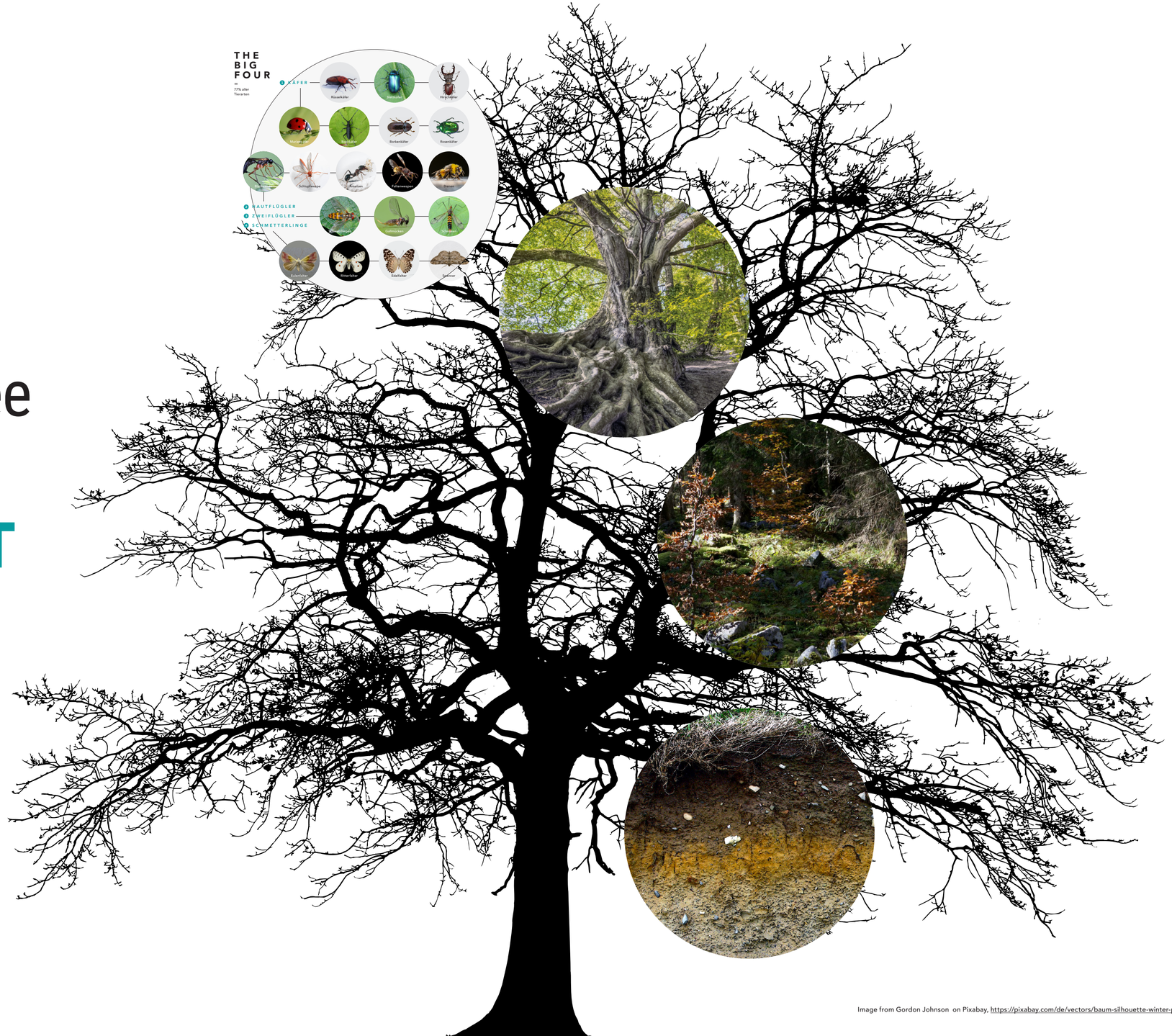
26
LIFE PRINCIPLES
& 26 Examples in the Ecosystem of a Tree

PART 4

DEVELOPMENT & GROWTH



Biomimicry DesignLens
Biomimicry.net | AskNature.org

Image from Gordon Johnson on Pixabay, https://pixabay.com/de/vectors/baum-silhouette-winter-pflanze-3979965/

