# PATTERNS IN NATURE

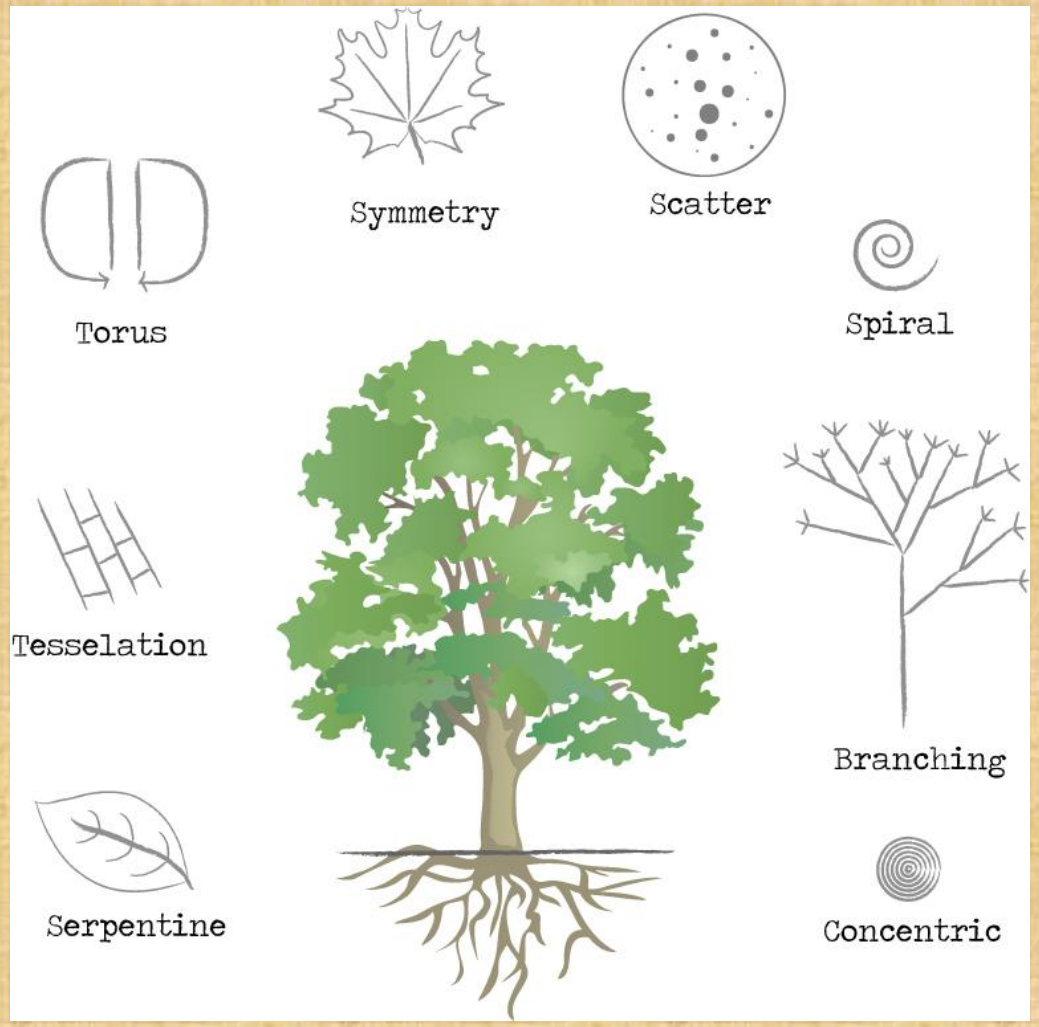
Understanding patterns & Practical applications

# WHAT ARE PATTERNS?

- **Patterns** are visible **regularities of form found in the natural world**
- It incl. **symmetries, waves, streamlines, cloud forms, spirals, lobes, branches, scatters and nets**
- **It is the form created by interaction with surrounding energies by pressure from 2 or multiple media creating an Intrusion in one way or the other to create a form of existence**
- **Everything is a fractal pattern**
- A **fractal** is a never-ending **pattern**: created by repeating a simple process over and over in an ongoing **feedback loop**
- **Patterns recognition is fundamental to human ecologic success & core of permaculture design**
- **Pattern recognition is a linking discipline** that applies equally to geography, biology, music, astronomy, physics, economics, physiology, technology

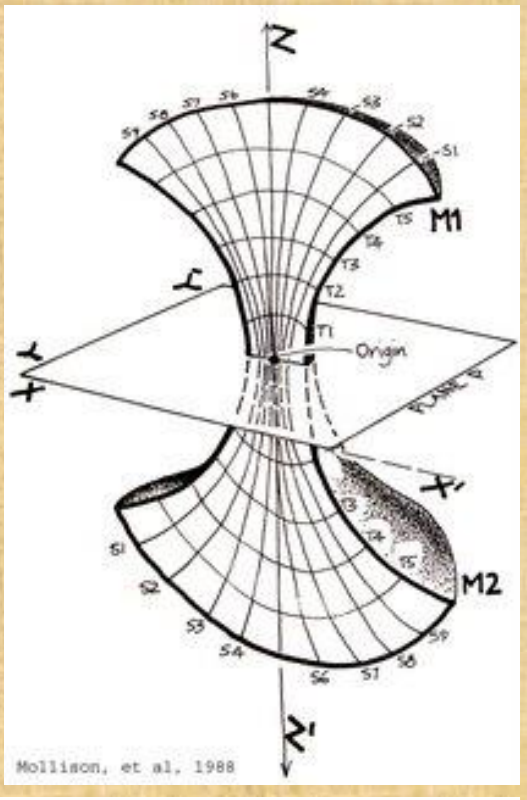
# PATTERNS FORMS IN NATURE

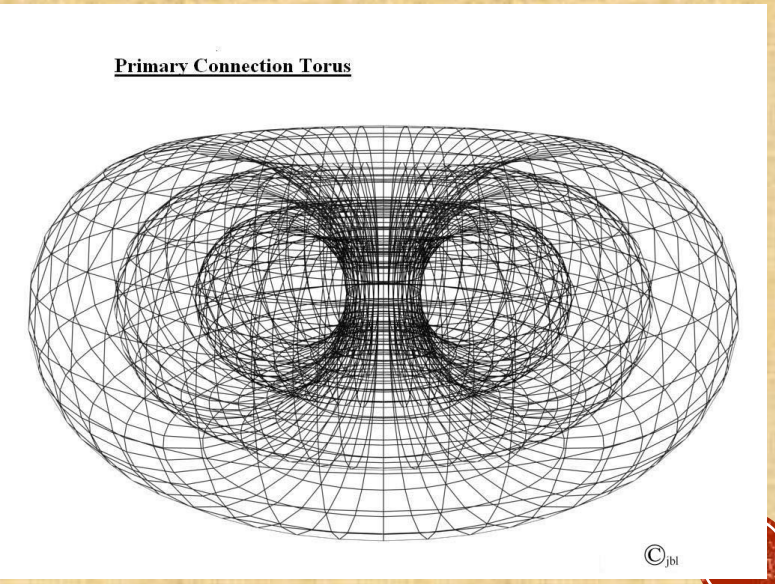
- Waves, streamlines
- Cloud forms
- Spirals (spiral patterns)
- Lobes
- Branches (branching patterns)
- Ripples patterns
- Streamline patterns
- Growth spirals
- Spirals
- Summation series



# THE GENERAL CORE MODEL

- **There are different forms of patterns but all are related to a general core model of events: Events of form** (pattern forms are created ):
- Patterns are everywhere. We are surrounded by forms of LIFE & FLOW
- Ex: the natural patterns of the universe, trees, fruits, birth,,,,
- There are **ONLY A FEW PATTERN FORMS but infinity of variations** (in sizes with slide imperfections)
- **This model resembles a tree and can differentiate into: waves, streamlines, spirals, cloud forms, toroid's, branches, scatters and nets**
- **<u>Inspire design ideas</u>**
- Patterns offer us a way to **<u>manipulate flow with minimal effort</u>**



# WHY PATTERNS ARE IMPORTANT?

- 1. **A MORE GENERAL PATTERN UNDERSTANDING FOR THE COMPREHENSION OF THE MEANING OF NATURE AND LIFE**
- **A LINKING DISCIPLINE** that **can be applied to geography, geology, music, art, astronomy, particle physics, economics, physiology, and technology**
- PATTERNS have **great relevance to education**, **at every level as a LINKING DISCIPLINE**
- **PATTERNS have great potential for DESIGN of SUSTAINABLE SETLLEMENTS**
- **Efficient use of space, energy flows in landscapes by close observation of patterns**
- **Surface is expensive. Nature will minimize it**

# TESSELLATION PATTERNS

- Tessellations form a class of patterns found in nature. The arrays of **hexagonal cells** in a
- Ex: honeycomb
- Ex: or the diamond-shaped scales
- Ex: pattern snake skin are natural examples of tessellation patterns.

