Natural principles

Succession and symbiosis

Increasing complexity, an insight into the mechanism of the natural world


FOOD
SHELTER
ENERGY
ETHICS
CLIMATE
WATER
SOIL
PERMACULTURE
A design system for ecological and sustainable living, integrating plants, animals, buildings, people, and communities.

- Bare soil + high rainfall on compacted ground.
- Late harvest maize as a biofuel having noticeable effects, here in Wales

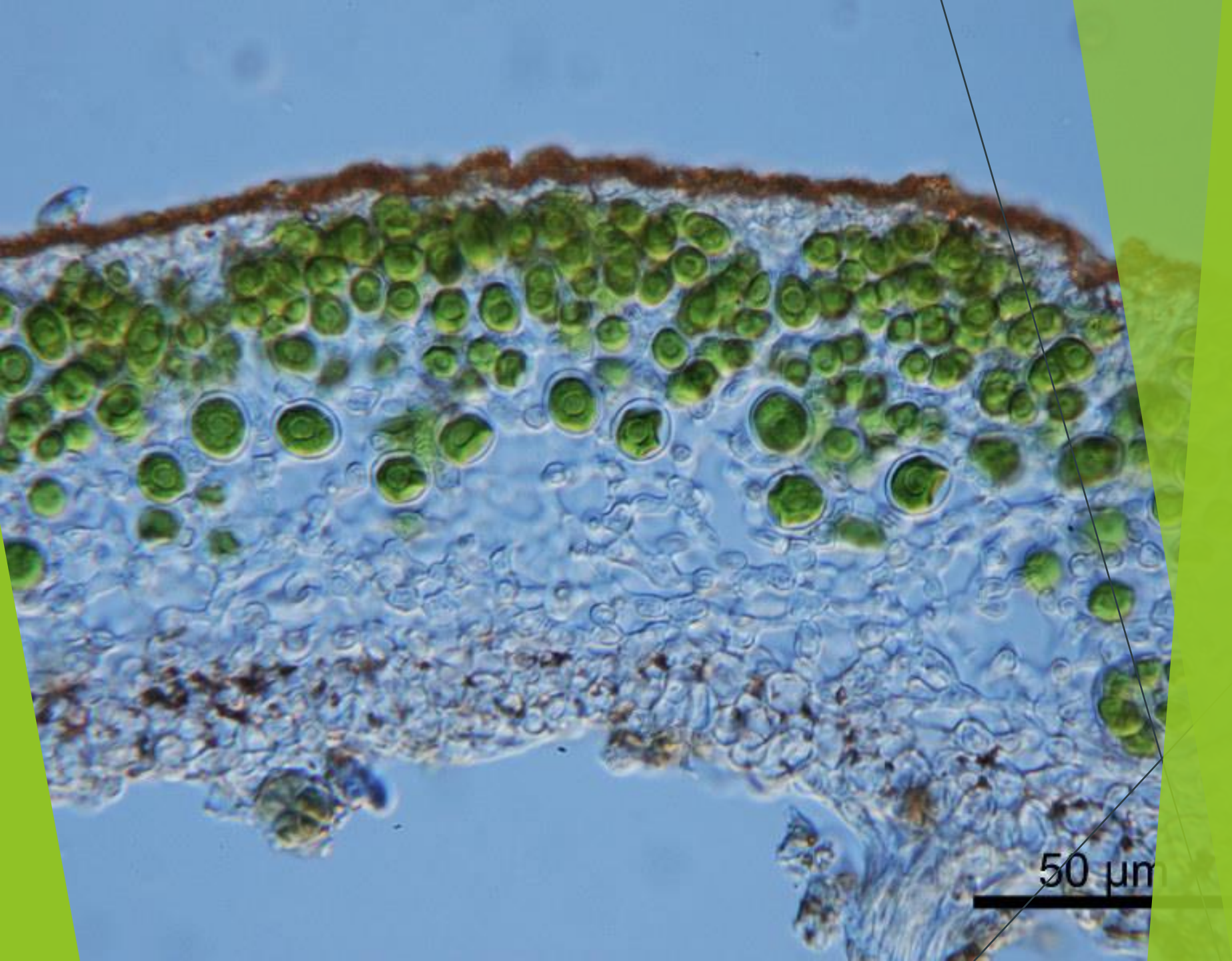
Carbon cycle

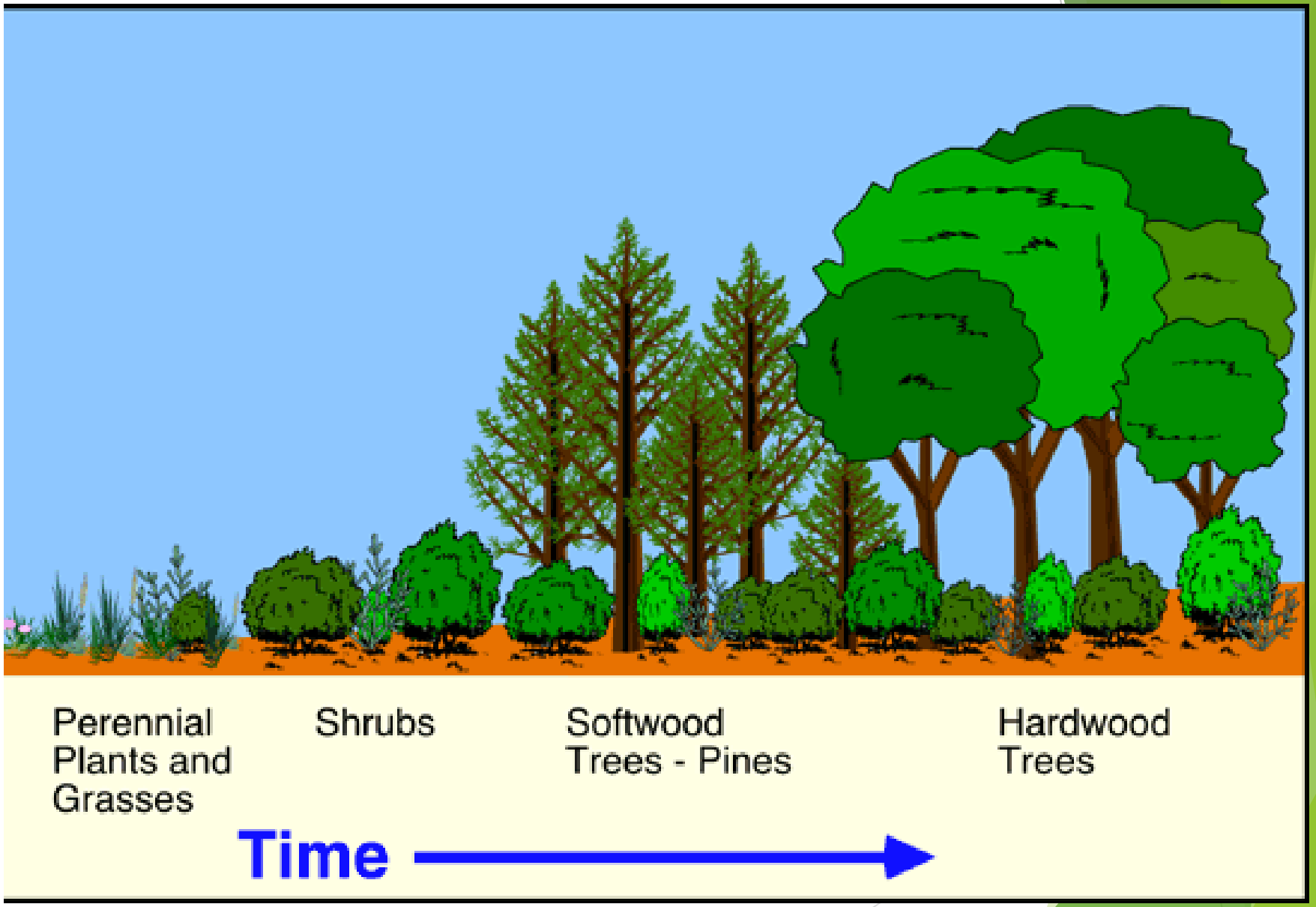
Carbon is the building block of life

From bare rock to abundance

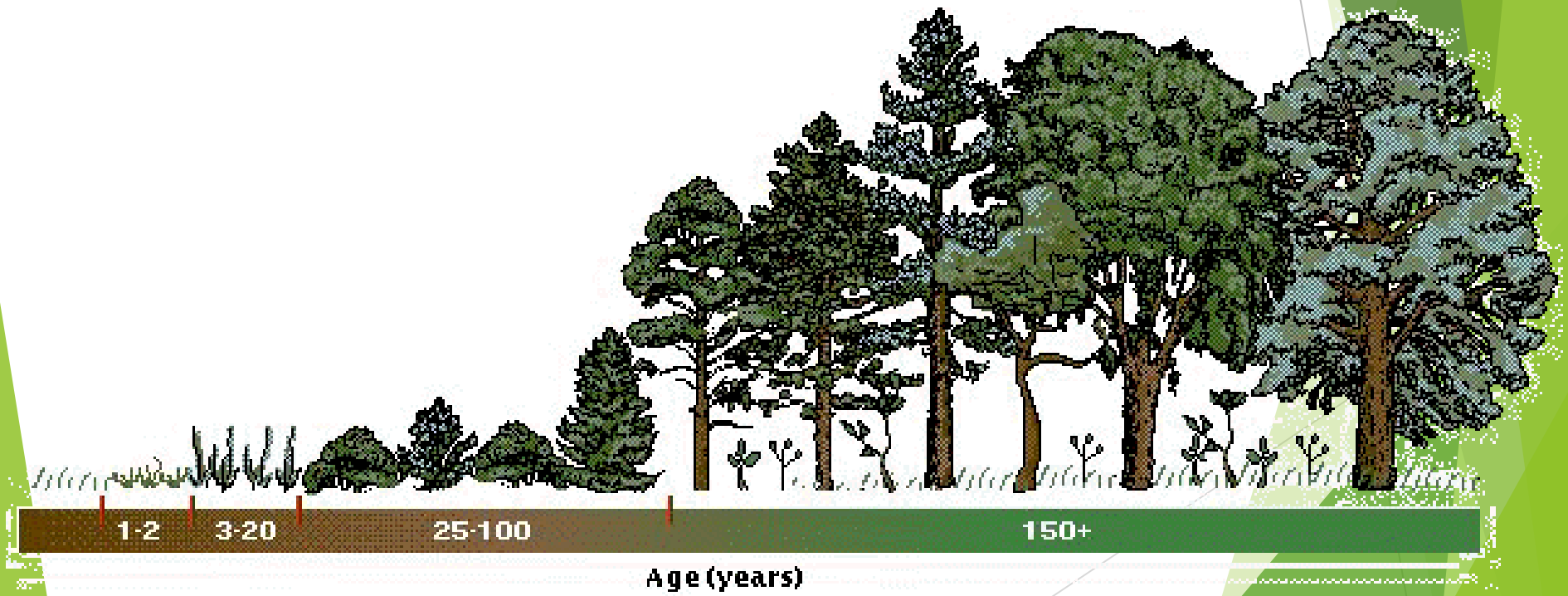
- England’s famed White Cliffs of Dover were formed almost 100 million years ago out of the crushed shells of tiny single-celled algae
- coccolithophores and larger diatoms,


