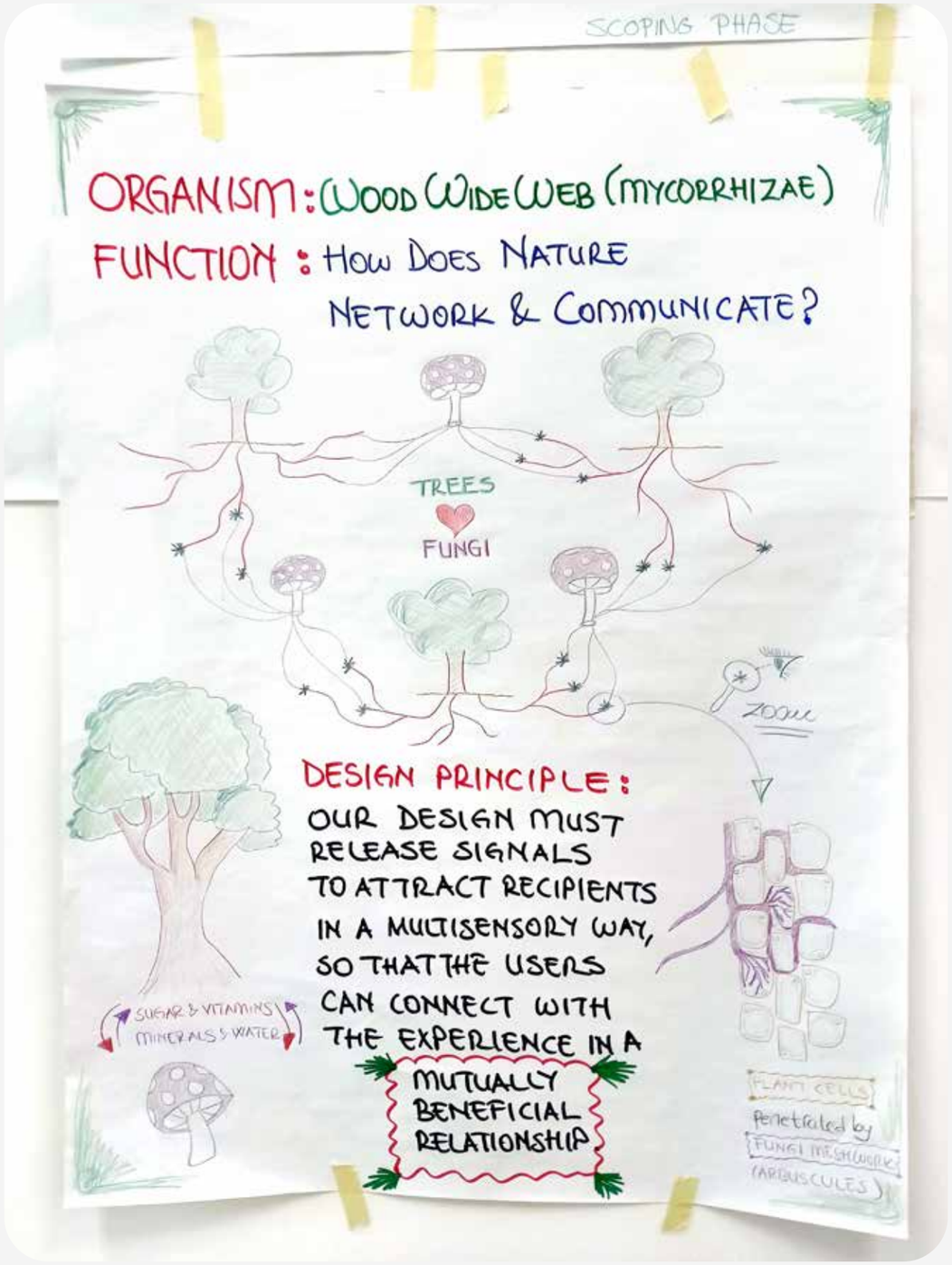
REFERENCES

Article: Arbuscular Mycorrhizae in plant survival strategies:
https://www.researchgate.net/publication/254999588_Arbuscular_Mycorrhizae_in_plant_survival_strategies
Video: BBC News: How trees secretly talk to each other:
https://www.youtube.com/watch?v=yWOqeyPIVRo
Decoder: How Trees Secretly Talk to Each Other in the Forest:
https://www.youtube.com/watch?v=7kHZ0a_6TxY

Abstract Design Principles

Design Principles derived from the relationship between trees and fungi:
Our design must release signals to attract recipients in a multi-sensory way, so that the users can connect with the experience in a mutually beneficial relationship.

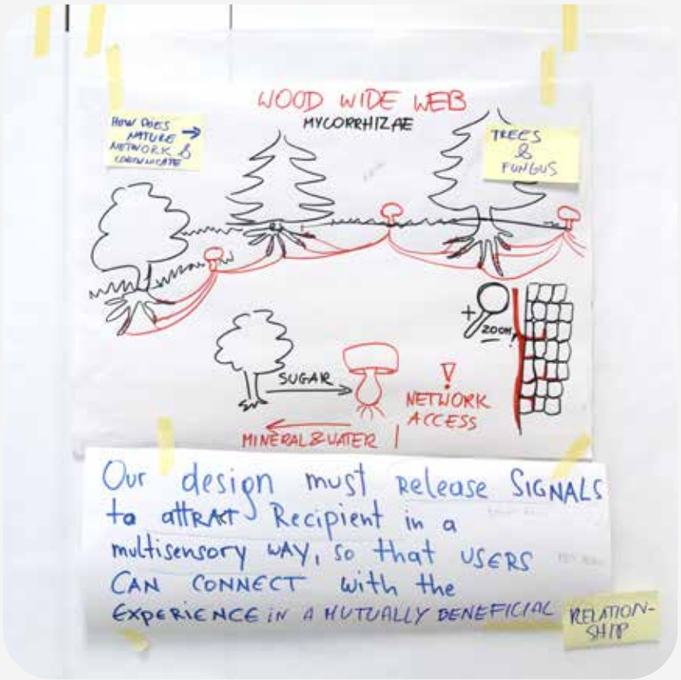
Function Poster

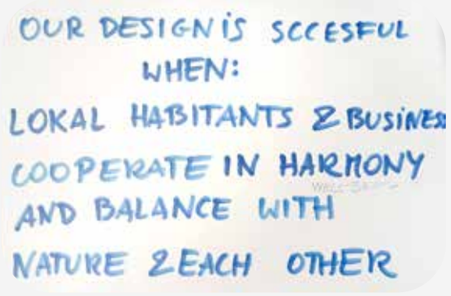


CREATING

Brainstorm

The team's kinesthetic model shows in its initial first strokes already the core of the project that emerged later in detail. Three concentric circles (belts) surround the lake: a) the circle (walking belt) in the reeds that follows the outskirts of the lake; b) bike paths (bike belt) around the lake area and c) the network of streets (street belt). The inner "walking belt" holds surprises and adventures on the way for tourists and locals alike. The design of this walking belt was created for a new appreciation of the region and its natural gifts, for the local inhabitants and opportunities for their businesses, as well as for the short- and long-term tourists who want to engage with what the region has to offer on multiple levels: wine & dine, arts & crafts, enjoyment & preservation of Nature, learning & entertainment.