26 LIFE PRINCIPLES

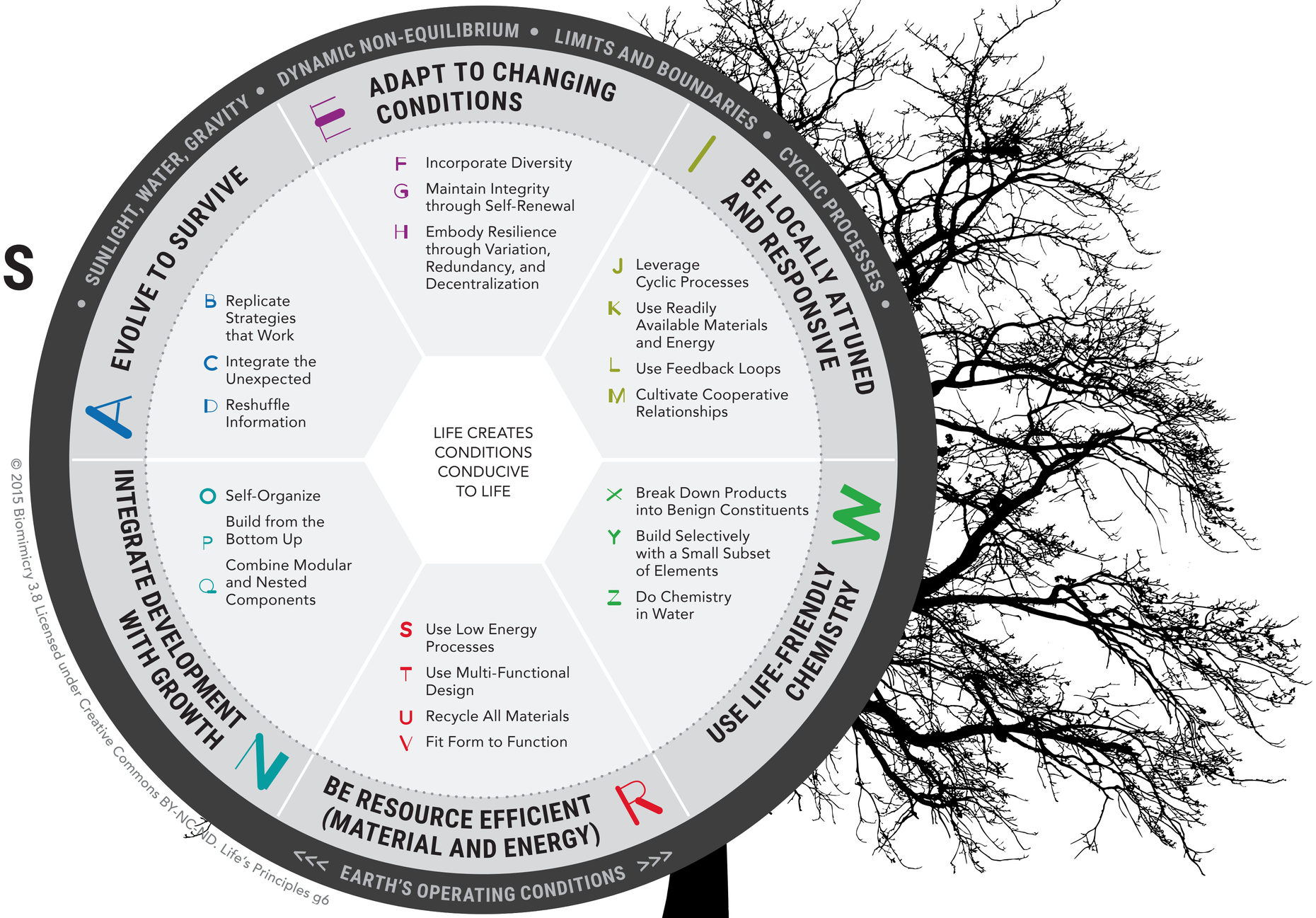


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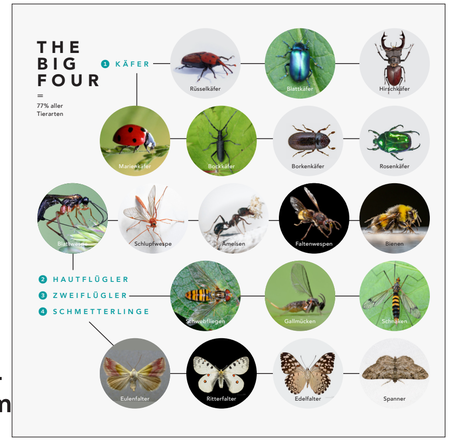
Image from Gordon Johnson on Pixabay, https://pixabay.com/de/vectors/baum-silhouette-winter-pflanze-3979965/

