

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

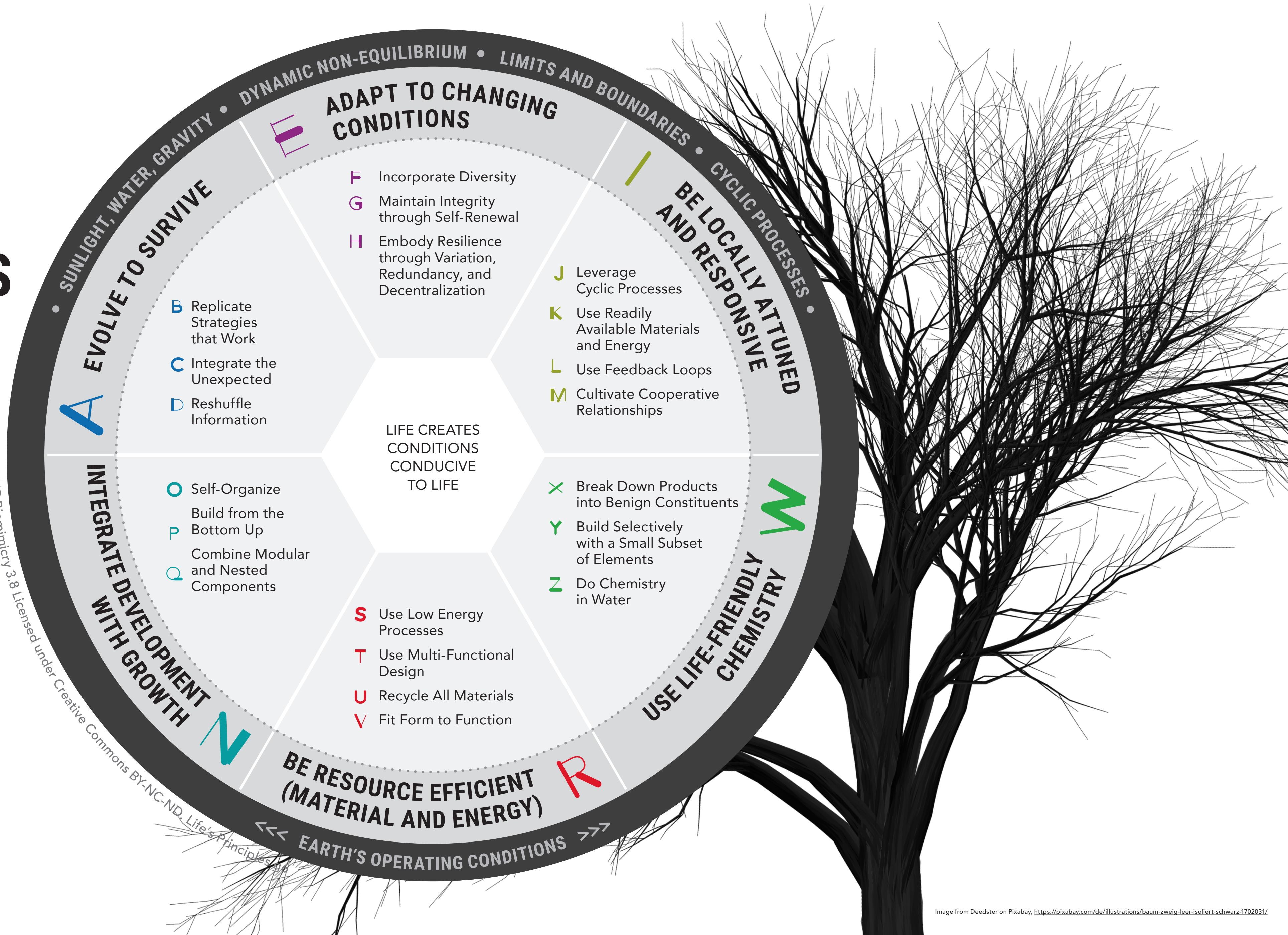
PART 5

## RESOURCES

Biomimicry DesignLens  
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# 26 LIFE PRINCIPLES