- **Distinct shapes are formed from several geometric units (tiles) that all fit together with no gaps or overlaps to form an interesting and united pattern.**

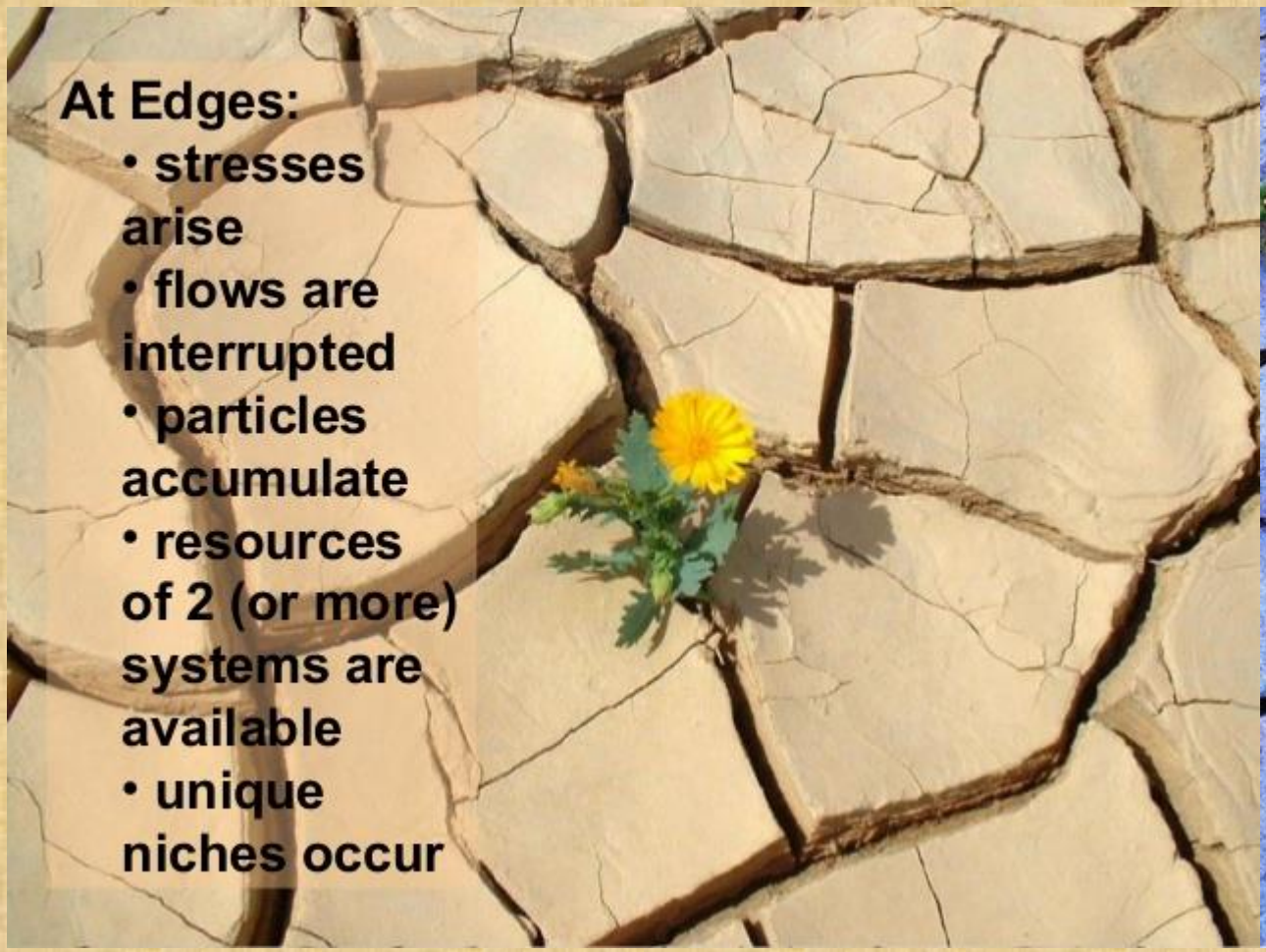
# FRACTAL PATTERNS

Fractals are **objects in which the same patterns occur again and again at different scales and sizes.**

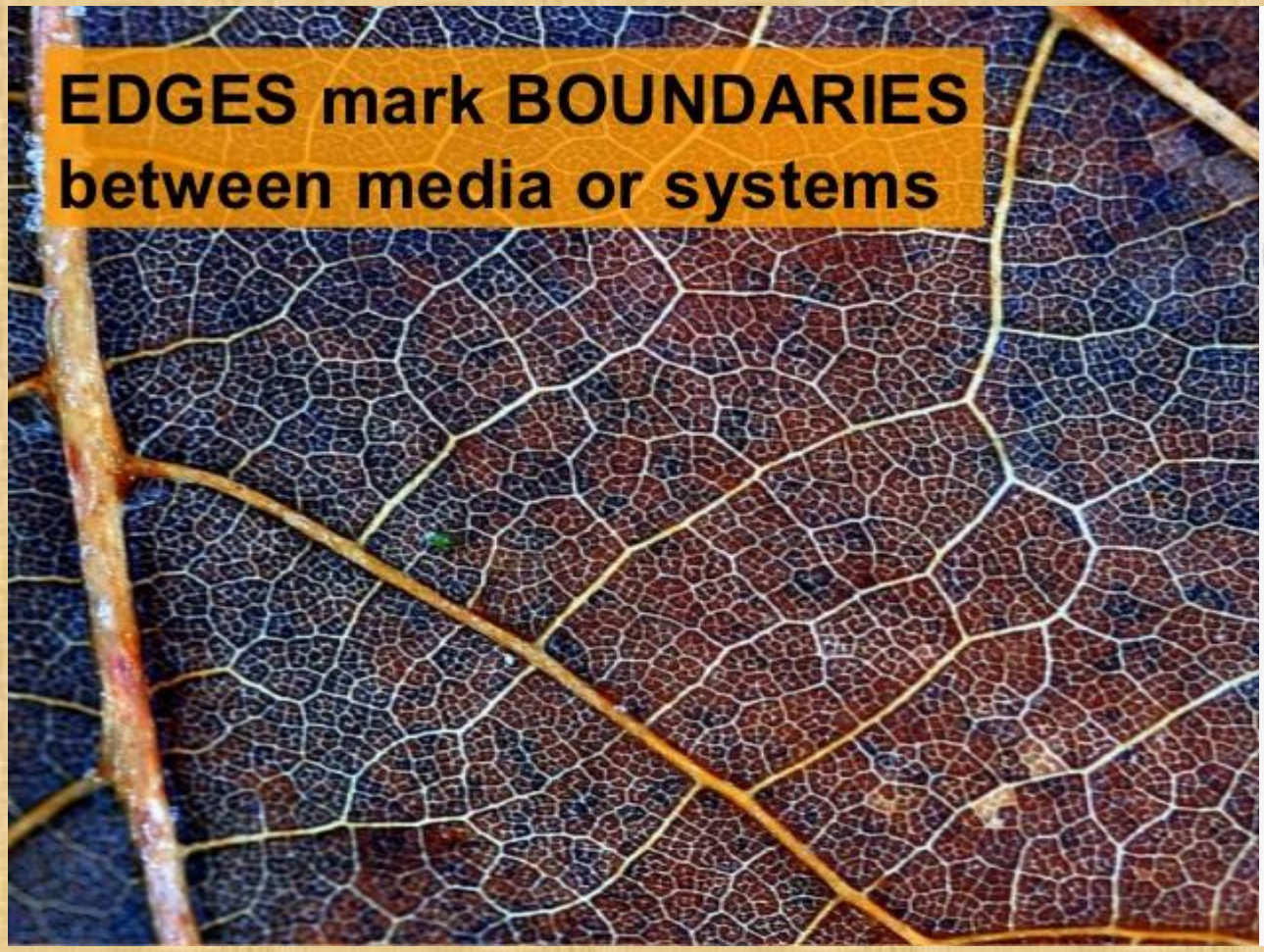
This **"self-similarity" goes infinitely deep**: each pattern is made up of **smaller copies of itself, and those smaller copies are made up of smaller copies again, forever.**