Kinesthetic Modeling

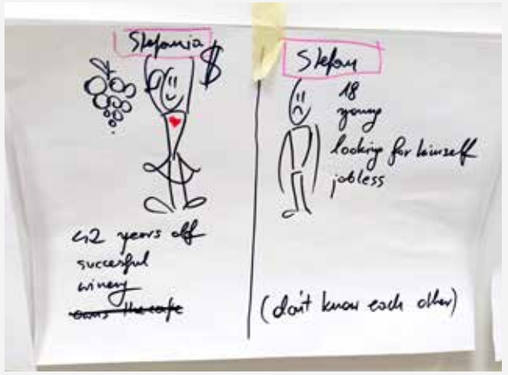

Bio-Rucola

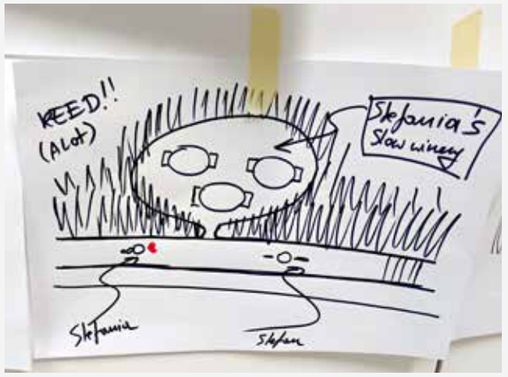

SACRIFICIAL
BIRD /
COMPLEX
BIRDS
HOTEL
INTERCONNECTED
POND

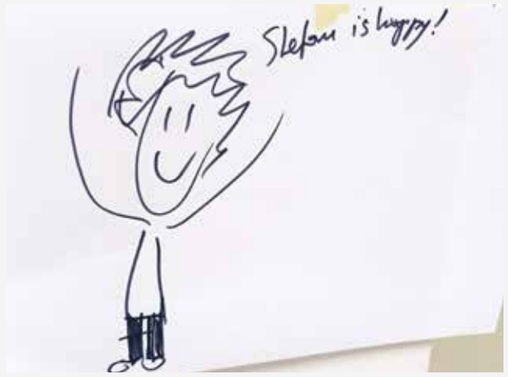

MONDAY


nike

Storyboarding







Improv Theater

Emulate Abstracted Design Principles

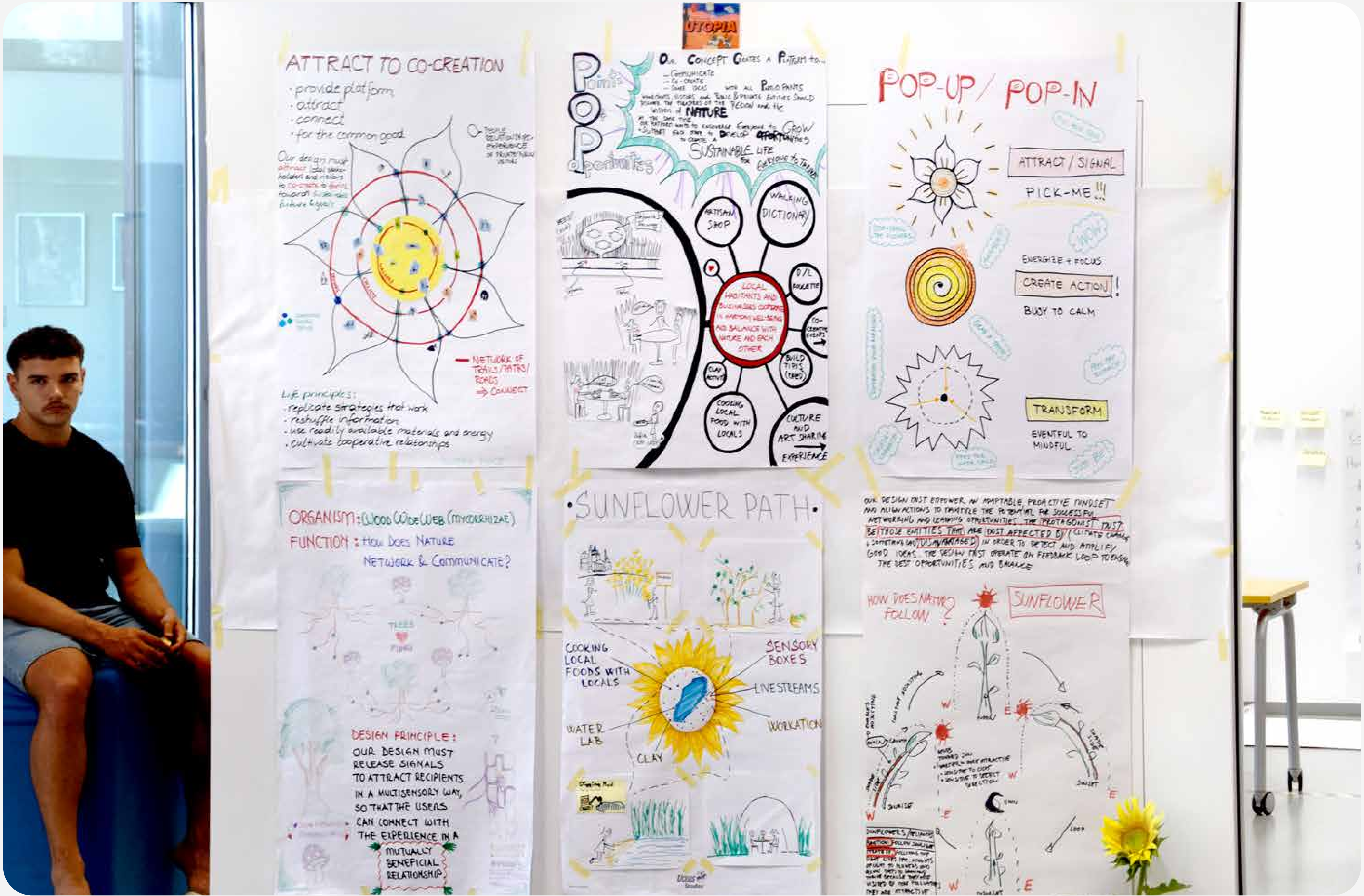
“Points of Opportunities” envisions the integration of the "reed belt" concept, anchoring a variety of engaging activities within the lakeside vicinity. The network of pathways encircling the lake serves as the connective thread that unites diverse demographics: tourists, local entrepreneurs, youth and seniors. A dynamic blend of cycling, strolling, jogging and more animates these pathways intermittently.

At the heart of this concept lies the creation of small, vibrant hubs nestled in the lakeside landscape. These hubs, strategically dispersed around the lake, blossom into artisan shops showcasing locally crafted treasures. Seniors, revered as walking dictionaries, share captivating narratives of the region's history and culture. Clay activity stations invite participants to explore their creativity through hands-on pottery sessions.

Adding to the immersive experience, families collaborate in constructing traditional “tipis” (local versions of little huts) using locally sourced reeds, fostering a sense of togetherness and appreciation for indigenous practices. The aromas of local cuisine waft through the air as communal cooking sessions bring visitors and locals together to prepare and savor regional delicacies.

Cultural and artistic exchanges flourish, as both visitors and residents participate in workshops on the way that celebrate the vibrant heritage of the region. Visitors sip exquisite wines amidst the reeds, engage in tastings that connect them with the land and its produce.

In essence, this initiative aspires to weave a tapestry of experiences as a nexus that marries tourism with community, crafting memories that linger long after the journey ends. By establishing localized activity hubs, this team’s proposal promises year-round attractions catering to both the wanderlust of tourists and their yearnings for enriching experiences with community.


UTOPIA
ATTRACT TO CO-CREATION
·provide platform
·attract
·connect
·for the common good
Life principles:
·replicate strategies that work
·reshuffle information
·use readily available materials and energy
·cultivate cooperative relationships
POP
POP-UP / POP-IN
ATTRACT / SIGNAL
PICK-ME!!!
ENERGIZE + FOCUS
CREATE ACTION!
BUOY TO CALM
TRANSFORM
EVENTFUL TO MINDFUL
ARTISAN SHOP
WALKING DICTIONARY
COOKING LOCAL FOOD WITH LOCALS
CULTURE AND ART SHARING EXPERIENCE
ORGANISM: WOOD WIDE WEB (MYCORRHIZAE)
FUNCTION: HOW DOES NATURE NETWORK & COMMUNICATE?
DESIGN PRINCIPLE:
OUR DESIGN MUST RELEASE SIGNALS TO ATTRACT RECIPIENTS IN A MULTISENSORY WAY, SO THAT THE USERS CAN CONNECT WITH THE EXPERIENCE IN A
MUTUALLY BENEFICIAL RELATIONSHIP
·SUNFLOWER PATH·
COOKING LOCAL FOODS WITH LOCALS
SENSORY BOXES
LIVESTREAMS
WORKATION
WATER LAB
CLAY
HOW DOES NATURE FOLLOW?
SUNFLOWER

While the idea of collaboration is a no-brainer, especially during challenging times, the economic models that drive business, at least in the Western world, are originally based on competition and creating competitive advantage. This thinking has been engrained in society for so long that a switch to deep collaboration for mutual vs. individual benefit presents a steep learning curve for individuals and communities alike, but more so a transformation of business practices all over the world. The three projects mentioned here are starting points for this kind of transformation that may need to evolve from the bottom up (individuals in isolated actions) and be supported from top down in form of national and local regulations that force restoration of nature and foster cooperation and networking across cultures and generations.

VISUAL JOURNEY

WELCOME EVENING	76	University of Applied Sciences Burgenland, Eisenstadt **Registration & Movie Night**
DAY 1	78	SOAK Workshop Barn “Fisch & Vogel,” Mörbisch am See **Connecting with Each Other / Biomimicry Lecture / Climate Change Lecture**
	86	SOAK Nature Lab, Martinsplatz'l in the Wine Hills, Mörbisch am See **SCOPING** / Nature **Exploring Biomimicry Life Principles in Nature** **Body & Mind Exercises** / (Re-)Connect with Nature
DAY 2	96	SOAK Nature Lab, National Park Lake Neusiedl—Seewinkel, Illmitz **SCOPING** / Nature **Exploring Design Challenge in Nature** **Body & Mind Exercises** / Learning from Water
DAY 3	120	SOAK Workshop Barn “Fisch & Vogel,” Mörbisch am See **SCOPING /** Culture **Scoping the Project** Regional Stakeholder Meeting / Refining Project Scope and Refining Function(s)
	134	SOAK Nature Lab, “Gemeindeschutzgebiet Seewiesen,” Mörbisch am See **DISCOVERING** / Models in Nature **Asking Nature** Biologizing the Research Question / Searching for Models in Nature
DAY 4	140	SOAK Design Studio, University of Applied Sciences Burgenland, Eisenstadt **DISCOVERING** / Abstracting Design Principles **Abstracting Strategies into Design Principles** Function Cards / Reviewing and Evolving Research Steps **Body & Mind Exercises** / Use Feedback Loops / Use Low Energy Processes
DAY 5	158	SOAK Design Studio, University of Applied Sciences Burgenland, Eisenstadt **CREATING** / Brainstorming Activities **Creating Nature-Inspired Design Concepts** Kinesthetic Modeling | Storyboarding | Improv Theater Benchmarking against Sustainability Mandates Crystallizing Initial Ideas into Concepts
DAY 6	170	SOAK Design Studio, University of Applied Sciences Burgenland, Eisenstadt **CREATING** / Refining Design Concepts **Refining & Seeking Stakeholder Feedback** Reviewing, Refining and Combining Design Concepts Stakeholder Feedback

WELCOME EVENING

SUN 9JULY

University of Applied Sciences Burgenland
Eisenstadt
Registration & Movie Night

GUARDIANS OF THE EARTH
Documentrary film by Filip Antoni Malinowski

In 2015, 20.000 negotiators from 195 nations met at the UN Climate Summit in Paris for a last attempt to agree on the first global climate agreement. The documentary shows the battle towards this monumental agreement through the perspective of major players as the head of the UNFCCC, the fossil fuel exporting countries and the most vulnerable states to climate change.
www.guardians-of-the-earth.net, www.soleilfilm.at/blog/?portfolio=guardians-of-the-earth