10µm
10µm
10µm
10µm
10µm
10µm

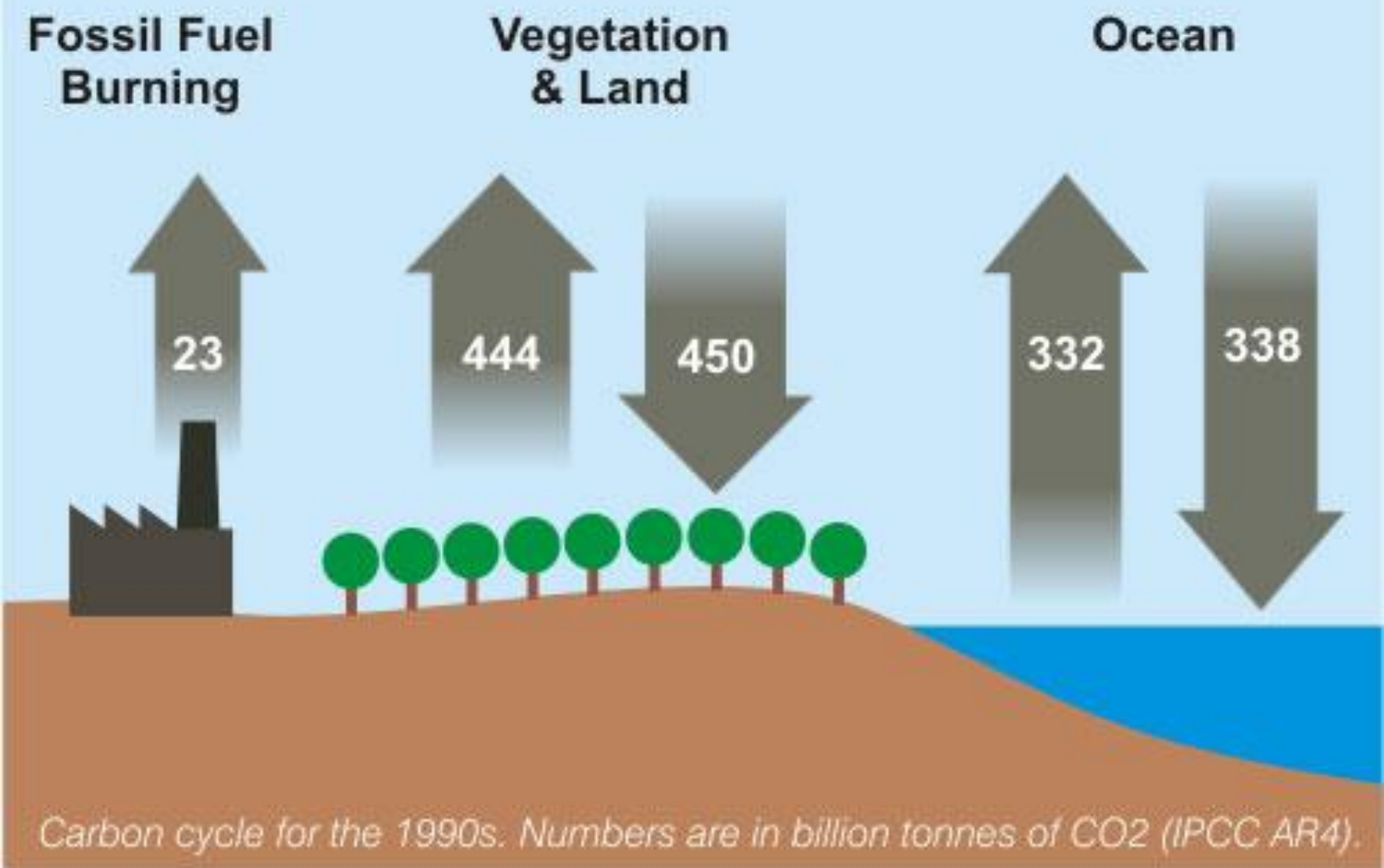

50 µm


Perennial Plants and Grasses
Shrubs
Softwood Trees - Pines
Hardwood Trees