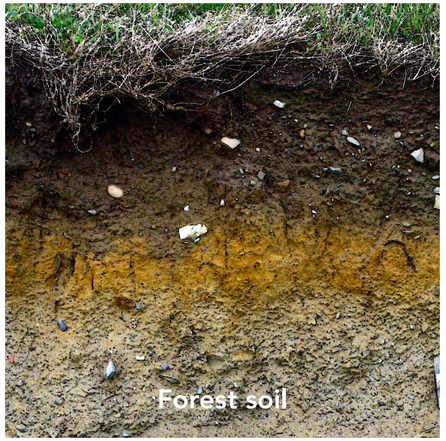
PART 4

INTEGRATE DEVELOPMENT WITH GROWTH

Holo-
meta-
bolism



Self-Organize



Build from the
Bottom Up

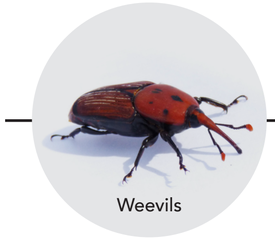
Combine
Modular and Nested
Components

THE BIG FOUR

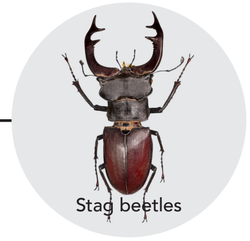
=

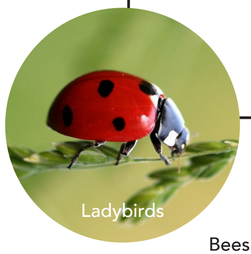
77% of all animal species in Austria

1 BEETLES

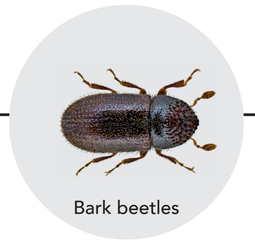

Weevils

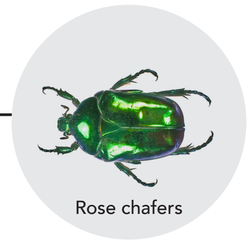

Leaf beetles


Stag beetles


Ladybirds

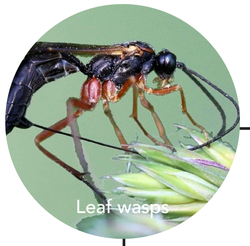

Longhorn beetles

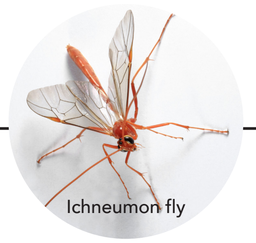

Bark beetles

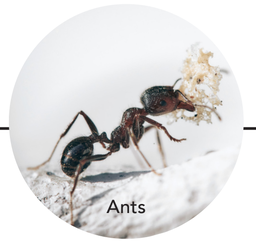

Rose chafers

2 HYMENOPTERA

Bees


Leaf wasps


Ichneumon fly


Ants

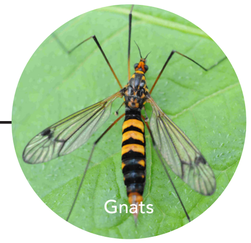

Potter wasps


Bienen

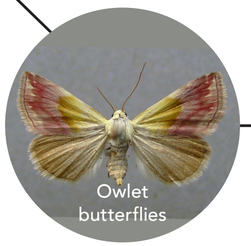
3 FLIES


Hoverflies

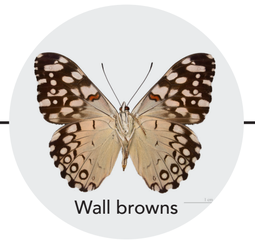

Gall midges

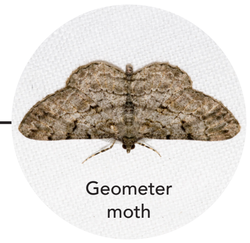

Gnats

4 BUTTERFLIES


Owlet butterflies


Swallow tails


Wall browns


Geometer moth

All images from Wikimedia Commons and/or Pixaby

Master Life's Principle

Integrate Development with Growth

Example in Nature

The Big Four *
Holometabolism

Most insects bear the trait of holometabolism, which means they go through a complete metamorphosis from the juvenile stage to the adult. The larval phase is devoted to eating and growing. During the following pupal stage in which no nourishment is consumed, a complete remodelling of the body takes place **(metamorphosis)**. After the last shedding of the cocoon a fully mature and reproduction-capable insect emerges **(imago)**. The Big Four are mega-diverse insect orders and comprise 77 percent of all animal species in Austria. Their way of growing and developing in separate phases can thus be seen as an extremely successful model of nature.

Design Guideline

Invest optimally in strategies that promote both development and growth.

Mixed forest © Conrad Amber, http://conradamber.at

Life's Principle

Self-Organize

Example in Nature

Naturally growing mixed woodland

Mixed woodland instead of monoculture

In locations with different microclimates (light, water, temperature, ground, stones and rocks, exposure, vegetation density, etc.) each tree type adapted to the respective climate germinates and thrives accordingly. Under natural conditions this encourages the growth in lower-lying locations of species-rich mixed woodlands with diverse fauna and flora. The development from bush land to young forest and then to a climax community happens according to a natural temporal sequence of plant communities (succession) and guarantees highly resistant eco-systems.