Many natural phenomena are fractal to some degree

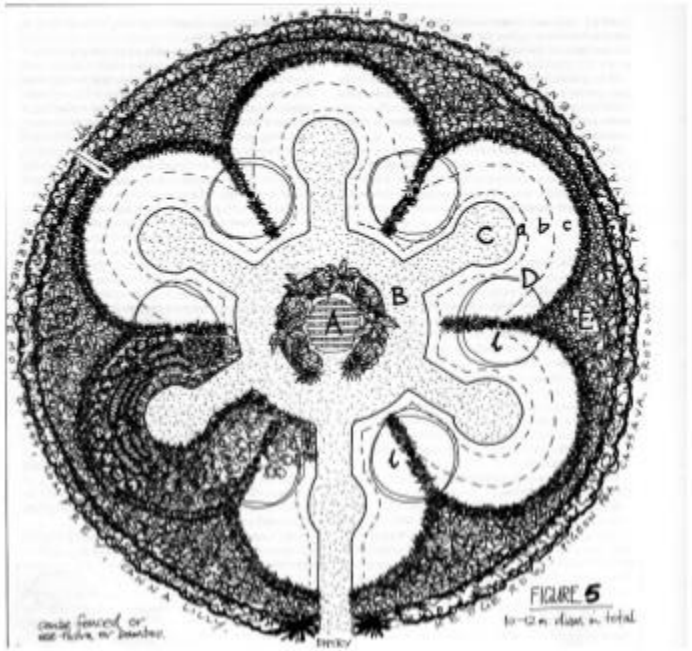
*The symmetry of this snowflake is repeated several times.*
*The central hexagon sprouts six more rough hexagons, and the outer corners of those produce still more hexagonal outgrowths.*


At Edges:
• stresses arise
• flows are interrupted
• particles accumulate
• resources of 2 (or more) systems are available
• unique niches occur


Guy Tal
Photography



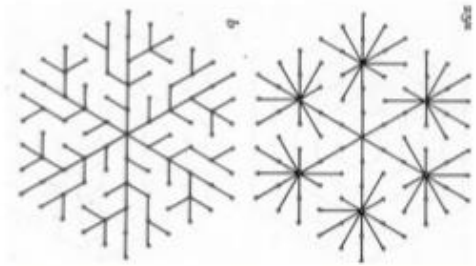

## Optimizing Edge



# THE BRANCH (BRANCHING PATTERNS)

**Branches: *for collection and distribution***

**Nature uses Pattern to solve *Spatial Relationships***



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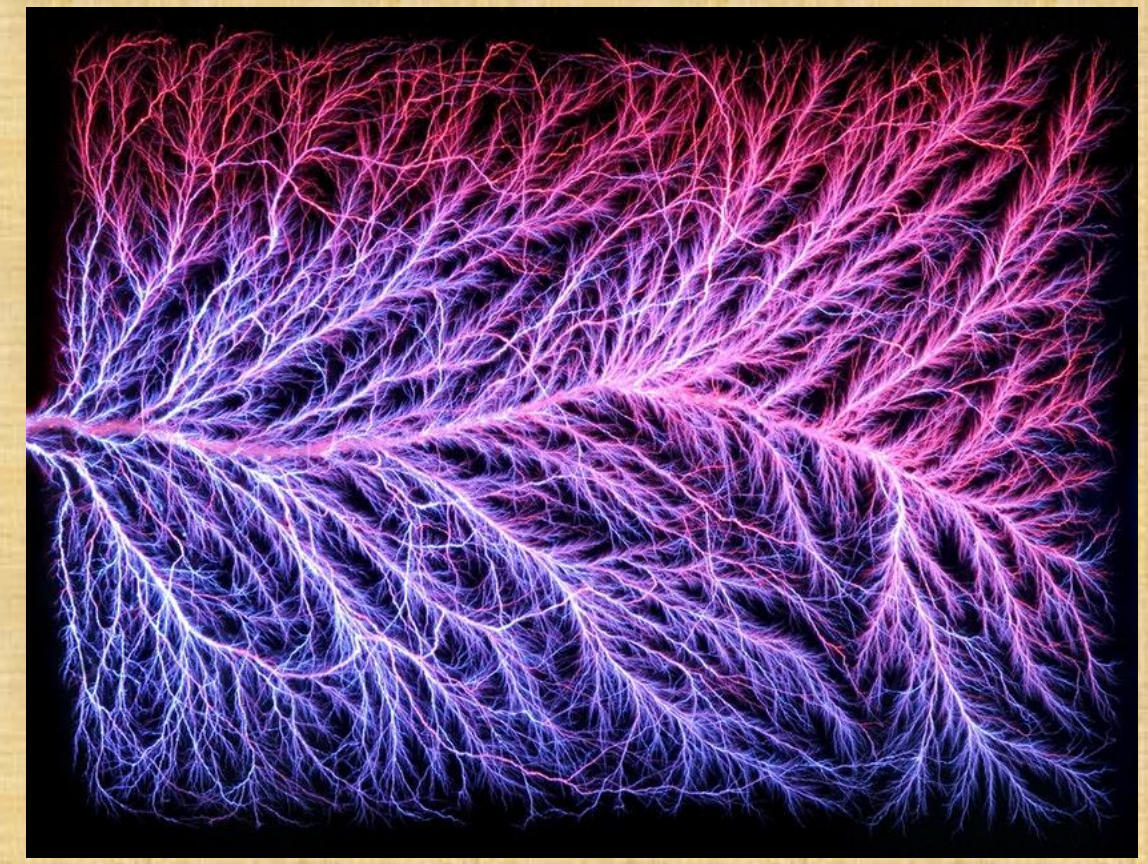
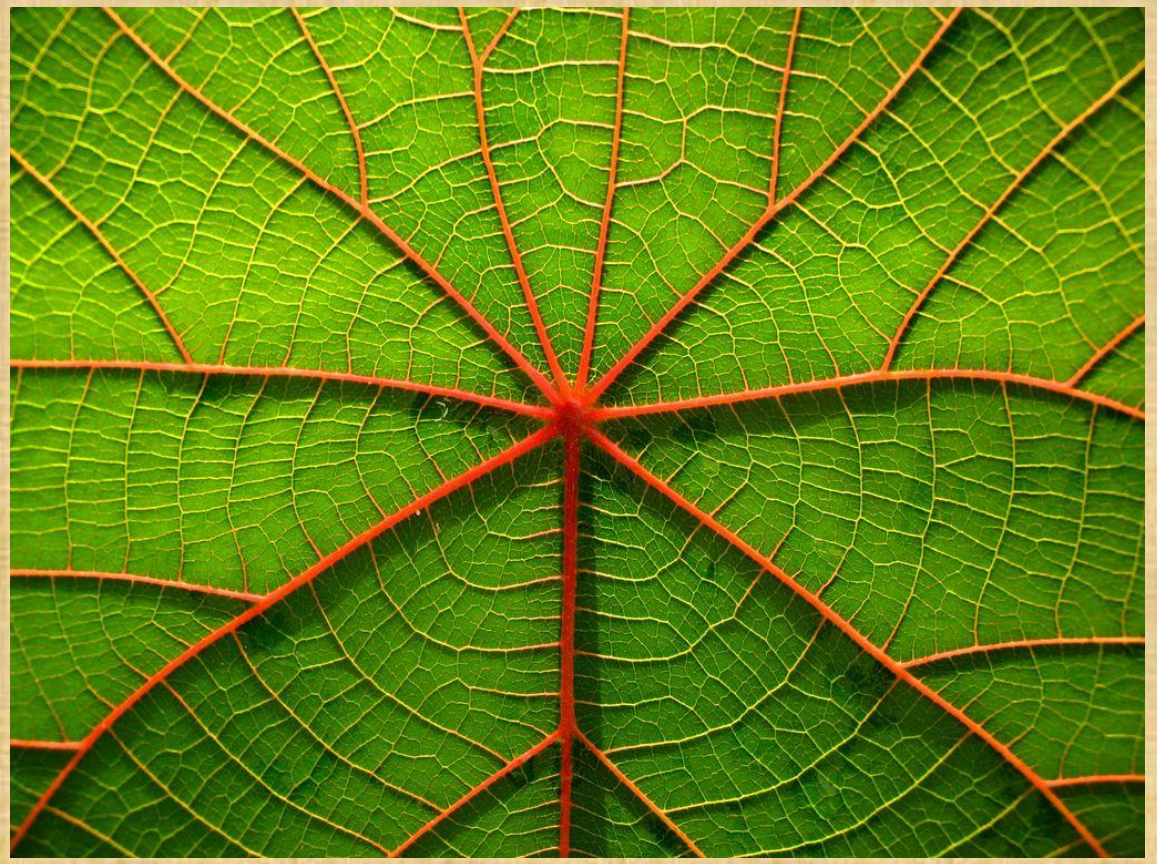