DAY 1
MON
10 JULY

SOAK Workshop Barn “Fisch & Vogel”
Mörbisch am See

Connecting with Each Other
Biomimicry Lecture
Climate Change Lecture


Kohlenstoffdioxidkonzentration im Holozän
EPICA Dome C Eisbohrkern nachaufbereitet (E. Monnin, 2006)
Law dome Eisbohrkern (D. Etheridge, 2010)
Cape Grim Messungen (CSIRAPS, 2019)
400
350
300
250
-10000
-9000
-8000
-7000
-6000
-5000
-4000
-3000
-2000
-1000
0
1000
Jahr

DAY 1
MON
10 JULY

SOAK Nature Lab
Martinsplatz'l in the Wine Hills
Mörbisch am See

SCOPING / Nature
Exploring Biomimicry Life Principles in Nature

Body & Mind Exercises
(Re-)Connect with Nature

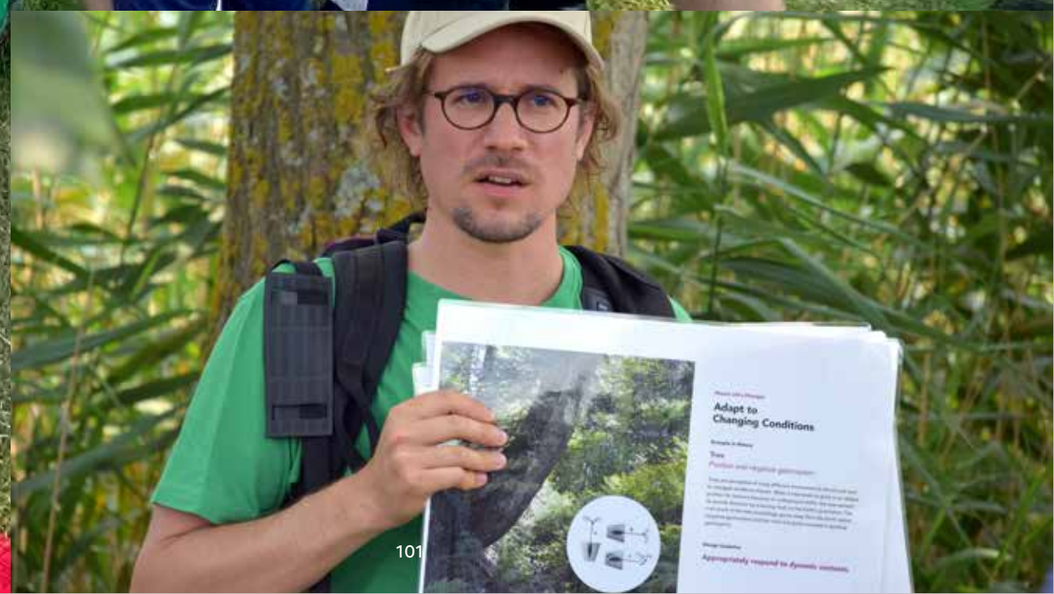
DAY 2
TUE
11 JULY

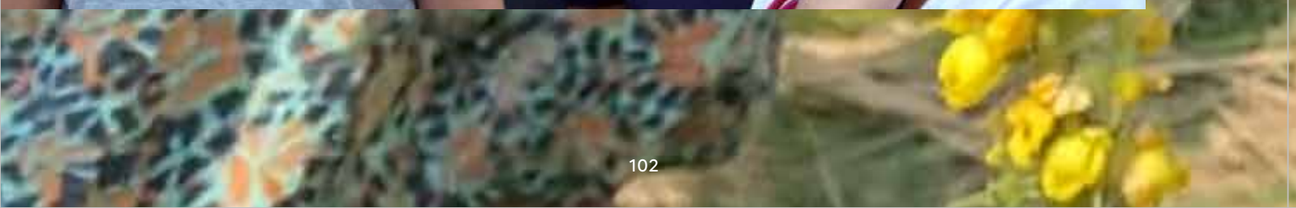
SOAK Nature Lab
National Park Lake Neusiedl—Seewinkel
Illmitz

SCOPING / Nature
Exploring Design Challenge in Nature

Body & Mind Exercises
Learning from Water


macron


Adapt to
Changing Conditions

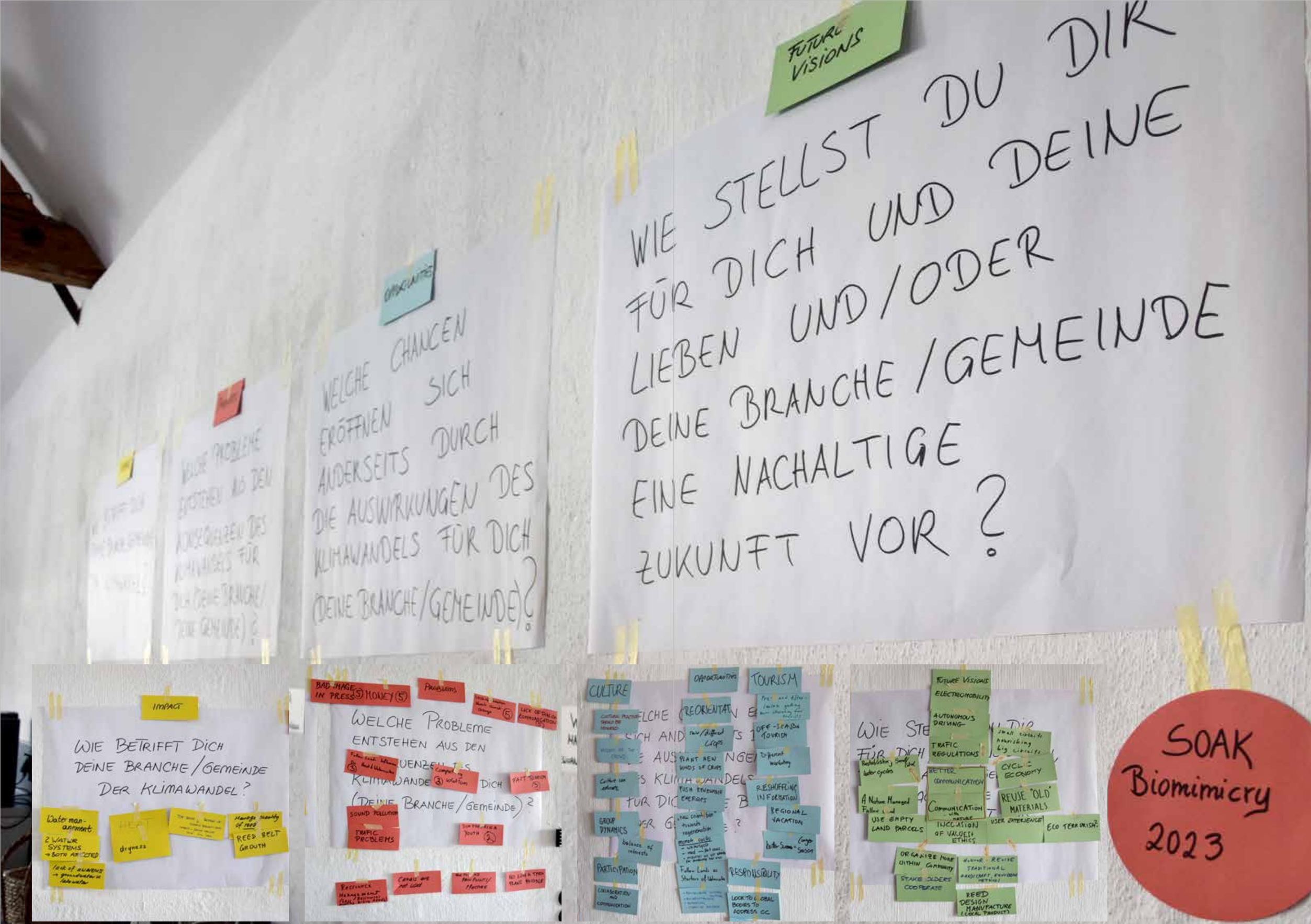


DAY 3
WED
12 JULY

SOAK Workshop Barn “Fisch & Vogel”
Mörbisch am See

SCOPING / Culture
Scoping the Project
Regional Stakeholder Meeting
Refining Project Scope and Refining Function(s)

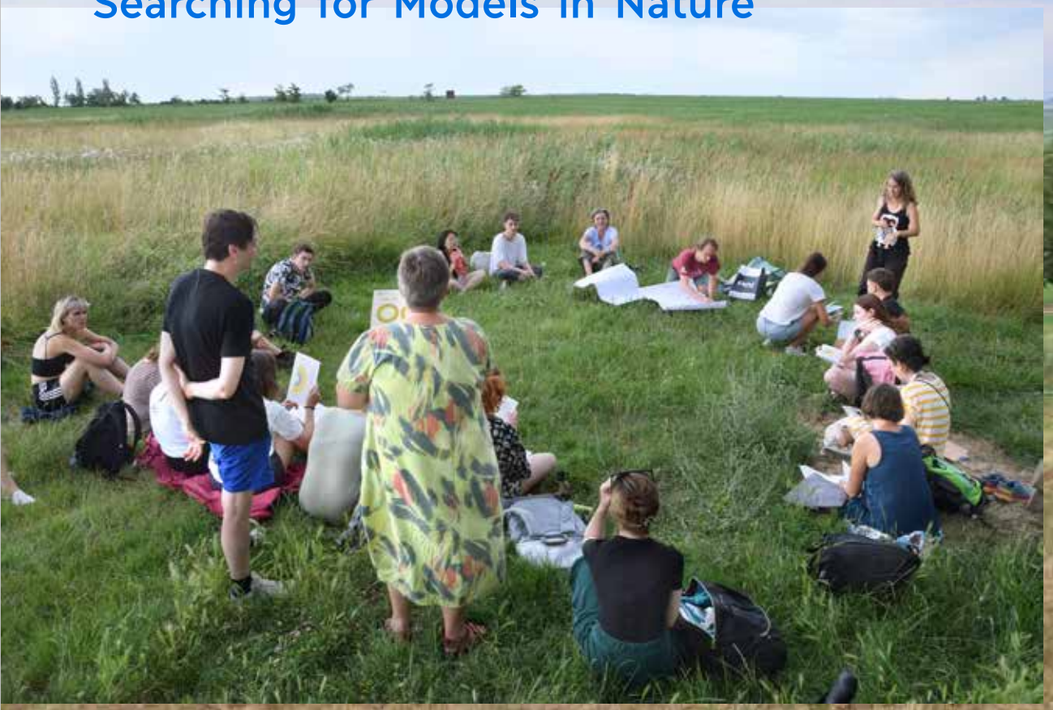

IMPACT
WIE BETRIFFT DICH (DEINE BRANCHE / GEMEINDE) DER KLIMAWANDEL?
PROBLEMS
WELCHE PROBLEME
OPPORTUNITIES
WELCHE CHANCEN ERÖFFNEN SICH ANDERSEITS DURCH
FUTURE VISIONS
WIE STELLST DU DIR FÜR DICH UND DEINE LIEBEN UND/ODER DEINE BRANCHE / GEME
EINE NACHALTIGE
ANDREA
BETTINA
ROBERT
HERBERT
GERHARD
WENDY

