Biomimicry Definitions & Key Terms

Abstract (Design Strategy) - The process of carefully studying the essential features or mechanisms that make the biological strategies effective and then translating the concepts using design language (i.e. replacing all biological terms for use in design) to share understanding of how the features work; sketches are often used to ensure accurate comprehension; alternative term is Abstracted Design Principle, which also relays how the biological strategy works without relying on biological terms. This makes cross-disciplinary collaboration easier: a design strategy focuses on function and mechanism without the baggage of potentially unfamiliar biological terms for use in engineering/design.

Biological Model - Any organism or ecosystem, along with its associated strategies and traits, that a biomimicry designer seeks to mimic/emulate

Biological strategy - The way an organism performs a function. It's an adaptation the organism has in order to survive; "how" a function is accomplished

Biologize - Analyzing and describing the function and context of an issue in biologically-relevant terms by asking, "How does nature…?" questions; To take a human need or function and rephrase it so that an answer may be found in biology, i.e., "How can I make the fabric red?" becomes, "How does nature create color?"; The second step in the Biomimicry Design Spiral

Biology - A branch of science that deals with living organisms and their vital processes (*Brittanica*)

Biomimicry - The intentional and conscious design and production of materials, structures, and systems that are modeled on biological functions and processes; the process of learning from and emulating biological forms, processes, and ecosystems to create more sustainable designs; the distinctive feature of biomimicry is the study and emulation of functional strategies to create sustainable solutions that also embody the (re)connect and ethos elements

Biomimicry Design Process - There are a few different ways to practice biomimicry, including designing for a problem/challenge by looking to nature, and vice versa: understanding a biological strategy and mimicking a design solution inspired by the model. Following a design process can be extremely helpful when setting out to solve a design challenge, and the **Biomimicry Design Spiral** provides a succinct description of the essential elements of a design process that uses nature as a guide for creating solutions. This particular Biomimicry Design Process describes the six most important steps a design team should take when seeking biomimetic solutions to a design challenge. The steps are described sequentially as a starting point. However, design teams often find themselves moving back and forth between steps or repeating them.

Biomimicry Taxonomy - A classification system used to organize information about the different ways that organisms and natural systems meet functional challenges into groups of related functions; The taxonomy diagram can be used to help navigate **AskNature.org**, or as a tool to support "thinking func-

tionally" and identifying questions to "ask" nature when beginning a design challenge

Biomorphism - Refers to designs that visually resemble elements from life (they "look like" nature), whereas biomimetic designs focus on function (they "work like" nature); Biomorphic designs can be very beautiful and beneficial, in part because humans have a natural affinity for nature and natural forms. But it's important to realize that "looking like" nature is not a reliable indicator of biomimetic design.

Bioutilization - Refers to the use of biological material or living organisms in a design or technology. For example, using trees as a material (wood) for furniture or a living wall of plants to help clean the air in an office building is bioutilization. Bioutilization can be beneficial—organisms can do a lot of things humans can't/shouldn't design for—and biomimetic designs sometimes incorporate bioutilization for this reason.

(Design) Brief - A document used by professional designers and their clients to communicate the context, goals, and requirements of a creative project

Climate - The composite or generally prevailing weather conditions of a region, such as temperature, air pressure, humidity, precipitation, sunshine, cloudiness, and winds, throughout the year, averaged over a series of years (dictionary.com)

Climate Change - Climate change is a long-term change in the average weather patterns that have come to define Earth's local, regional, and global climates. These changes have a broad range of observed effects that are synonymous with the term (nasa.gov)

Constraints - Potential barriers or limitations that a design concept might face (i.e. technology, cost, materials, regulations, culture) and how the solution could be deployed in the real world (e.g. market strategy); In terms of quantitative measurements, constraints may include limits on cost, size, weight, or performance, for example. This also includes sustainably-minded considerations, such as not wasting fresh water or emitting pollution.

Criteria - In design, criteria typically reflect the context of the how and where the design will be used and needs of the expected end-user of a technology or process, and address such things as how the product or system will function (what job it will perform and how), its durability, and its cost; Sustainability considerations should also be included; Quantifiable whenever possible, and stated so that one can tell if a given design meets them

Design (noun) - The way something has been made; the way the parts of something are formed and arranged for a particular use, effect, etc.

Design (verb) - To plan and make decisions about (something that is being built or created); to create the plans, drawings, etc. that show how (something) will be made. Note: The word "design" implies intent and forethought in both its noun and verb uses. For this reason, the Biomimicry Institute refrains from using "design" to refer to nature and to biological strategies, except in poetic usage Biological strategies are not "designed," rather they are a result of evolutionary processes.