Electric discharge



Branching pattern in leaves

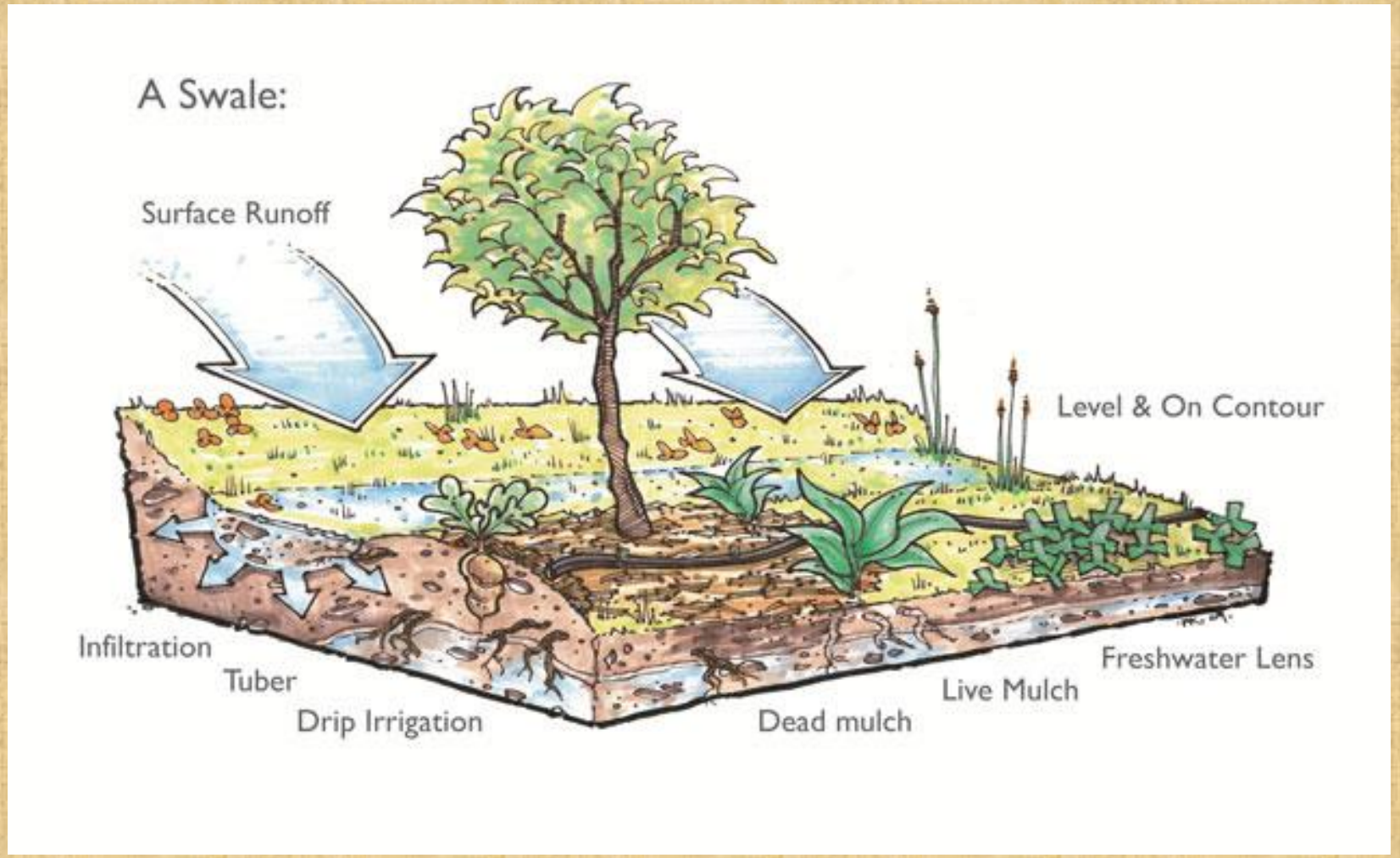
# WAVE PATTERNS

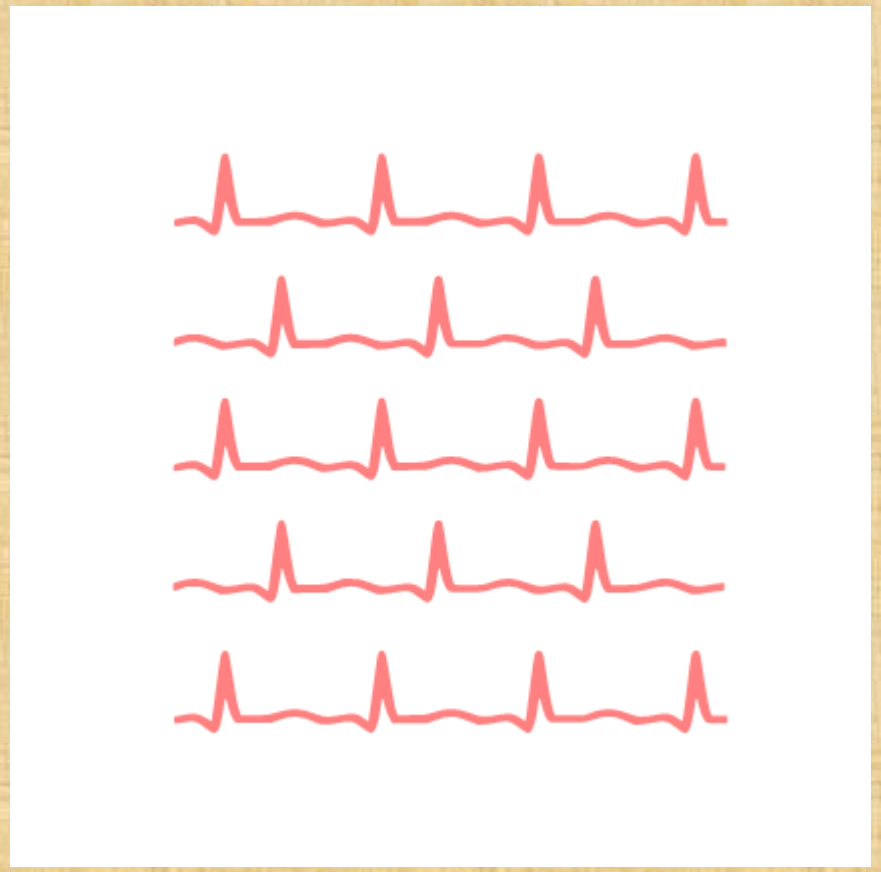
The **wave patterns**, streamlines and flows **provide pulsation, timing**