Time

Time stacking

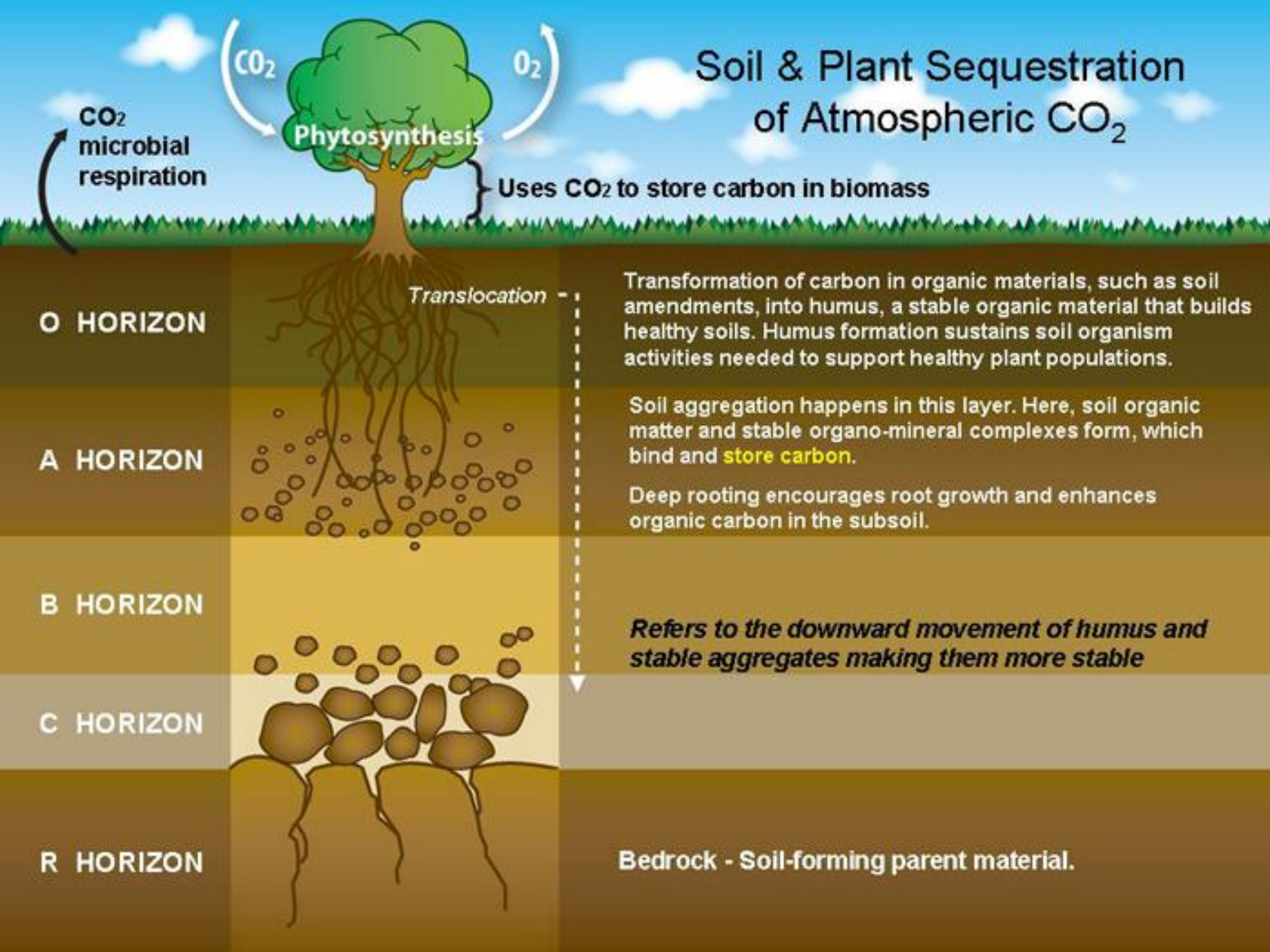


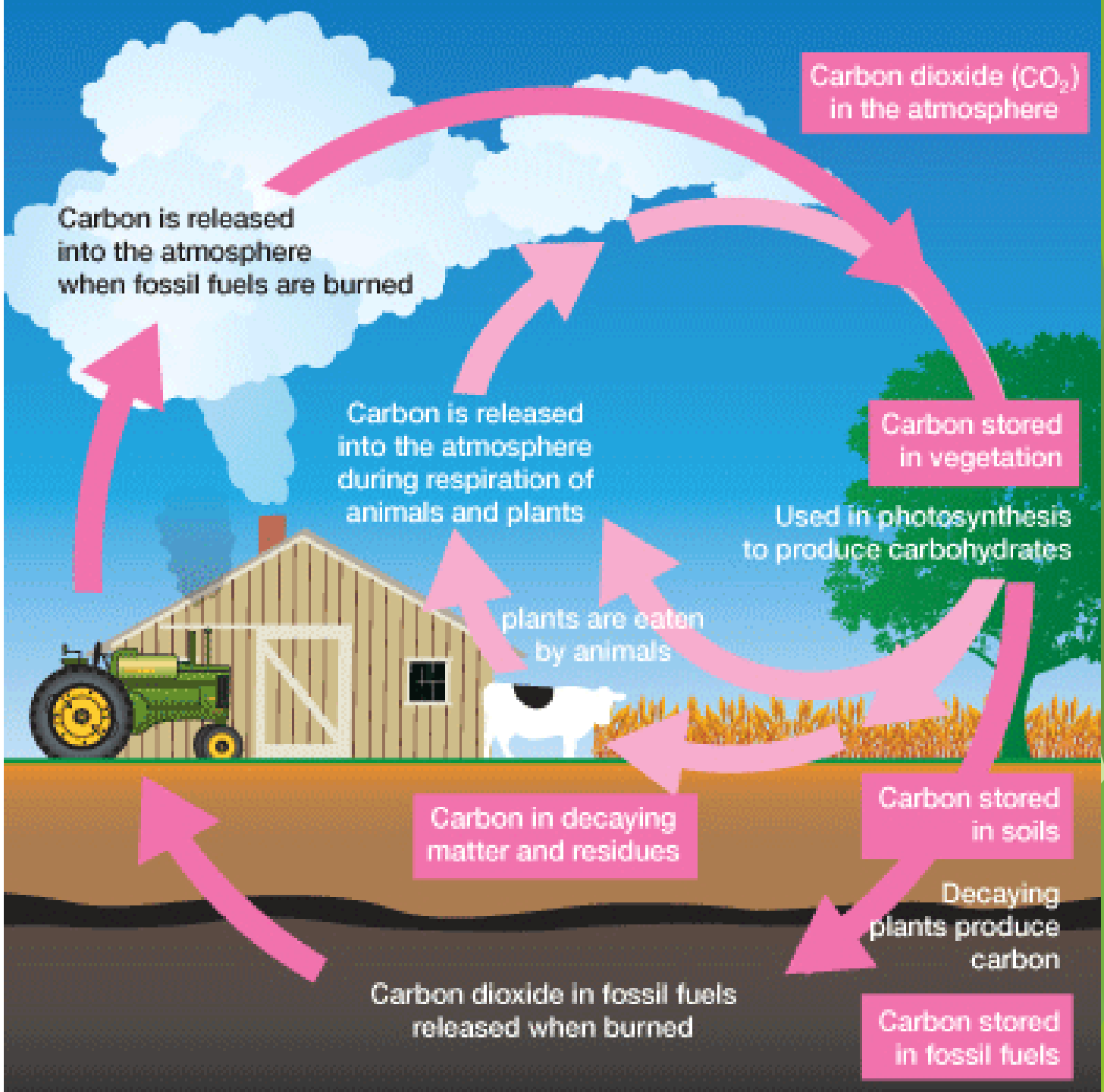
The complete picture of the carbon cycle