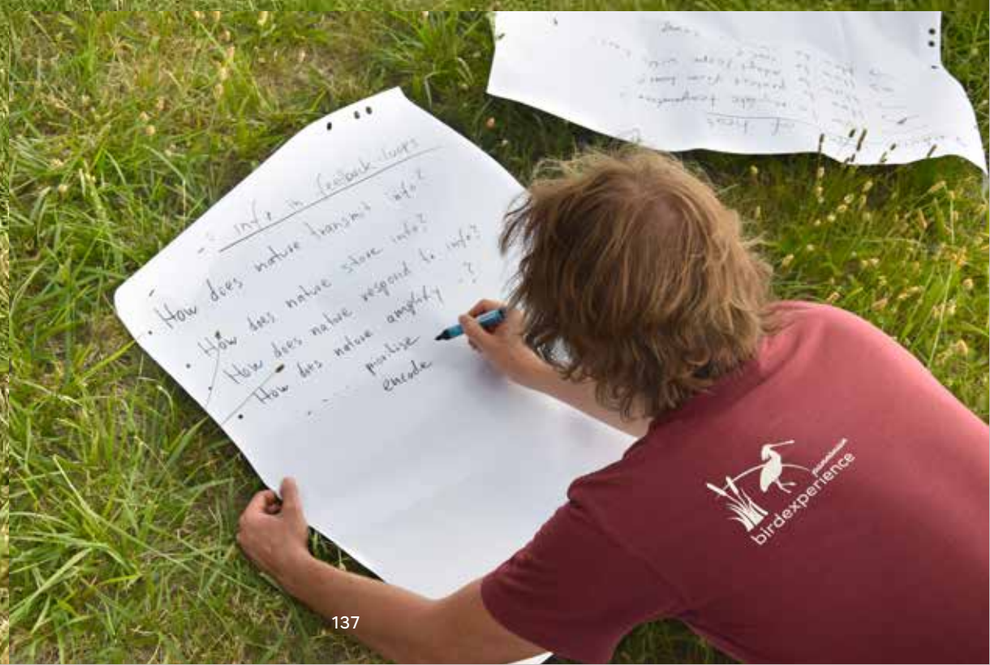

FUTURE VISIONS
WIE STELLST DU DIR FÜR DICH UND DEINE LIEBEN UND/ODER DEINE BRANCHE/GEMEINDE EINE NACHALTIGE ZUKUNFT VOR?
WELCHE CHANCEN ERÖFFNEN SICH ANDERSEITS DURCH DIE AUSWIRKUNGEN DES KLIMAWANDELS FÜR DICH (DEINE BRANCHE/GEMEINDE)?
IMPACT
WIE BETRIFFT DICH DEINE BRANCHE/GEMEINDE DER KLIMAWANDEL?
Water management
2 WATER SYSTEMS → BOTH AFFECTED
HEAT
dryness
REED BELT GROUTH
WELCHE PROBLEME ENTSTEHEN AUS DEN
BAD IMAGE IN PRESS
MONEY
PROBLEMS
LACK OF DIALOG COMMUNICATION
SOUND POLLUTION
TRAFIC PROBLEMS
TOURISM
CULTURE
GROUP DYNAMICS
PARTICIPATION
RESPONSIBILITY
RESHUFFLING INFORMATION
REGIONAL VACATION
FUTURE VISIONS
ELECTROMOBILITY
AUTONOMOUS DRIVING
TRAFIC REGULATIONS
BETTER COMMUNICATION
CYCL = ECONOMY
REUSE "OLD" MATERIALS
A Nature Managed
USE EMPTY LAND PARCELS
ORGANIZE MORE WITHIN COMMUNITY
STAKE HOLDERS COOPERATE
REED DESIGN MANUFACTURE
SOAK
Biomimicry
2023

DAY 3
WED
12 JULY

SOAK Nature Lab
Observation Deck “Gemeindeschutzgebiet Seewiesen”
Mörbisch am See

DISCOVERING / Models in Nature
Asking Nature
Biologizing the Research Question
Searching for Models in Nature




How does nature transmit info?
How does nature store info?
How does nature respond to info?
How does nature amplify positive events?
birdexperience

DAY 4
THU
13 JULY

SOAK Design Studio
University of Applied Sciences Burgenland
Eisenstadt

DISCOVERING / Abstracting Design Principles
Abstracting Strategies into Design Principles
Function Cards
Reviewing and Evolving Research Steps

Body & Mind Exercises
Use Feedback Loops
Use Low Energy Processes

Body & Mind Exercises

Learning from Water

The *Learning from Water* exercises offered movement and perception activities to connect with one's own body, its sensorium and subsequently with the surrounding environment, as a step into the *Biomimicry (Re-)Connect with Nature* process. Based on fluid processes in the body, gravity, vertical alignment and balance of the body, as well as the waveform of the spine were explored, providing an experience of selected Biomimicry Life Principles, such as *Use Feedback Loops* or *Use Low Energy Processes*. These kinds of physical explorations serve to develop a more sensitive and mindful contact with one's own body and its environment and aim to fulfill some of the *Inner Development Goals (IDGs, www.innerdevelopmentgoals.org)*—honing transformational skills for sustainable development. See more pictures on pages 88/89 (bottom) and 114/115.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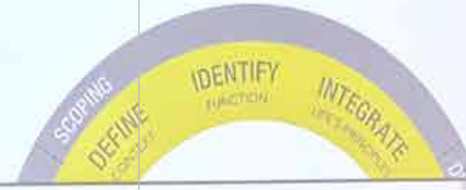
E.HG.015b
E.11
www.fh-burgenland.at

Scope Objectives and Boundary of the Exploration

- Identify Function — *What do you want your design to do?*
- Define Context & Boundary — *In what context is your design to function?*
- Integrate Life's Principles (LPs) — *Which LP's apply specifically in your design in this context?*
- Define Success — *How must your design succeed in this context?*

Objective: A successful design will create conditions conducive to life by following the LPs
A well-adapted design must meet the functional needs of the design challenge in the
context in which it must exist in order to contribute to its success — definition borrowed from
nature where a well-adapted biological strategy must meet the functional needs of the organism
in the context in which it lives in order to contribute to its survival

- Deliver Document success — ***Scoping Results*** listing detailed design challenge (function, context) and vision of



(What is my design supposed to do in which contex

Process information
(in feedback-loops)

How does nature ...

- transmit information?
- respond to information?
- amplify information?
- gather / exchange information?
- encode and decode information?
- share information?

(Re)create balance

How does nature

- respond to disturbance?
- create disturbance?
- send/process/respond to signals?
- regulate physiological processes?
- maintain homeostasis?

Connect to experience

How does nature ...

- teach / share skills?
- maintain community?
- learn?
- grow and develop?
- process experience?

Reduce impact of heat

How does nature

- regulate temperature?
- protect from heat?
- adapt to heat?
- cool?
- stabilise temperature?
- utilize heat?

Organism

Hermit Crabs *(Coenobita clypeatus)*

Function / Process

to exchange resources through coordination within the same species

Strategy

How do they exchange resources? – To signal availability, which causes a coordinated line up leading to a chain-reaction of exchange

A crab waiting next to a big empty shell signifies to smaller crabs an opportunity for shell-exchange. They form a line according to size (large to small). Once the biggest crab arrives to take the original empty shell a synchronous chain-reaction of shell-exchange commences, leaving only the smallest shell vacant for an even smaller crab.

Mechanism

For hermit crabs, finding a shell is not an easy pro… often snails and m… hermit crabs cannot grow their own shell, and must ther… ed sy…rch per… empty snail shells to switch into as they grow. Not only mu… not broken, but the shell must be the right size, and there is … petition for these new homes. Thus hermit crabs have develop… and efficiently finding the perfect shell.

In the "asynchronous" system, if a crab looking for a new shell finds … that has the right size it switches shells and leaves the old one behind.