The **possibility of measurement** over time into a system

Waves are found in water

**Waves are found in swales on contours**
**Your heartbeat is a wave pattern**





Heartbeat wave pattern

**The Wave, a sandstone formation in northern Arizona**

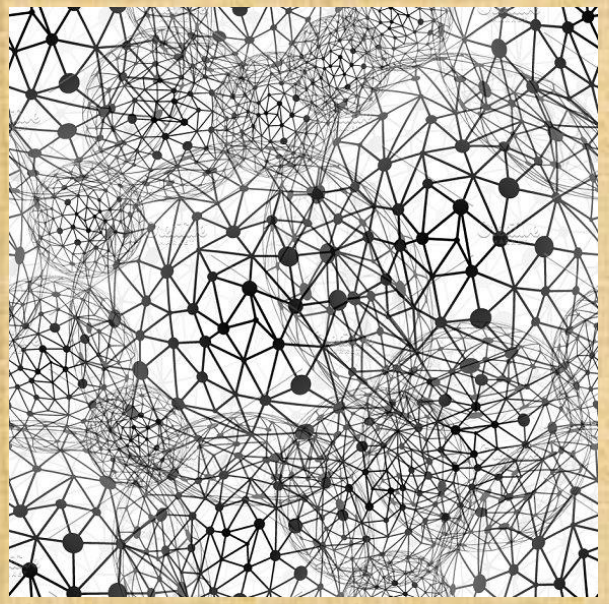
# NET PATTERNS

The net or mesh is useful for sorting, collecting, filtering and small surface exchange.

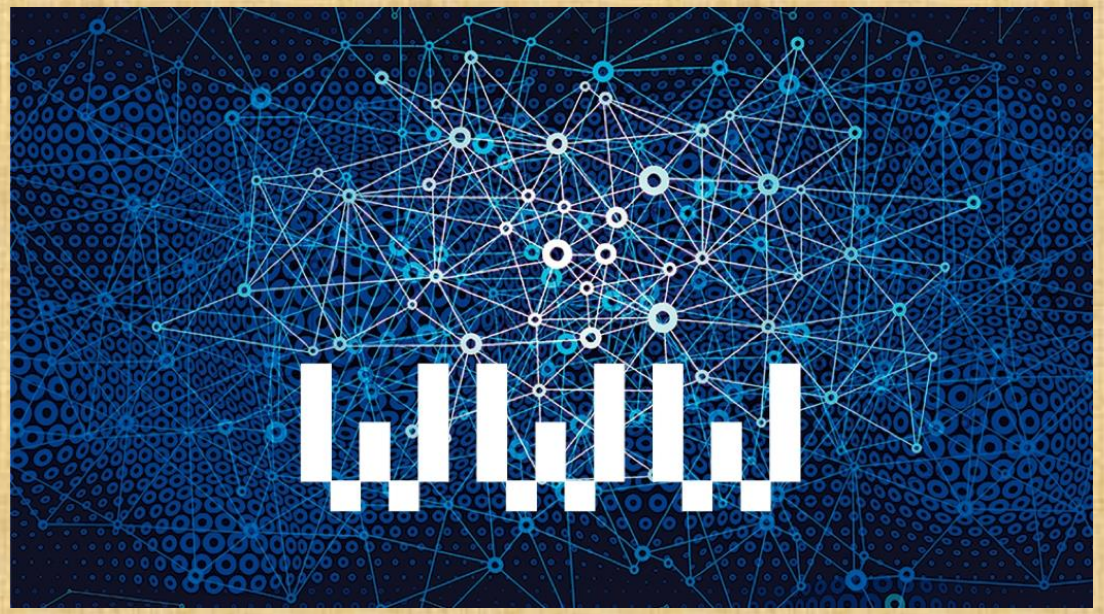
It both **distributes tension and force**
In nature we find that pattern in **spider webs** and **bird nests**. We can use the **strengthen and reinforce.**

For instance straw mulch, when stacked
At different angels it is not easy removed by wind or rain.