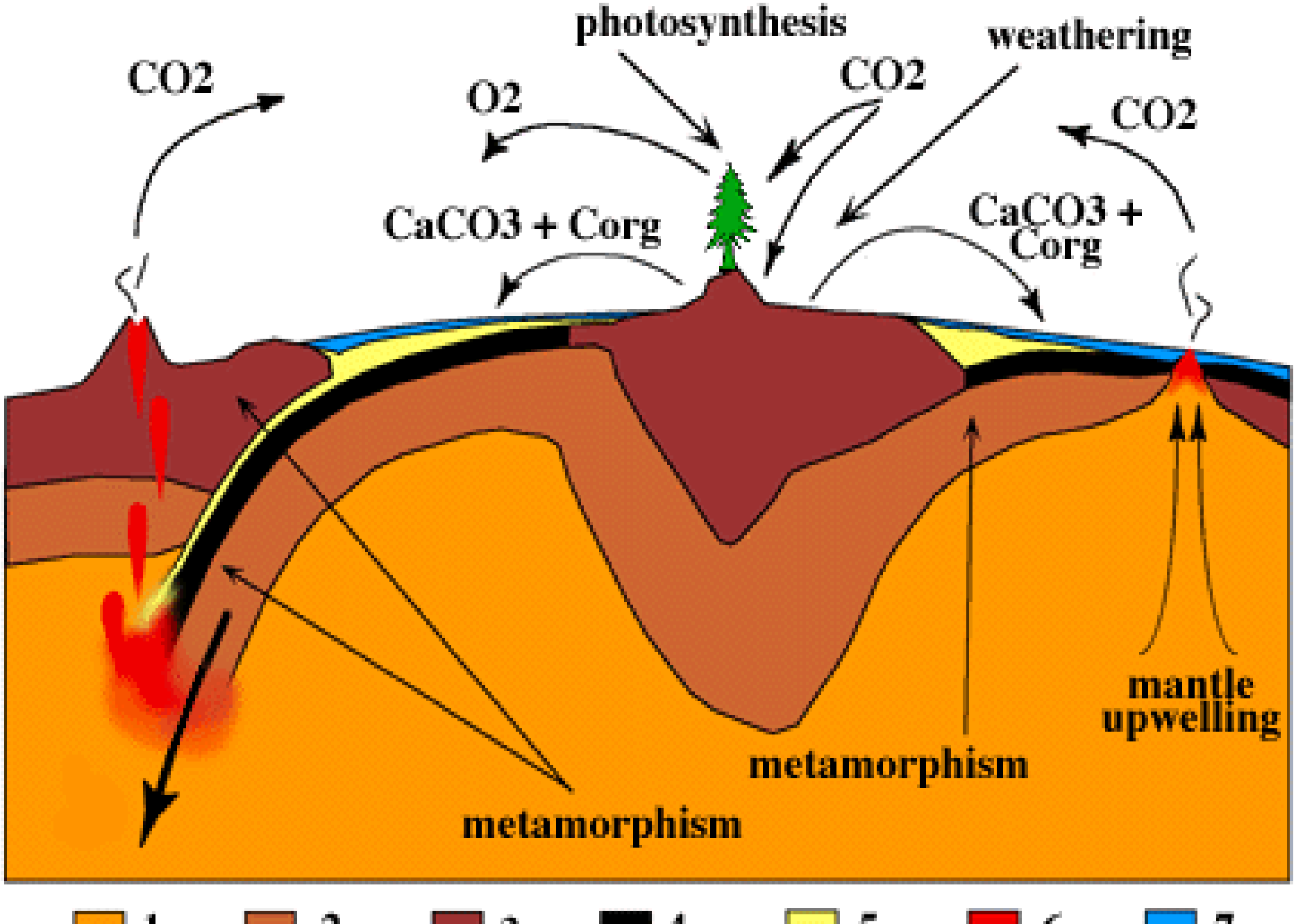


Carbon cycle for the 1990s. Numbers are in billion tonnes of CO2 (IPCC AR4).