FUNCTION
OUR DESIGN MUST CREATE THE TRUE APPRECIATION OF WATER
CONTEXT
SEALING OF THE SOIL
CLIMATE CHANGE
SUN
FLOODS
DECLINE OF THE GROUNDWATER LEVEL
OVERUSE OF WATER [in agriculture]
DRY AGRICULTURAL GROUNDS


SLIME MOLD
Physarum polycephalum
Function
to distribute information and motivate engagement efficiently
Strategy
COLLECTIVE ENGAGEMENT, CONNECTION and COOPERATION play a substantial part in the success of the strategy.
DESIGN PRINCIPLE
Food
Light
Jun 2021 - Jul

DAY 5
FRI
14 JULY

CREATING / Brainstorming Activities
Creating Nature-Inspired Design Concepts
Kinesthetic Modeling | Storyboarding | Improv Theater
Benchmarking against Sustainability Mandates
Crystallizing Initial Ideas into Concepts

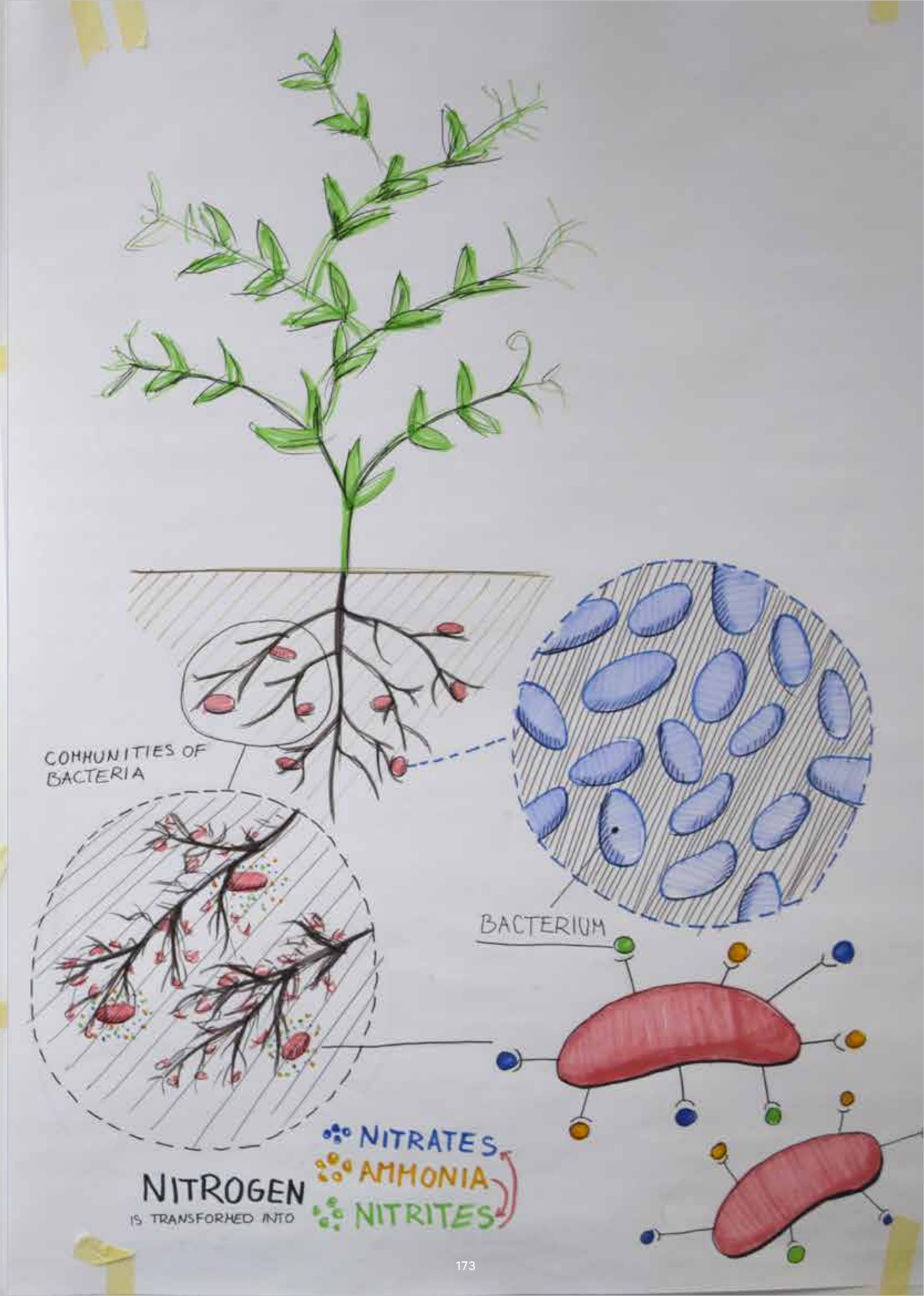

Smell
touch
taste
sound
DESIGN PRINCIPLE
Our DESIGN
MUST
release
signals
to
Title
EVENT
DIGITAL
ACTION
Nature is taking a rest.


MUST CREATE AWARENESS
BY CONSTRUCTING A
INSTALLATION THAT
THE LOSS OF WATER
IT IN A NATURALLY
WIND IS GUIDED
MULTITUDE OF COLD
AIR. AT THE END COOL AIR
AND THE COLLECTED
BE REINTRODUCED TO


POINT OF

DAY 6
SAT
15 JULY

CREATING / Refining Design Concepts
Refining & Seeking Stakeholder Feedback
Reviewing, Refining and Combining Design Concepts
Stakeholder Feedback


COMMUNITIES OF BACTERIA
BACTERIUM
NITROGEN
IS TRANSFORMED INTO
NITRATES
AMMONIA
NITRITES


POP-UP PARK


PRINCIPLE


SUNFLOWER PAT

FUNCTION

STRATEGY

MECHANISM

DESIGN-PRINCIPLES

LIFE PRINCIPLES

COMMON GROUND

Benefits for TOURISM

* integration of restorative tourism
* creation of added value for the region instead of extraction of resources
* preservation of immaterial cultural heritage
* enhancing better understanding for the region
* foster attachment to local people & Ecosystem
* improve the production of local products - HIGH QUALITY - and make them more well-known
* promote Biodiversity through cultivating sustainable cyclic agricultural practices and herd management
* foster a planet centered mindset within the community
* enable enduring relationships between stakeholders & communities

VISION

Benefits for the co

* enhance the quali
* foster endur generation
* improve
* drive
* Vuca

TOURIST

WINE-GROWER

CITIZEN


ATTRACT TO CO-CREATION
POP-UP / POP-IN


Du
12. Juli, 08:19
Kronen Zeitung
SOMMER
Rätsel
Krone
RÄTSEL KRONE SAISON
NR 3
Ohne Worte...
burgenland
neusiedler see
Tourismusverband Nordburgenland
Obere Hauptstraße 24
7100 Neusiedl am See
Tel. +43 2167 8600 13
Mob. +43 664 9693166
hierner@burgenland.info
www.neusiedlersee.com

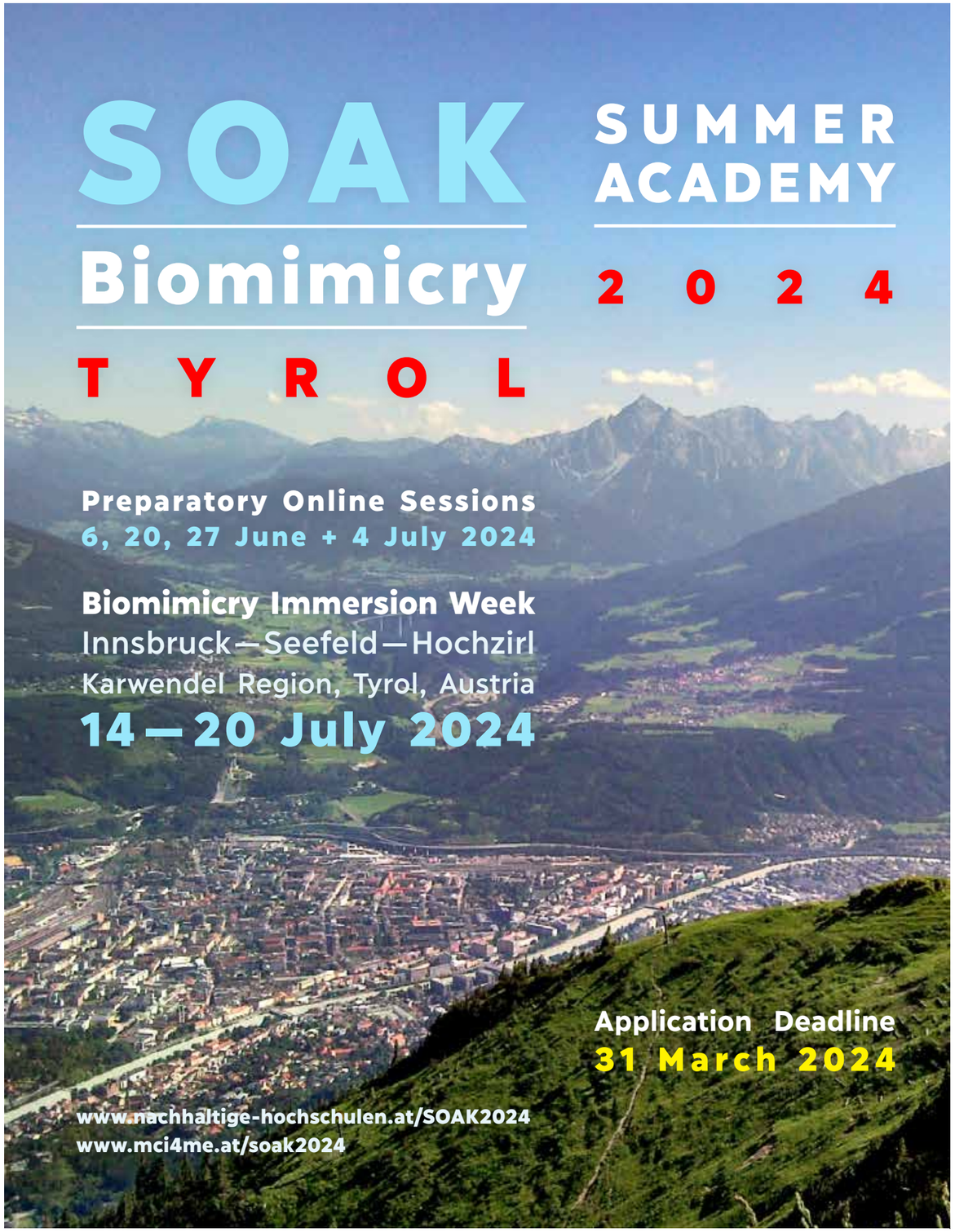
PREVIEW

SOAK

BIOMIMICRY

2024

Photo: Wikimedia Commons



COOP SUSTAINABLE UNIVERSITIES

FH Burgenland

MCI® THE ENTREPRENEURIAL SCHOOL

dı:'ʌngewʌndtə Universität für angewandte Kunst Wien University of Applied Arts Vienna

SOAK Biomimicry 2024

SOAK Biomimicry—Summer Academy 2024 is taking place in Tyrol, Austria. It is led by the **University of Applied Sciences Burgenland,** organized and hosted by **MCI | The Entrepreneurial School®**, a University of Applied Sciences in Innsbruck, and supported by the **FHV-Vorarlberg University of Applied Sciences.** In this effort, they partner with the **University of Applied Arts Vienna.**

The **focus** of SOAK Biomimicry 2024 concerns the interplay between the **climate** and **biodiversity crises** hitting the **Karwendel Region,** in particular, the local woodlands and forests. Foundational learnings include understanding how Nature responds to these problems as well as becoming familiar with people's ideas and methods for mitigating climate change and reducing the loss of biodiversity.