Designer - A broad term used to refer to anyone responsible for conceiving, creating, and/or imple-

menting ideas that affect human cultural, social, technological, scientific, or financial systems at any scale

Ecological - Of or relating to the environments of living things or to the relationships between living things and their environments (merriam-webster.com)

Empathy Interviews - Usually one-on-one conversations that ask open-ended questions to gather information about specific experiences that help to reveal deep, unacknowledged needs (learningforward.org)

Engineer (noun) - a person who uses scientific knowledge to design, construct, and maintain engines, machines, or structures (collinsdictionary.com)

Ethos - The philosophy of understanding how life works and creating designs that continuously support and create conditions conducive to life; One of the three essential elements of biomimicry

Emulate - The scientific, research-based practice of learning from and then replicating functional strategies found in nature's forms, processes, and ecosystems to create more regenerative designs.

Form - In biomimicry, form refers to copying shape and/or structure, such as mimicking the shape of the bump on a lotus leaf that helps remove dirt when it rains.

Function - The outcome or role of a characteristic, mechanism, or process; what an adaptation does for an organism or what a design does for its users. (e.g., collecting water, accommodating growth, managing disturbance)

Human impact - The ways that humans and their developments affect their physical environment (nationalgeographic.org)

Innovation - A new idea, method, or device (merriam-webster.com)

Iterate - To do (something) over again or repeatedly

Mechanism - The specific way an organism performs a strategy, i.e. the details of how that function is performed for a cohesive version of how to emulate a strategy in design

Organism - Refers to a living thing that has an organized structure, can react to stimuli, reproduce, grow, adapt, and maintain homeostasis; An organism would, therefore, be any animal, plant, fungus, protist, bacterium, or archaeon on Earth (biologyonline.com)

Portal - A website serving as a guide or point of entry to the World Wide Web and usually including a search engine or a collection of links to other sites arranged especially by topic (merriam-webster.com)

Portfolio - A selection of a student's work (such as papers and tests) compiled over a period of time and used for assessing performance or progress (merriam-webster.com)

Process - In biomimicry, process refers to mimicking a series of actions, relationship associations, or operations found in nature, such as photosynthesis in a leaf for generating and storing energy from the sun

(Re)Connect - The concept that we are nature and find value in connecting to our place on Earth as part of life's interconnected systems; (Re)Connect as a practice encourages us to observe and spend time in nature to understand how life works so that we may have a better ethos to emulate biological strategies in our designs; One of the three essential elements of biomimicry

References - Something (such as a sign or indication) that refers a reader or consulter to another source of information (such as a book or passage) consultation of sources of information (merriam-webster.com)

Regenerative - When referring to emulating nature, organisms/ecosystems "regenerate," which mean processes restore or renew resources of energy and materials; in biomimetic design, to be regenerative means that the design emulates natural systems for the continuous renewal of ecological and societal functions

Rubric - A guide listing specific criteria for grading or scoring academic papers, projects, or tests (merriam-webster.com)

Scientific observations - Scientists use observation to collect and record data, which enables them to develop and then test hypotheses and theories (sciencelearn.org)

Submission - The act or condition of submitting something for consideration, approval, treatment, or action (dictionary.com)

Sustainability - Creating and maintaining the conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations. Sustainability is based on the principle that everything we need for our survival and well-being depends, either directly or indirectly, on the natural environment.

Sustainable Development Goals (SDGs) - A collection of 17 interlinked global goals designed to be a shared blueprint for peace and prosperity for people and the planet, now and into the future; The SDGs were set up in 2015 by the United Nations General Assembly and are intended to be achieved by 2030. (sdgs.un.org)

System - In biomimicry, system refers to mimicking biology at an ecosystem's level, like building a city that functions like a forest.

Trait - A specific characteristic of an organism which can be determined by one's genes, the environment, or interactions between both (genome.gov)

United Nations - An international organization founded in 1945 that is the one place on Earth where all the world's nations can gather together, discuss common problems, and find shared solutions that benefit all of humanity. It comprises 193 Member States. (un.org)

Video Pitch - A concise video presentation created to persuade viewers that an idea has merit. Some tips on making a video pitch include keeping it short and concise, detailing a storyline in advance that includes the problem to be solved, the process of looking to nature for a solution, and the emulated solution that addresses the problem; the goal is to make it compelling for the audience and share an overview of the key project components; check permissions for material used and be sure sources references are credited