Soil & Plant Sequestration of Atmospheric CO_2



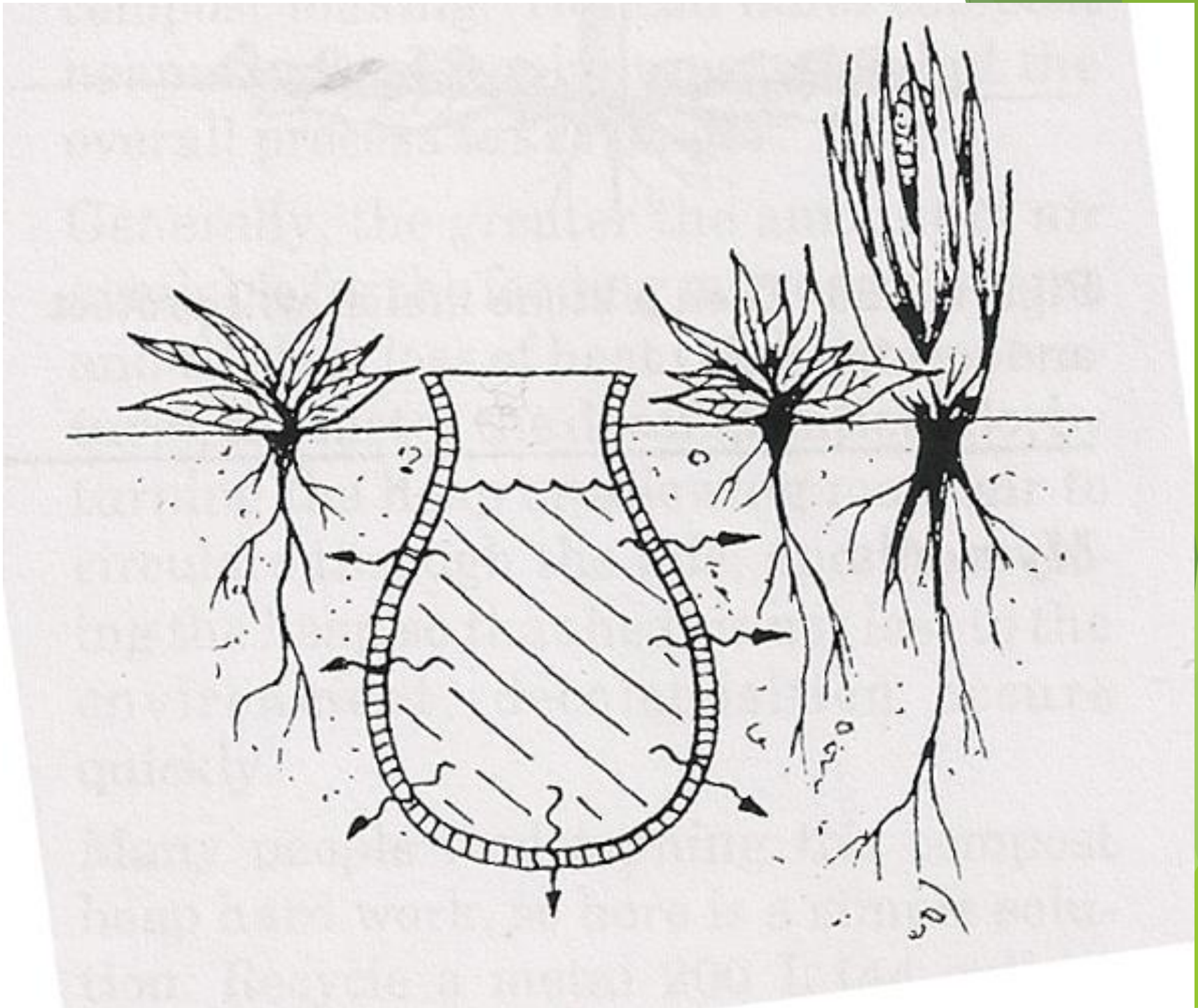

Carbon dioxide (CO_2) in the atmosphere
Carbon is released into the atmosphere when fossil fuels are burned
Carbon is released into the atmosphere during respiration of animals and plants
Carbon stored in vegetation
Used in photosynthesis to produce carbohydrates
plants are eaten by animals
Carbon in decaying matter and residues
Carbon stored in soils
Decaying plants produce carbon
Carbon dioxide in fossil fuels released when burned
Carbon stored in fossil fuels


photosynthesis
weathering
CO2
O2
CO2
CO2
CaCO3 + Corg
CaCO3 + Corg
mantle upwelling
metamorphism
metamorphism

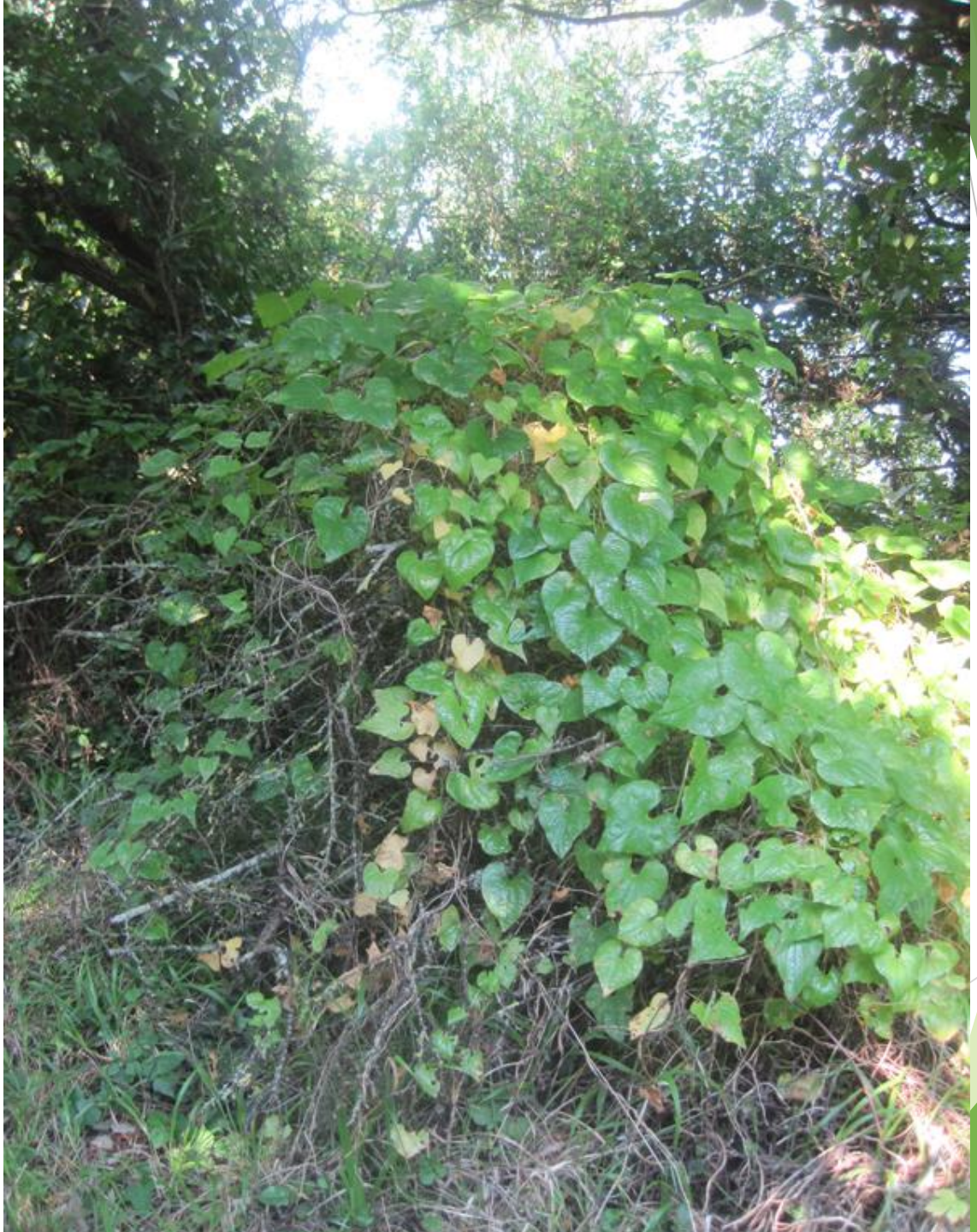
What is a forest?

What do they look like?

What are they made of?