The **vision** of SOAK Biomimicry 2024 is **a)** to motivate people to integrate Nature-inspired, regenerative concepts and actions for alleviating the climate and biodiversity crises in their own lives and environments and **b)** to empower them to demand, initiate and contribute to the necessary sustainability actions in their spheres of influence.

SOAK Biomimicry 2024 participants will be engaged in all steps of the **Biomimicry Innovation Process** in order to develop ideas and design concepts for triggering a transformation in people's ways of thinking and behaving.

For this collaboration to be successful, COOP is bringing into dialogue a number of disciplines, sustainability experts and innovation facilitators. SOAK Biomimicry 2024 is sure to evolve into an unforgettable week of learning, experiencing Nature and building community across boundaries.

Contacts

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www.nachhaltige-hochschulen.at/SOAK2024

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University of Applied Arts Vienna/IPSD
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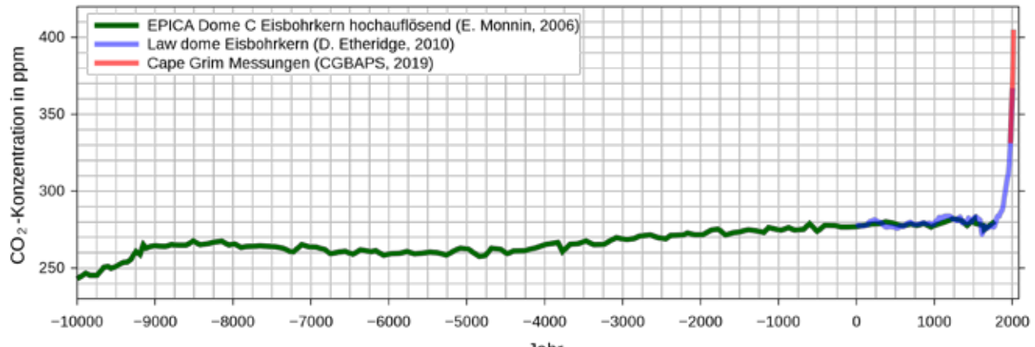
base.uni-ak.ac.at/courses/2024S/S04072/

APPENDICES

Climate and Biodiversity Crises / Scientific Statistics

Carbon Dioxide Concentration During the Holocene

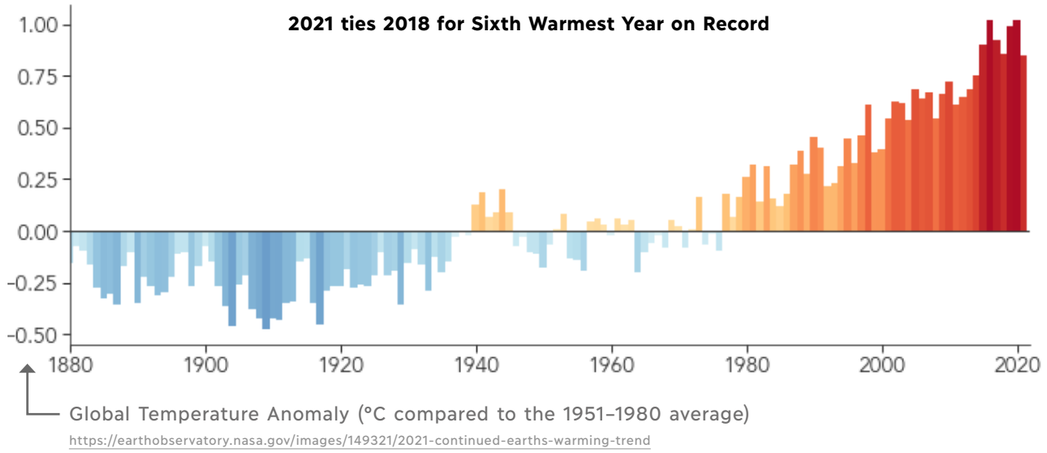
Contemporary civilizations began to emerge when the last ice age ended and earth's climate settled into relatively stable conditions. For the past 10.000 years, global average temperatures varied only slightly somewhere around 15° Celsius, and earth's atmosphere contained around 0,028% Carbon Dioxide (280 ppm). The concentration of carbon dioxide in the atmosphere started to rise in the 19th century and has begun to dramatically increase year by year since the middle of the 20th century. From 1850 to 2023, the amount of CO_2 in the atmosphere has increased by around 50% and is now above 0,042% (or 420 ppm). More of the greenhouse gas CO_2 in the atmosphere means that more heat radiation stays in the atmosphere. As the amount of CO_2 increases, heat radiation and energy "trapped" in earth's atmosphere also increase, leading to a warming climate—known as the greenhouse effect. This development and the fast-paced rate of change are very bad news for (current) life on the planet.



https://de.m.wikipedia.org/wiki/Datei:Ghgs-epcia-holocene-CO2-de.svg

Global Temperature

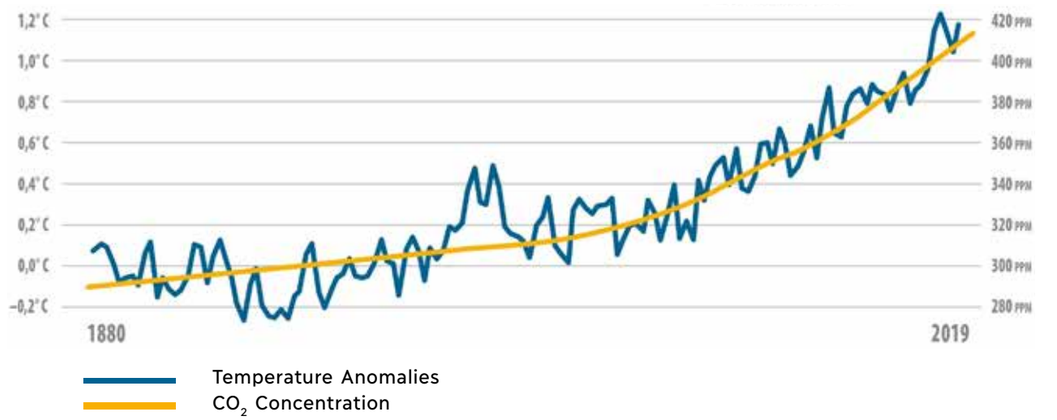
Global average temperatures have increased by more than 1° Celsius since 1850. The chart below compares the average temperatures between 1880 and 2021. One might think that one degree change is no big deal, but life—as known today—can exist only within a very narrow range of potential changes to living conditions. Too many drastic changes of temperature, oxygen levels and CO_2 concentration within a short time cause extinctions to existing life forms. They might cause other forms to evolve out of the ashes—which may or may not be favorable to human life.



https://earthobservatory.nasa.gov/images/149321/2021-continued-earths-warming-trend

CO_2 and Global Temperature

The chart below shows that rising temperatures go hand in hand with increasing carbon dioxide concentrations, the latter of which are caused, primarily, by human actions.

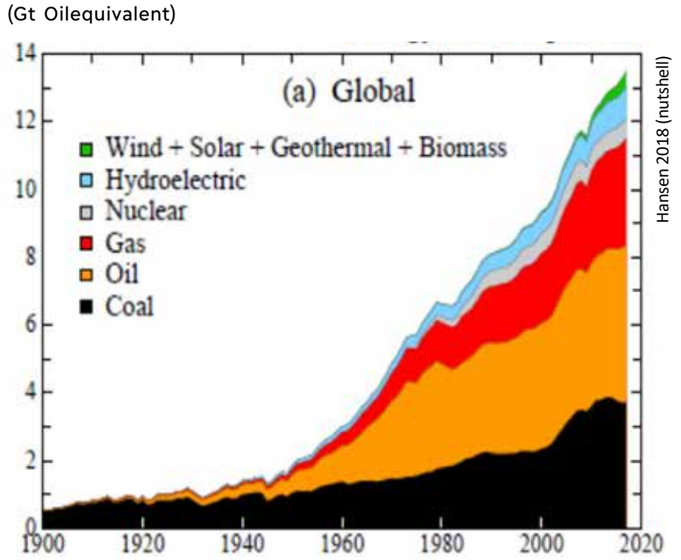


https://www.nasa.gov/news-release/nasa-noaa-analyses-reveal-2019-second-warmest-year-on-record/

https://www.researchgate.net/figure/Global-Temperature-and-Carbon-Dioxide-Concentrations-1880-2010-Notes-Global-annual_fig2_279935551

Energy Consumption

The main cause for rising CO_2 concentrations, and therefore the increase in global average temperatures, is the burning of fossil fuels to meet the growing energy demands of current economic practices. The increase in energy consumption dramatically accelerated after WWII with industrialized consumer-based economies growing worldwide. Global energy consumption increased by about 2.500% from 1900 to 2018. However, global human population only increased by about 400% during the same stretch of time. The disproportionate growth rate of energy consumption, six times as large as the population increase rate, is one of the most distorting aggressors to the fragile balance of life systems on earth.