Design Guideline

Create conditions that foster the interaction of components in order to enrich the system.

Humus layer. Source: Regierungspräsidium Karlsruhe: Unterrichtsmaterialien zum Thema Boden, Karlsruhe 2003, https://de.serlo.org/nachhaltigkeit/boden-fruchtbarkeit/bodenfruchtbarkeit-humusaufbau-ist-humus

Life's Principle

Build from the Bottom Up

Example in Nature

Forest soil

Soil formation

Domestic woodland soil formed on post-Ice Age bedrocks inhabited by the simplest forms of life (sand-stone mixture on rock). Frost and the root strength of the primary inhabiting plants caused the granulation of minerals (stones and rocks). Soil animals and microorganisms transformed vegetal matter into humus, and over the millennia a mighty soil complex accumulated (1 cm per 100 years). Various soil horizons gradually became differentiated: the detritus layer (dead plant material) lies on the soil surface, under it in the A horizon is the richly nutritious humus layer, while in the B horizon the transformation of minerals takes place, and in the lowest C horizon the granulation of the parent rock. With increasing complexity of the soil structure the potential is enhanced for interaction with organisms, producing rich soil eco-systems.

Design Guideline

Assemble components one after the other.

Tree, Image from FelixMittermeier on Pixabay, https://pixabay.com/de/photos/baum-wurzeln-wald-beeindruckend-3385957/

Life's Principle

Combine Modular and Nested Components

Example in Nature

Tree

Branch and root ramifications

The tree continually forms ramifications in its crown and roots, a fractal structure that takes up more and more space. The most important task of the aboveground part of this structure is photosynthesis, while the subterraneous root system functions as anchor and for provision of nutrients and water. The investment in the biomass of the tree's crown relates directly to the ramification of the roots.

Design Guideline

Füge mehrere Einheiten schrittweise von einfach zu komplex ineinander.

TEAM

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BIOMIMICRY

»Biomimicry — from the Greek, *bios*, meaning “life”, and *mimesis*, meaning “to imitate”,
is an emerging discipline with an ancient practice«.
Dayna Baumeister — Co-founder of Biomimicry 3.8
www.biomimicry.net

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