10 MAR 2005
LRT



Mature, old growth forest

Food Forests


“No food
No life”
Rose, permaculture farmer, Rwa
www.sector39.co.uk
S
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Forest gardens

- **Quinta Do Boiço**

Tabua


Permaculture Design Course
Theme: Reading patterns in nature: The Forest Garden
Layer 2 Understory
Layer 7 Root Layer
Root Layer

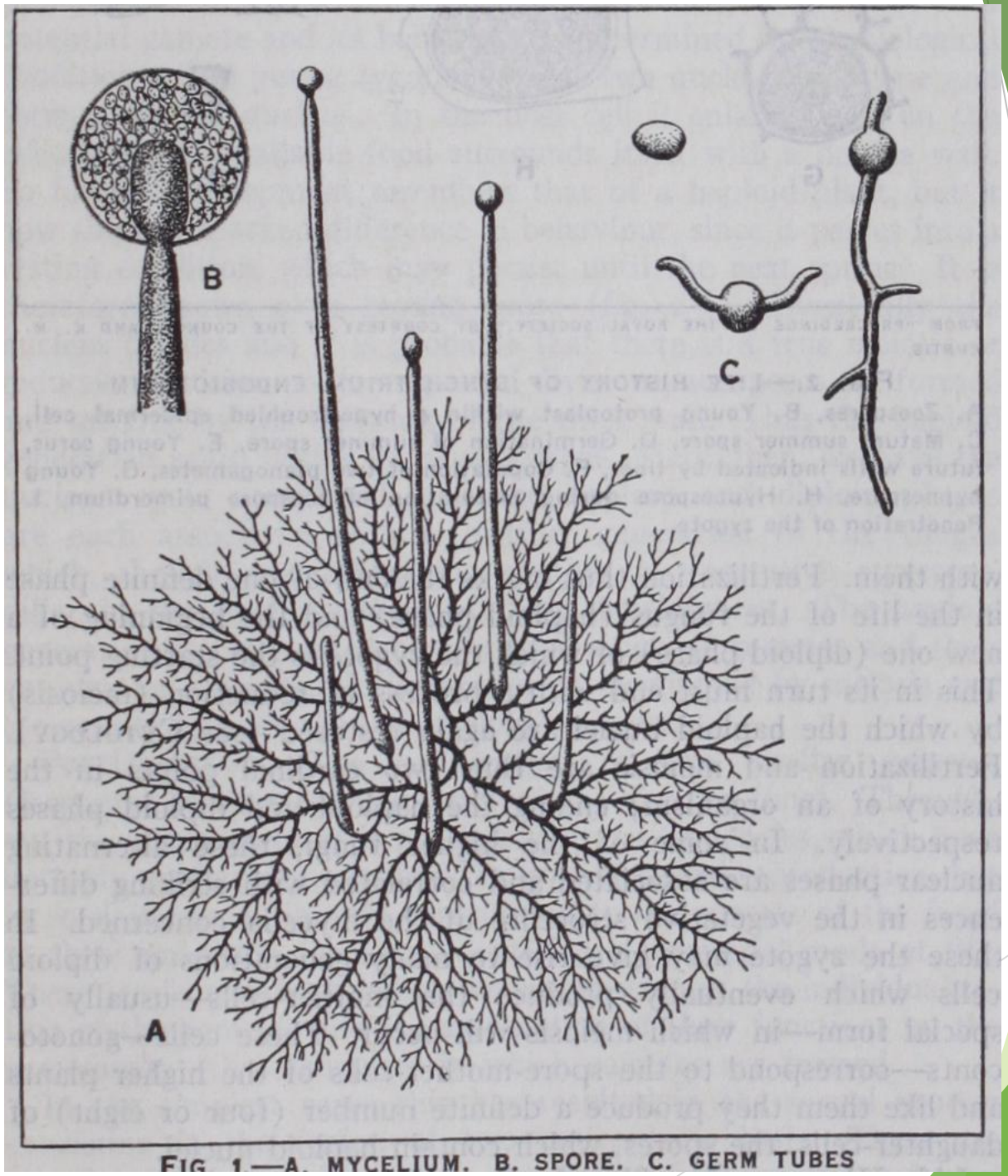
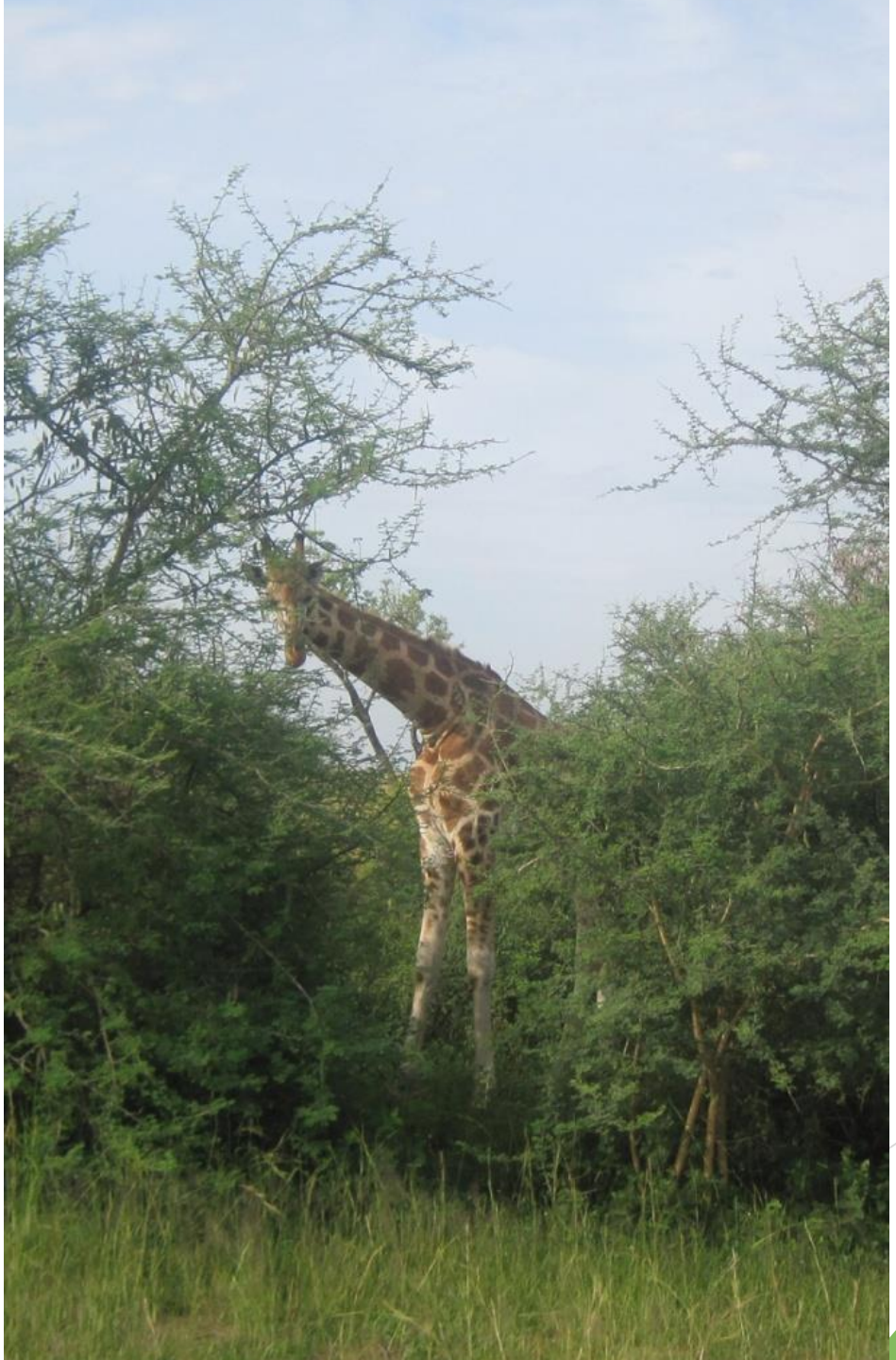


FIG. 1.—A. MYCELIUM. B. SPORE. C. GERM TUBES


SCIENCE photo LIBRARY



What is a forest garden?