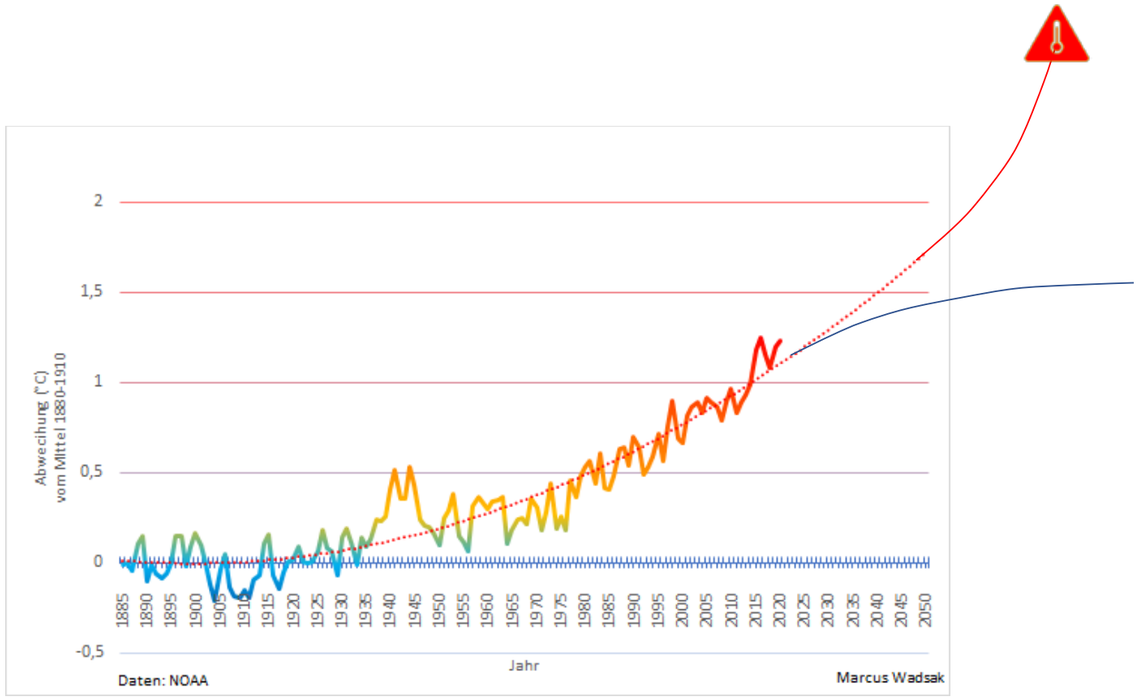


https://www.columbia.edu/~jeh1/mailings/2018/20181206_Nutshell.pdf

Global Temperature Rise

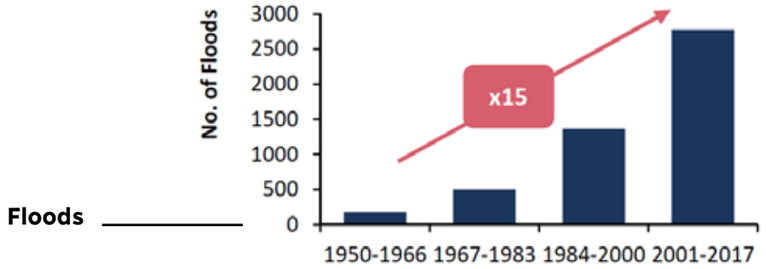
If nations worldwide stay true to the pledges made under the 2015 Paris Agreement, global greenhouse gas emissions must decrease drastically in a very short time in order to enable stabilizing dynamics of earth's climate at an average temperature increase of no more than 2 degrees (compared to 1850) during the second half of this century. Scientists agree that an increase of 1.5 degrees would keep humanity in a precarious "safe" zone, but given the global developments, one can already see that society is moving past this point of possibility rapidly. Even a moderate increase of 2° Celsius over pre-industrial levels could make life unbearable for millions of people.

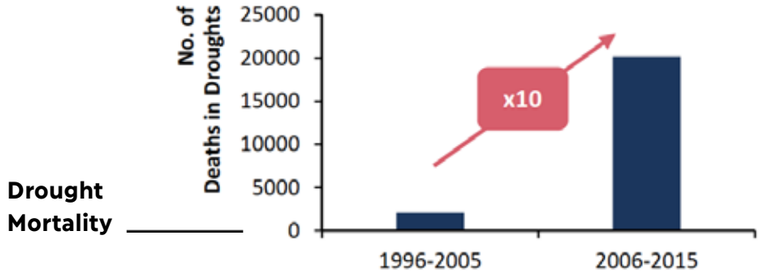
Minor or no climate action, such as further increases, flatlining or only slight reductions of greenhouse gas emissions, would result in further and accelerated warming that, most likely, would unleash various interdependent tipping points, leading to drastic changes, even break-downs, in Earth's climate. Catastrophic consequences for all life as early as the second half of this century can be calculated in such a scenario and might result in run-away climate change, the point of no return: discontinuous permanent system change. Scientists keep reporting that predicted changes are happening much faster than previously thought. This reality check is very concerning because it may mean that humans are running out of time to a) adapt to new dynamics and b) influence how fast catastrophic changes are coming their way.

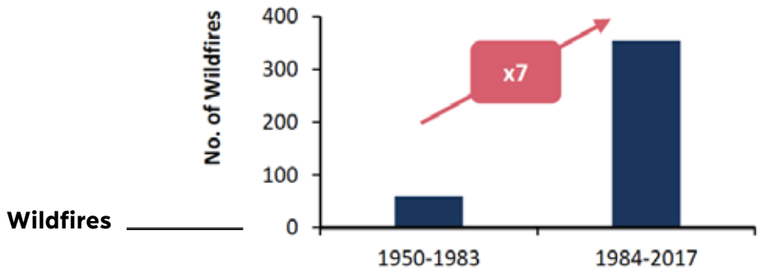


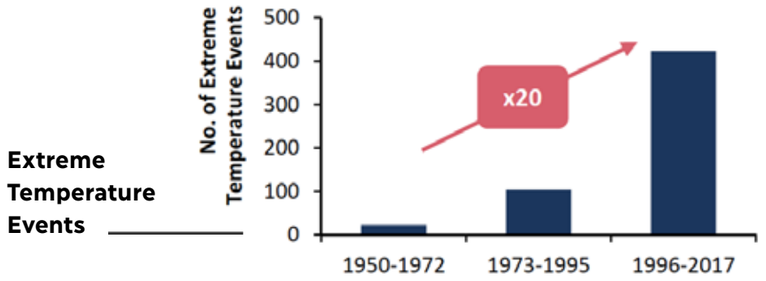
Consequences of Global Climate Change

The consequences of global warming can already be felt by millions around the world through an increase in extreme weather events and wildfires worldwide. Inspite of the noticeable evidence, people seem paralyzed and unable to take mitigating actions. Scientists, such as Helga Kromp-Kolb, Austrian meteorologist and climate researcher, claim that it's not too late to turn things around if the global community acts immediately, drastically and in collaboration across the world.







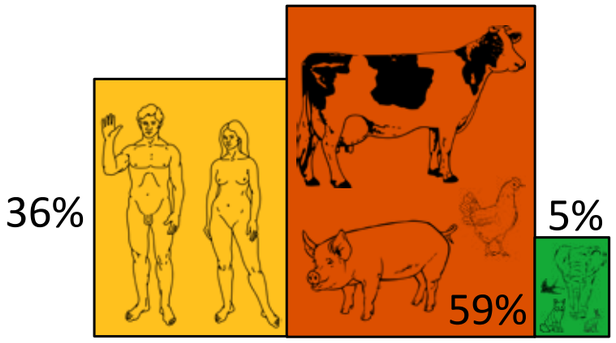


Grantham 2018; EM-DAT database

The Impact of Humanity on the Biosphere

Over the relatively short span of human history, major innovations, such as the domestication of livestock, adoption of an agricultural lifestyle, and the Industrial Revolution, have increased the human population dramatically and have had radical ecological effects. Today, the biomass of humans and the biomass of livestock (dominated by cattle and pigs) far surpass that of wild mammals. This is also true for wild and domesticated birds, for which the biomass of domesticated poultry is about threefold higher than that of wild birds. In fact, humans and livestock outweigh all vertebrates combined, with the exception of fish. Even though humans and livestock dominate mammalian biomass, they are a small fraction of all animal biomass. (Excerpt from https://www.pnas.org/doi/10.1073/pnas.1711842115)

The below graphic points to a significant imbalance in the biomass. Humans and their domesticated livestock make up 95% (of all mammals and birds) and wild mammals and birds only 5%. Vis-à-vis this visible imbalance, one might begin to understand the gravity of what is happening here, the impact industrial meat production has on wild animal species and the environment.



Bar-On et al., 2018

Species Extinction

Most species of living organisms known to science, monitoring and gathering data about species that have been discovered is also a difficult task. It is therefore difficult to say exactly how many species go extinct every year. The estimates given in the info below are examples of the figures one can find in scientific papers and articles. However, even the lower estimates of extinction rates show alarmingly high numbers of species going extinct year by year. Many scientists call this phenomenon “Earth’s Sixth Mass Extinction Event.” The last extinction before this one was that of dinosaurs and other species about 65 million years ago, caused by a large meteor that hit the Earth. This event of the sixth mass extinction is, however, “home-grown”—by humans.