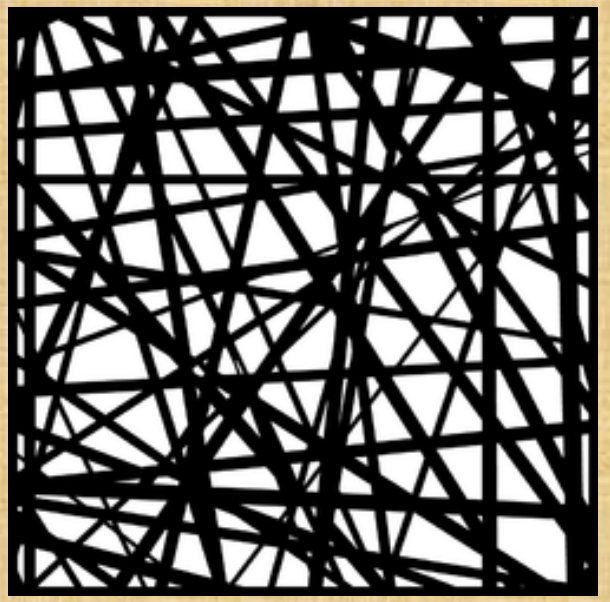
Spider web



Neural network



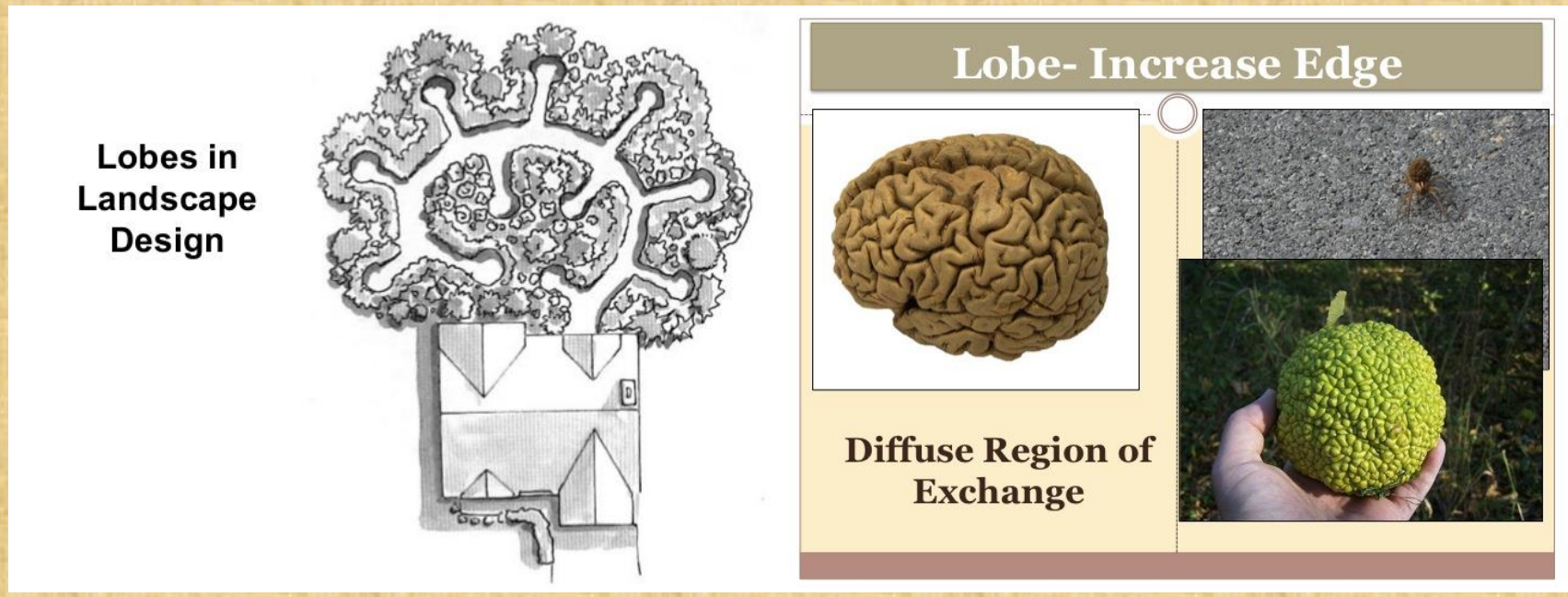
World wide web pattern

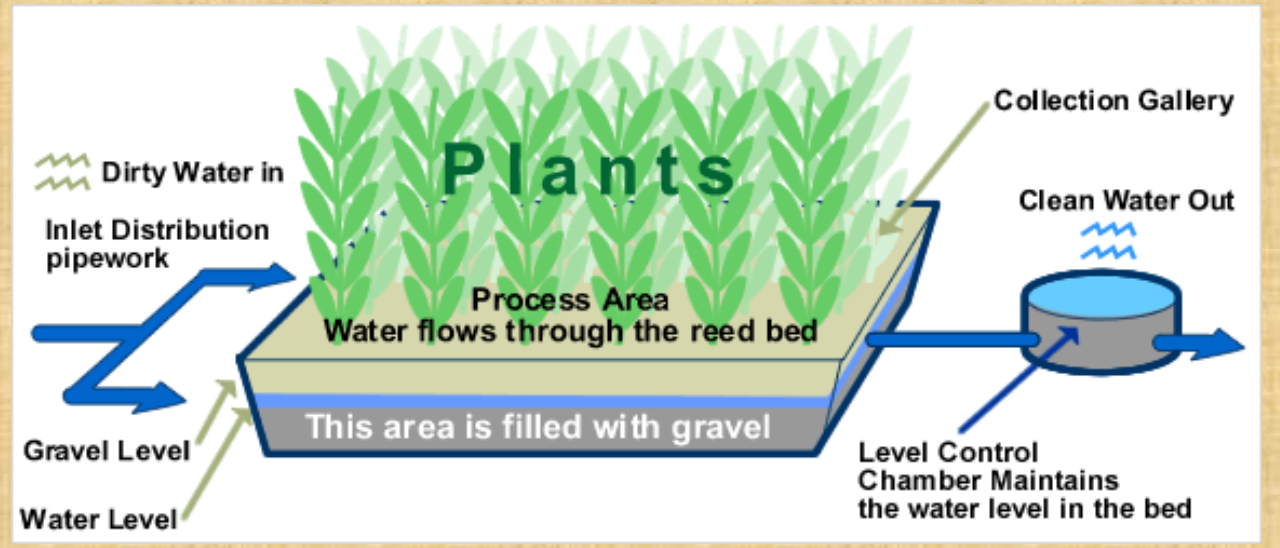


Birds nest pattern

# THE LOBE

- The lobe provides surface, edges or interfaces where 2 things meet
- The **edge is the most productive and fecund part of the system, where the most interesting things happen**
- Ex: to provide **natural waste water treatment, build stacked rocks with a lot of place for things to grow and clean the water**



# SPIRAL PATTERNS

Red Cabbage
Multiple Fibonacci Spiral

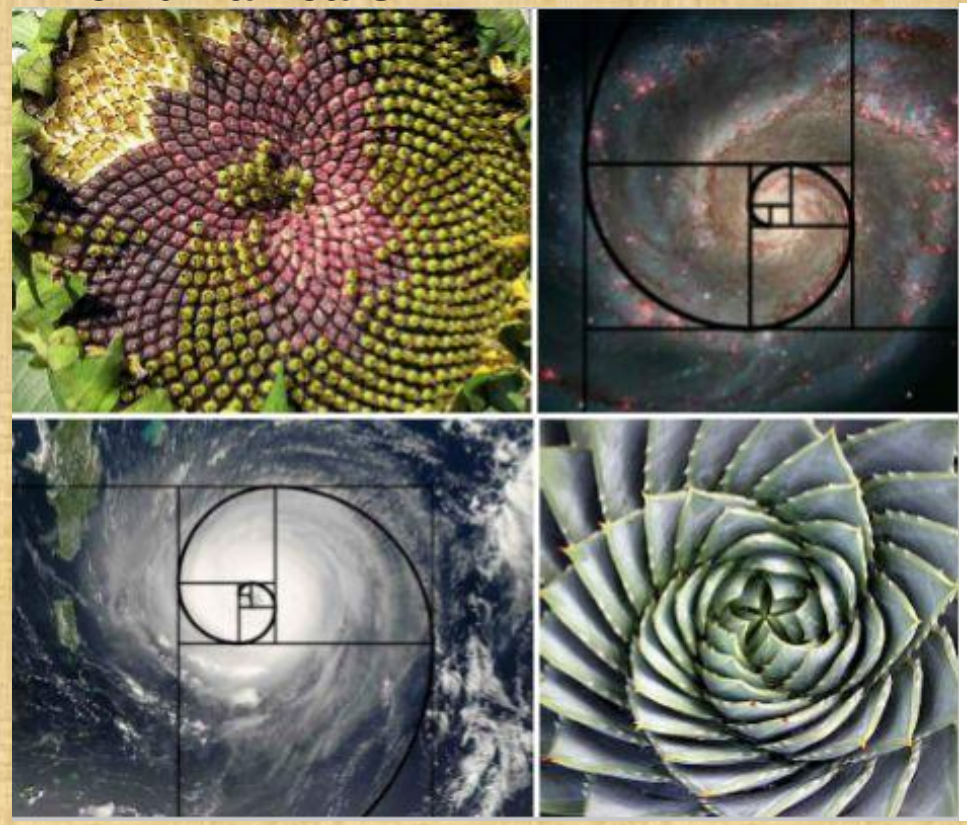
- Spirals are usually **patterns of growth and flow**
- It Is found in water swirling down a drain
- The shell of a snail
- In tornadoes
- It has the function of **speeding up or slowing down**, **concentrating or dispersing** depending what way the flow is going
- Branches of the stem of a plant go in a **spiral, maximizing exposure to the sun**

Spiral Aloe

# THE GOLDEN STREAMLINING PRINCIPLE

**The Fibonacci sequence is a repeated pattern that appears all across nature. Starting at one, each number is an addition of the two previous numbers**: 1, 1, 2, 3, 5, 8, 13,…

The combination of the Fibonacci sequence and the Golden or GROWTH Ratio that appears in a variety of plants, as well as **other natural patterns, like human ears.**



## The Fibonacci Sequence

0, 1, 1, 2, 3, 5, 8, 13, 21, 34 . . .

1/1 = 1.0
1/2 = 0.5
2/3 = 0.667
5/8 = 0.625
8/13 = 0.615
13/21 = 0.619
The ratio of further pairs approaches 0.618034 . . .
THE GOLDEN MEAN

# GROWTH SPIRALS

Nautilus Shells: Logarithmic growth spirals

Spiral pattern: Seed Head of Sunflower

# ADAPTIVE PATTERNS

- Patterns of the veiled chameleon, *Chamaeleo calyptratus*, provide camouflage and signal mood as well as breeding condition. adaptive purpose

# PATTERNS AND WAYS TO APPLICATION

Permaculturists look at **what functions the design is supposed to achieve**

- WHAT PATTERN TO CHOOSE?
- **How are we moving people and materials around**, **blocking wind**, **creating warm microclimates**, etc. —and then look for patterns that help do that.