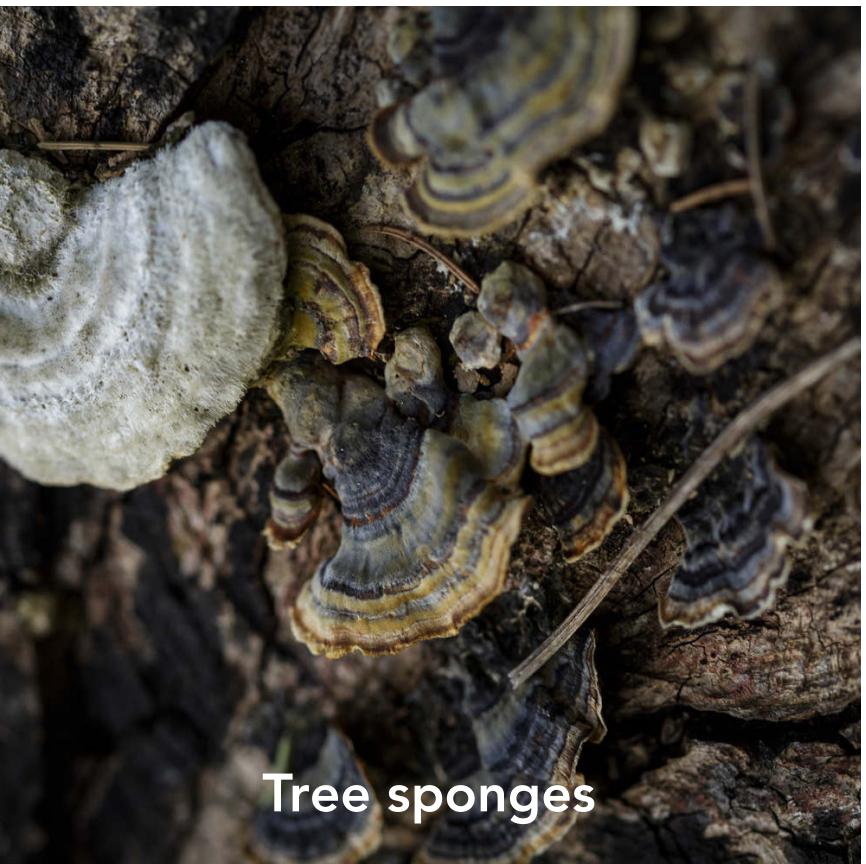


## PART 5

# BE RESOURCE-EFFICIENT (MATERIAL AND ENERGY)



Wood-nesting  
wild bees



Tree sponges



Woodpeckers



Anthills



Rose chafer

Use Low Energy  
Processes

Use Multi-Functional  
Design

Recycle All Materials

Fit Form to Function



Master Life's Principle

## Be Resource-Efficient (Material and Energy)

Example in Nature

**Wood-nesting wild bees**

Brood strategies

Wood-nesting wild bees choose their nesting place and the amount of provisions for the larva according to criteria of the shortest flights to supply the necessary resources. They live solitary; each female gathers pollen as victuals for the larva in their brood cells, which the bees fashion in the already existent mines made by the larva of the longhorn beetle. They use moist clay as intermediate walls of the single cells and to close off the nest. This building material and the larva provisions have to be procured from the environment with great energy and time investment; short flights and low material requirements therefore favour propagation success.

Design Guideline

**Skillfully and conservatively take advantage of resources and opportunities.**





Life's Principle

## Use Low Energy Processes

Example in Nature

**Tree sponges or agarics,  
e.g. white rot fungi (*Ceriporiopsis*)**  
Use of catalysts

Fungi depend on procuring nutrients from their direct surroundings. Tree sponges are capable of digesting wood, an ability that only few living creatures possess. With the help of enzymes (catalysts) they macerate the almost indigestible lignin stored in the tissue of trees. The enzymes enable this procedure at low temperature. In this way the fungi ensure that dead wood decomposes and yet again becomes the basic nutrition for many other living creatures.

Design Guideline

**Minimize energy consumption by reducing  
requisite temperatures, pressures, and/or  
time for reactions.**

S



Life's Principle

## Use Multi-Functional Design

Example in Nature

### Woodpeckers (*Picidae*) Beak tool

The versatility of the woodpecker's beak offers multifunctional options of use as a gripping, hacking and drumming tool. It is used for hacking when searching for fodder, in building nest hollows and in quarrelling and fighting, as tweezers for picking up food, as a tool for plumage-grooming, and to turn its eggs in its nest; it also enables the bird to produce a loud drumming sound, a self-promotional signature tune to gain attention. And last but not least, the woodpecker feeds, drinks and sings with its beak.

Design Guideline

**Meet multiple needs with one elegant solution.**

T



#### Life's Principle

## Recycle All Materials

#### Example in Nature

### **Anthills of the red wood ant (*Formica rufa*)** Circular economy in the woodland soil

Hill-constructing wood ants play a pivotal role in the material cycle of woodland. They construct nest hills made of residue materials from trees (mostly spruce needles and small twigs) of a height of up to one and a half metres, with the nest also attaining the same dimension under the earth. It is a junction for trading building materials, and, in a labyrinth of tunnels and chambers, they maintain their nurseries, fodder depots and refuse disposal storage. The nutrients concentration yielded by long years of accumulating organic material thus forms a favourable basis for the growth of new trees.

#### Design Guideline

### **Keep all materials in a closed loop.**





Life's Principle

## Fit Form to Function

Example in Nature

**Rose chafer (*Cetonia aurata*)**

Wing form

A slight change in form at the edge of the rose chafer's wing cases allows it to spread its rear wings for flight without having to lift its protective armour from its body. This avoids the disturbing braking effect through the lifted wing cases during flight. The result is impressive. Despite its considerable body size of 1.4 to 2 cm it is one of the best flight acrobats in the beetle kingdom, which is essential for it as a day-active bloom visitor.

Design Guideline

**Select for shape or pattern based on need.**



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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](http://www.biomimicry.net)

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