Normal Rate of Exctinction ..... 1–5 species in a year

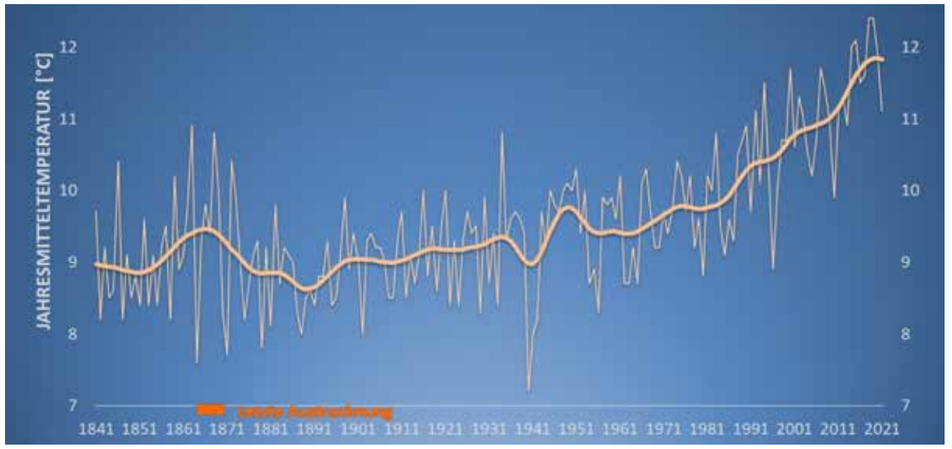
Current Rate of Extinction 100x
..... 1,000x
..... 10,000x

Which would translate to Exctinction Rates of ..... 100–500 species in a year?
..... 1,000-5,000 species in a year?
..... 10,000–50,000 species in a year?

Climate Change in the Region Lake Neusiedl

Annual average temperature at Lake Neusiedl

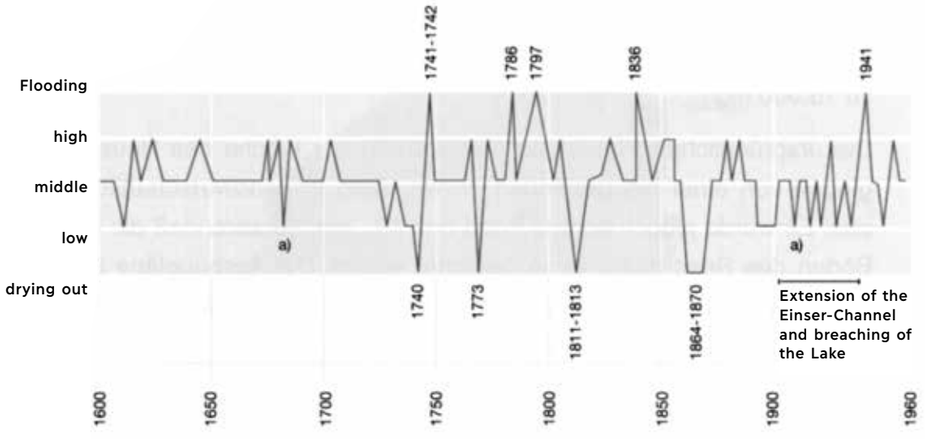
Average temperatures in the Region Lake Neusiedl have increased by up to 3° Celsius since 1850 which is higher than the average increase around the world. Higher temperatures increase potential evaporation, leading to drier conditions and the well-founded concern that the lake might dry up—decimating the local flora and fauna.



Source: Herbert Formayer, BOKU—University of Natural Resources and Life Sciences Vienna

Water Level of Lake Neusiedl

Lake Neusiedl is a dynamic steppe lake and has always had changing water levels. Historic records show that the lake has dried out on several occasions since the 1600s. Higher temperatures and higher evaporation will probably increase the intensity and frequency of drought events to unprecedented levels.



Schematic Water Level Representation of Lake Neusiedl from 1600 to 1960.
Source: Austro-Hungarian Water Commission (1996).

While the tragedy of the described situation may cause one to sink into despair, it is important to note that the Biomimicry process is filled with opportunities to discover countless examples of solutions in Nature that could be adapted to solve human dilemmas.

Biomimicry Links, Tutorials & Exercises

Biomimicry

Biomimicry 3.8 www.biomimicry.net
Biomimicry DesignLens www.biomimicry.net/the-buzz/resources/biomimicry-designlens
Biomimicry Institute www.biomimicry.org
Biomimicry Center biomimicry.asu.edu

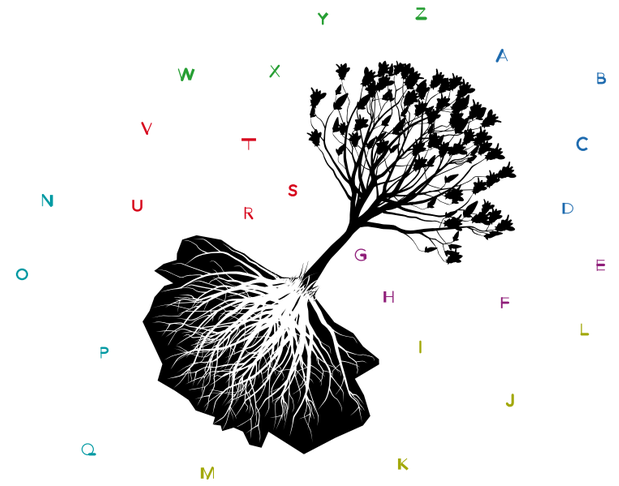
Janine Benyus, Co-founder of Biomimicry 3.8 www.n2k.world/biomimicry

Dayna Baumeister, Co-founder of Biomimicry 3.8 & **Thomas Baumeister,** Biologist
www.youtube.com/watch?v=I5m6UD0KS08

Ask Nature www.askNature.org

Alphabet of Life

Alphabet of Life / Alphabet des Lebens
Nature's Learning Lab / Lernwerkstatt Natur
www.alphabet-des-lebens.net



Regina Rowland, Biomimicry Expert, SOAK Lead
Biomimicry—Innovation & Design Inspired by Nature
www.alphabet-des-lebens.net/biomimicry_thinking.html

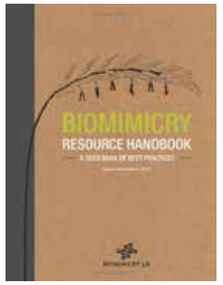
Daniel Bayer, SOAK Scientist at the Design Table, National Park & Climate Ranger
26 Biomimicry Life Principles in the Ecosystem of a Tree
www.alphabet-des-lebens.net/ecosystem_tree.html

Literature

Biomimicry Resource Handbook: A Seed Bank of Best Practices
by Dayna Baumeister, 2014

Digital: https://biomimicry.net/product/digital-handbook/

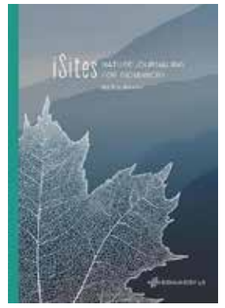
Hardcopy: https://www.amazon.de/Biomimicry-Resource-Handbook-Seed-Practices/dp/1505634644/ref=asc_df_1505634644/?tag=googshopde-21&linkCode=df0&hvadid=310644330856&hvpos=&hvnetw=g&hvrand=3724618007512318827&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=1000711&hvtargid=pla-433006204009&psc=1&mcid=e17cc880bd273e4e9ba8b0dd111caa0a&th=1&psc=1&tag=&ref=&adgrpid=57334095730&hvpone=&hvptwo=&hvadid=310644330856&hvpos=&hvnetw=g&hvrand=3724618007512318827&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=1000711&hvtargid=pla-433006204009



Zygote Quarterly Biomimicry Journal
Digital magazine showcasing the nexus of science and bio-inspired design.
zqjournal.org

iSites: Nature Journaling for Biomimicry
by Erin Rovalo, 2019 (in Europe only available on Amazon.de):

https://www.amazon.de/iSites-Journaling-Biomimicry-Erin-Rovalo/dp/1795052112/ref=sr_1_1?__mk_de_DE=%C3%85M%C3%85%C5%BD%C3%95%C3%91&crid=GIY9B6ZTRIXL&keywords=iSites%3A+Nature+Journaling+-for+Biomimicry&qid=1703089093&sprefix=isites+nature+journaling+for+biomimicry%2Caps%2C123&sr=8-1



SOAK Biomimicry 2023 Review

YouTube
Video by Luc Kopf & Elisabeth Kopf, Design Buero Baustelle
www.youtube.com/watch?v=vRIVF9kaLcg

Body & Mind Exercises

Learning from Water
Movement and Perception Exercises—Align your Body to Biomimicry Life Principles
by Regina Hügli, water activist, artist and martial arts practitioner
see photos on pages 88/89 (bottom), 114/115 and 142/143
onebodyofwater.net

SOAK Biomimicry 2023 Organizers & Partner

Initiator

Cooperative (COOP) Sustainable Universities, Austria
www.nachhaltige-hochschulen.at

Organizer & Host

University of Applied Sciences Burgenland, Austria
www.fh-burgenland.at

Co-Organizers

University of Applied Sciences FH Campus Wien, Austria
www.fh-campuswien.ac.at

FHV - Vorarlberg University of Applied Sciences, Austria
www.fhv.at

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www.dieangewandte.at/IPSD

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Biomimicry Team

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UN Agenda 2030

SOAK contributes to Sustainable Development Goals (SDGs)**:**

SOAK Biomimicry 2023 contributes, additionally, to Sustainable Development Goals (SDGs)**:**

In addition to SDG 14.1 (to reduce marine pollution), discussions included ecosystem dynamics of Lake Neusiedl in response to climate change as well as how different waters are interconnected through migratory birds, for instance.

Sustainable Development Goals sdgs.un.org

Imprint

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