- **Nature uses branching patterns** to **collect and distribute energy** and materials

- The way roots and branches of a tree collect and distribute sun, water, and nutrients

- If there are places to collect or distribute things in our design, **maybe a branching pattern is needed**

- **Many garden paths are in a branching pattern**; we're collecting and distributing water, food, mulch, compost materials, and so on.

- Mound and lobe patterns can increase surface area and **exposure—are** there places that we need to do that?

# PRACTICAL APPLICATIONS OF PATTERNS IN DESIGN

*Industrial Mixing Device Based off the Golden Ratio*

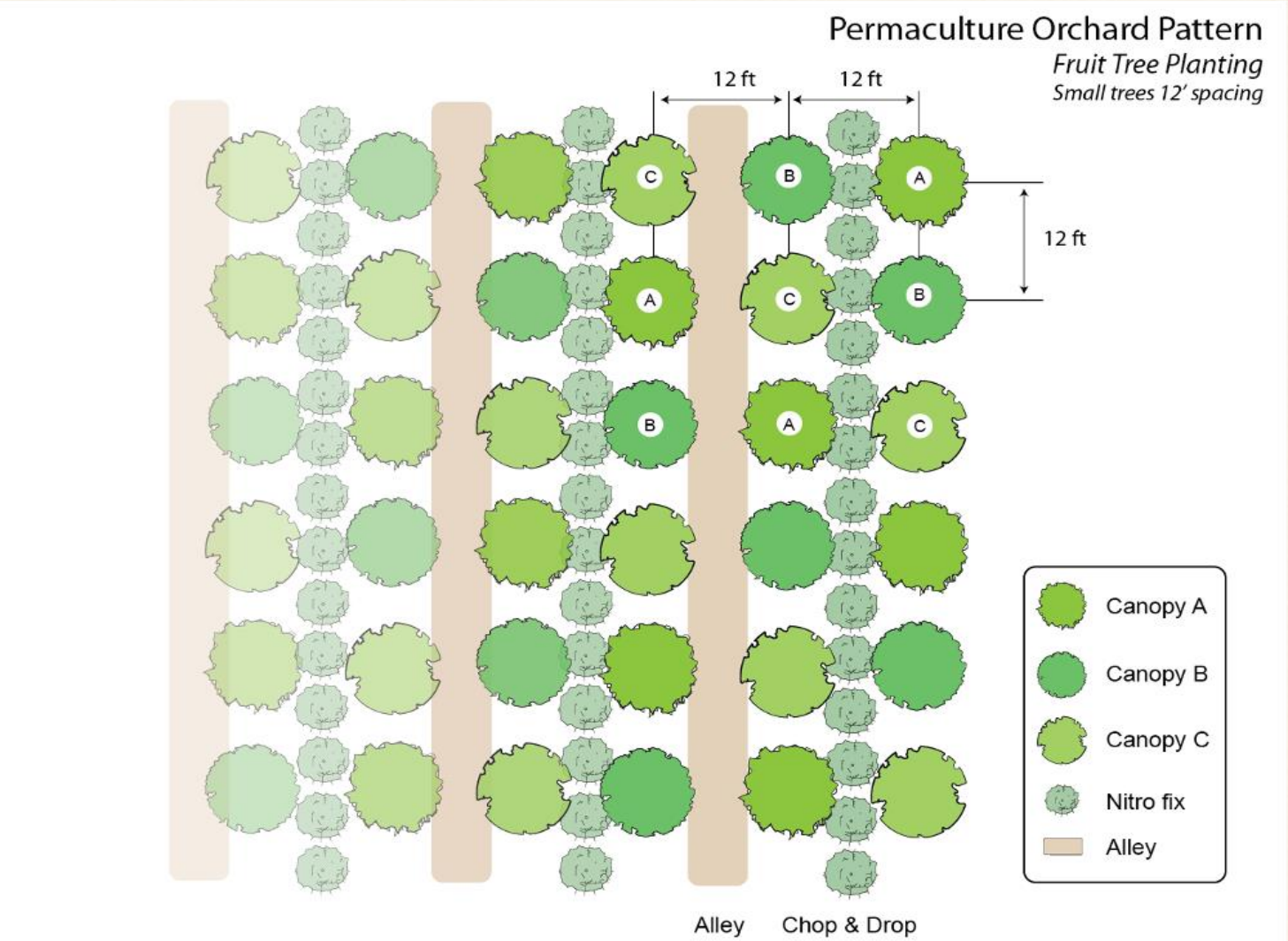
*Mandala Garden, ferme du Bec Hellouin*

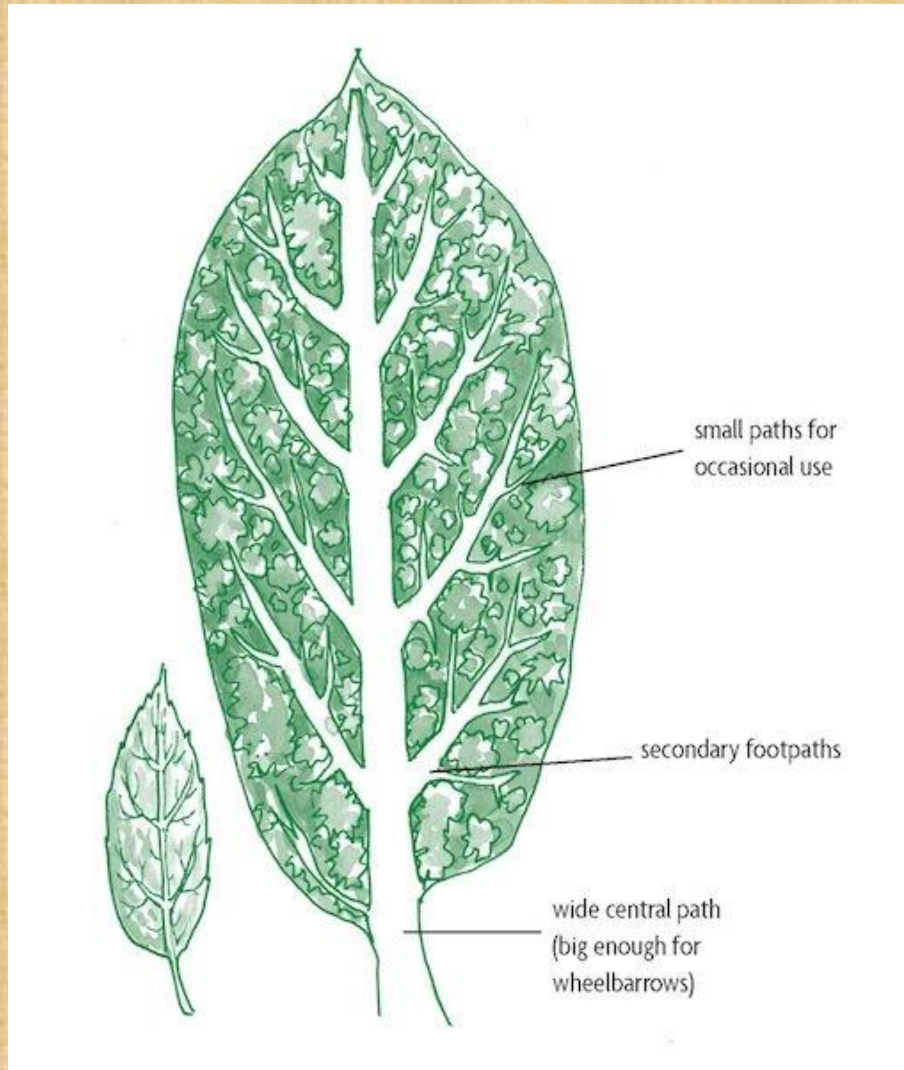
# Adapt your patterns to your landscape

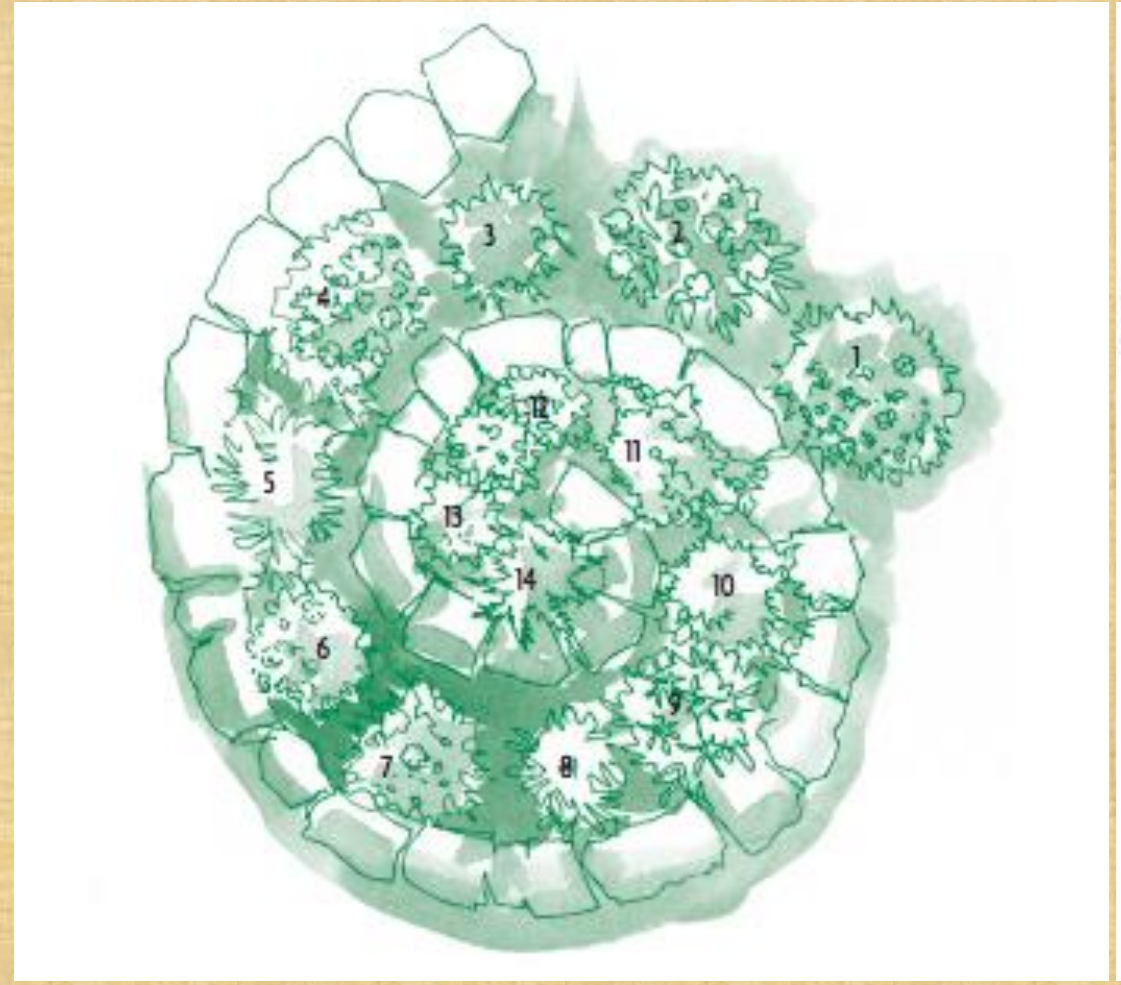
Using Spiral patterns in gardens

Using wave patterns in gardens

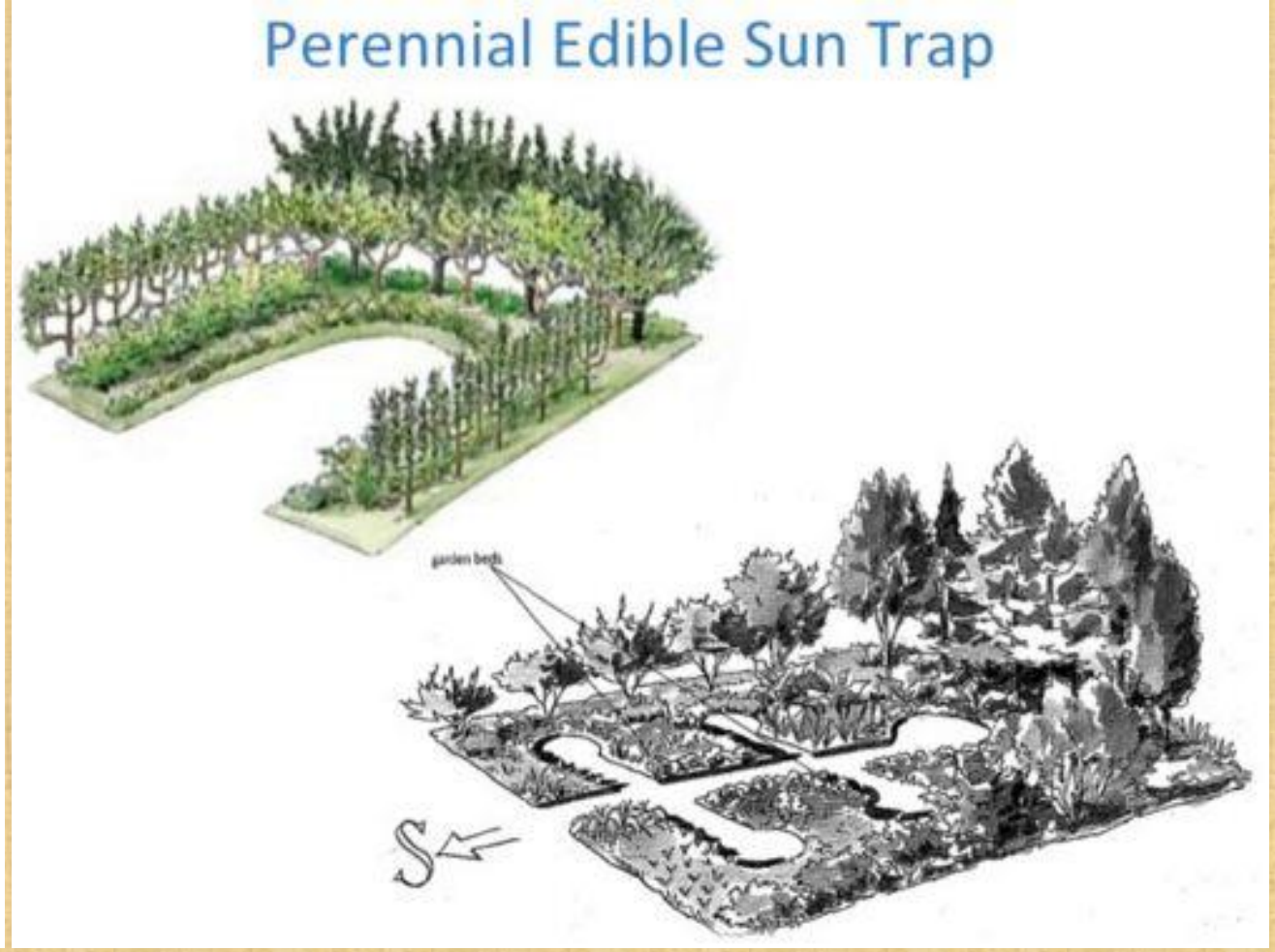
# PERMACULTURE ORCHARD AND GARDEN PATTERNS






Permaculture Herb Spiral




Edible Sun trap

# PATTERNING LANDSCAPE


Wain-hira utilza
rai uma hun ho diak,
ita sei hetan produsaun oi-oin
Kriasaun: Permatil
Ilustrasaun: Arte Moris

# PATTERNING TOWNS