"A designed, productive landscape modelled on the principles of natural ecological systems and processes"

Some Gardening Pioneers

Robert Hart – Beyond the Forest Garden

Masanobu Fukuoka – One Straw Revolution

Bill Mollison - Permaculture

Geoff Lawton – Permaculture Institute

Patrick Whitefield – How to make a FG

Martin Crawford – Agroforestry research trust

Maddy Harland – Permaculture Magazine

Emma Maxwell – Cwm Harry

Chloe Ward – CAT

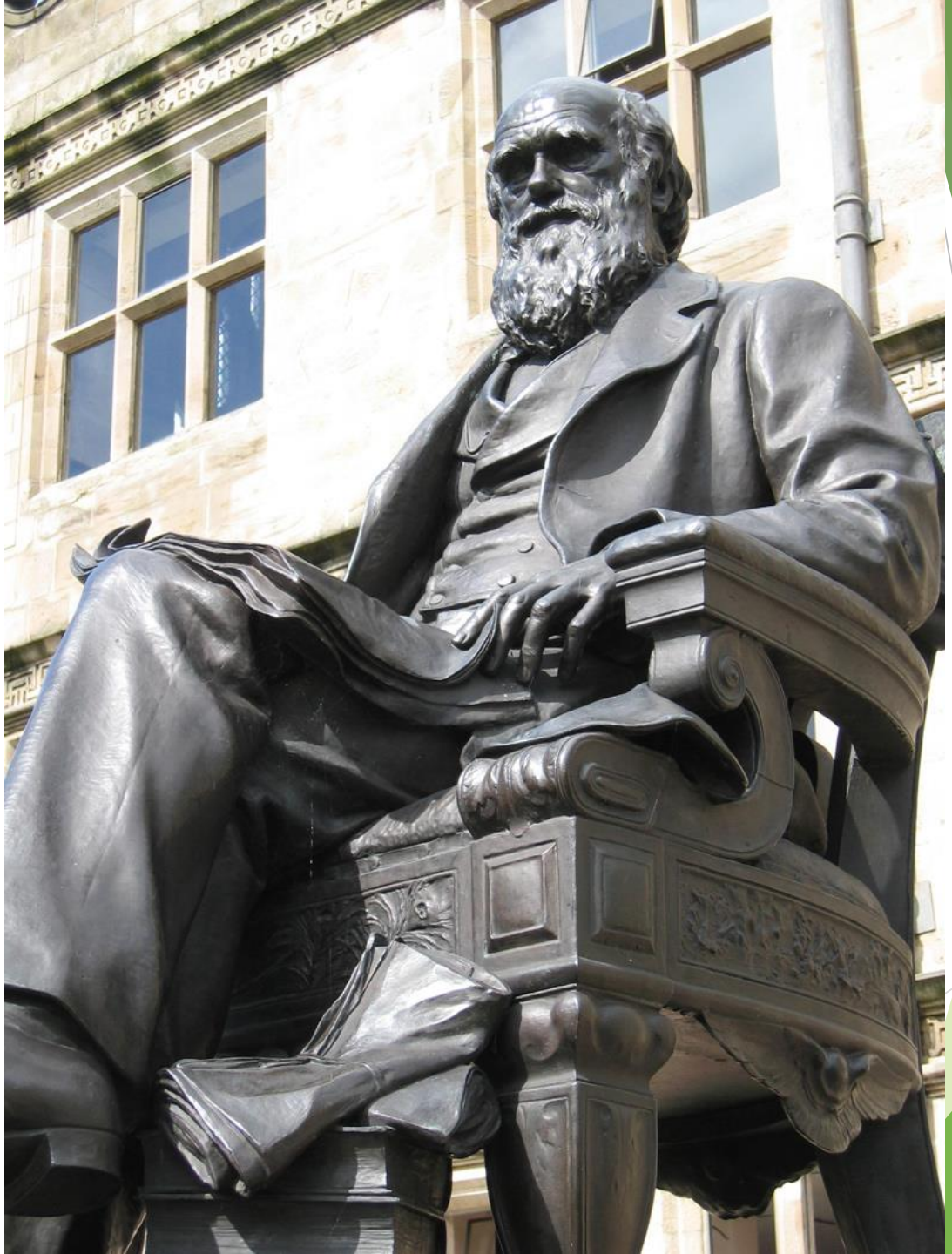
Tomas Ramiraz

Nature as a teacher

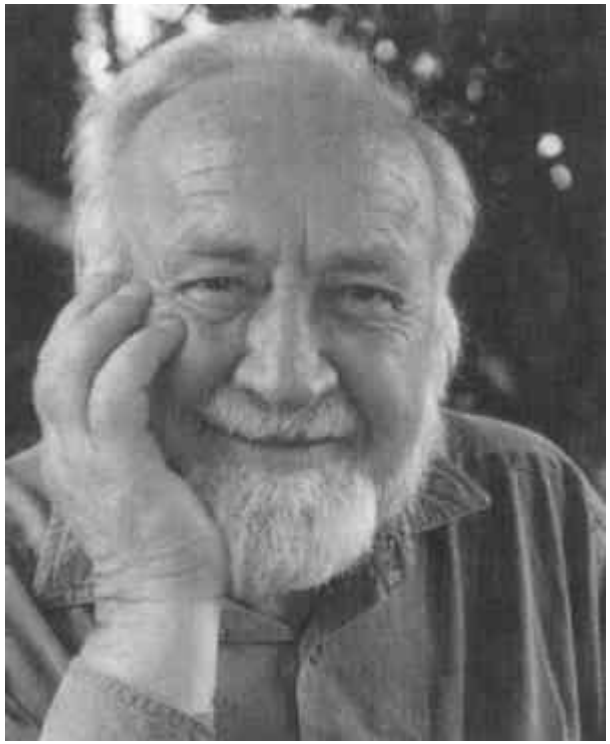
Exploring ecological principles

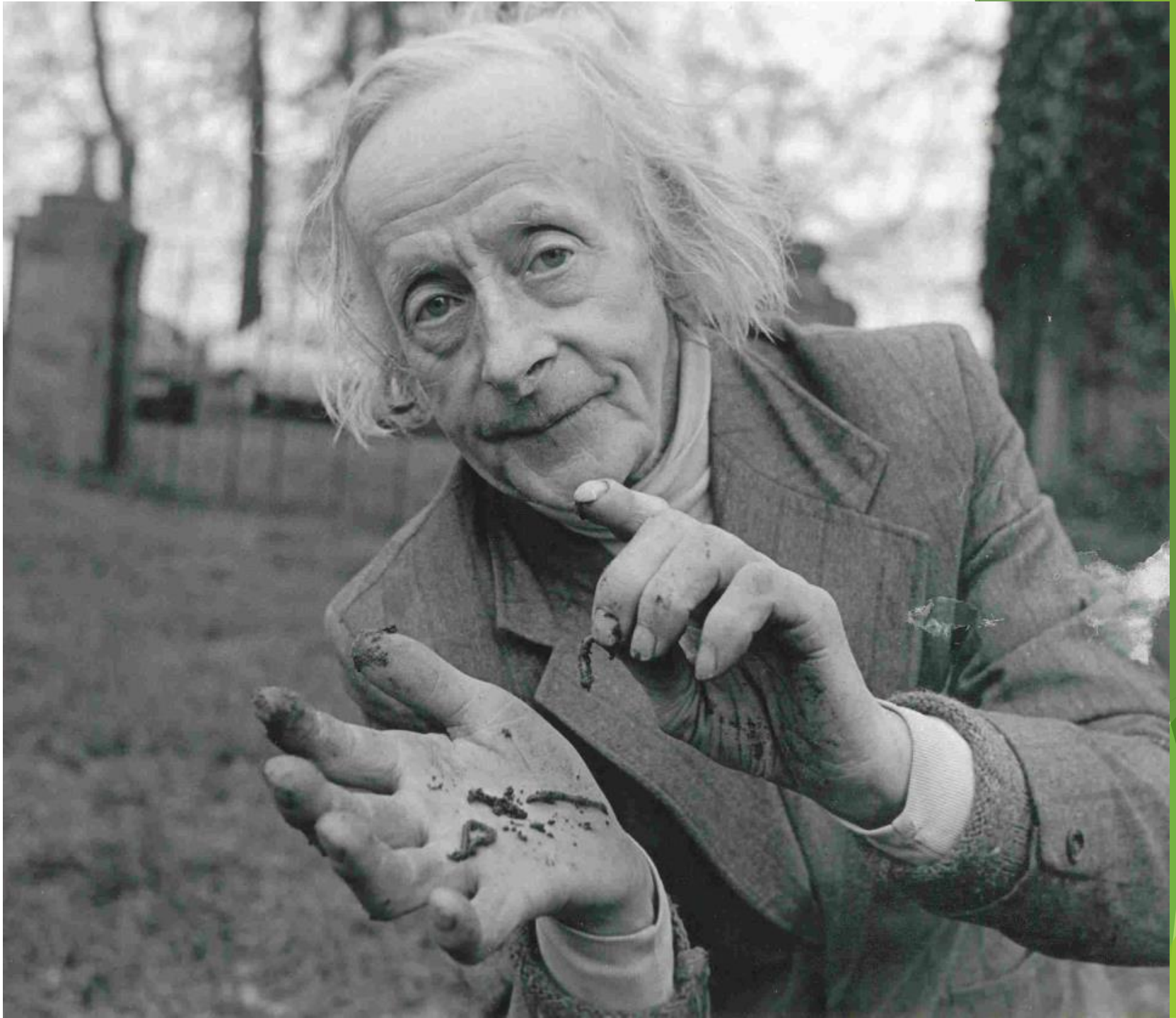
Natural Systems

1. Solar powered
2. Made from natural resources
3. Cylical – everything is recycled
4. Become more diverse and interconnected over time
5. Robust, productive and self-sustaining
6. Mainly comprised of perennial plants and fungi



Permaculture

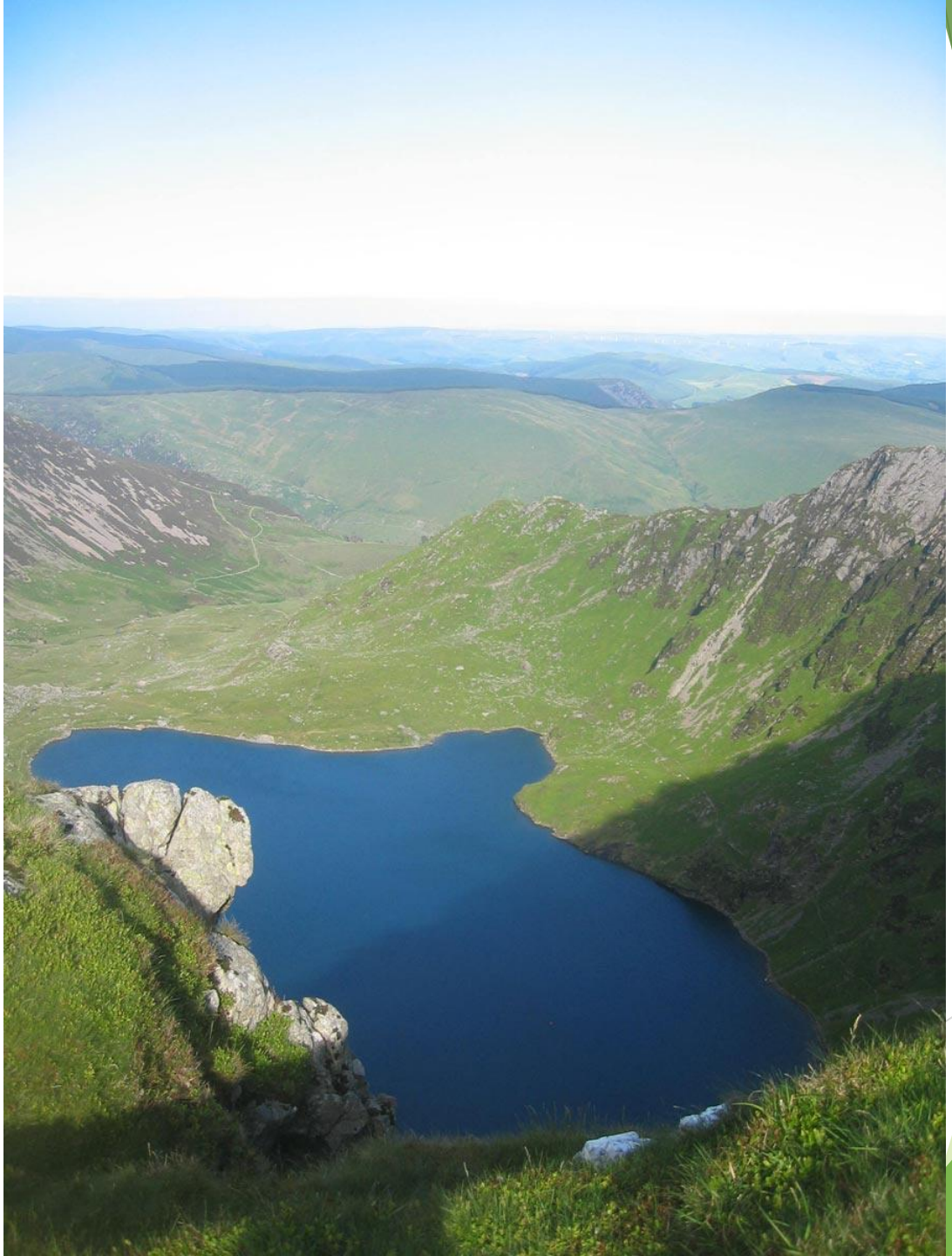




Symbiosis -complex, intimate mutually beneficial relationships

Key principle

- **Relative Location** Components placed in a system are viewed relatively, not in isolation. Functional Relationship between components.
- **Everything is connected to everything else** Recognize functional relationships between elements.



Key principle

- Limiting factors
- Grazing action by sheep prevents regrowth of understory and also establishment of trees

Key principle

- **Diversity** As a general rule, as sustainable systems mature, they become increasingly diverse in both space and time.

- What is important is the complexity of the functional relationships that exist between elements not the number of elements.


TRINIDAD'S
RUM
SPECIALISTS

Key principle

- Produce no waste
- Everything cycles

- Relates to '*Catch and store energy*'

Key principle

- Use and value natural resources and services
- Let nature take its course

Edge effect


STONE PINE
ALDER
WILLOW
HAZEL
VERTICAL STACKING SYSTEM

Acros Building Fukuoka, Japan
by Emilio Ambasz

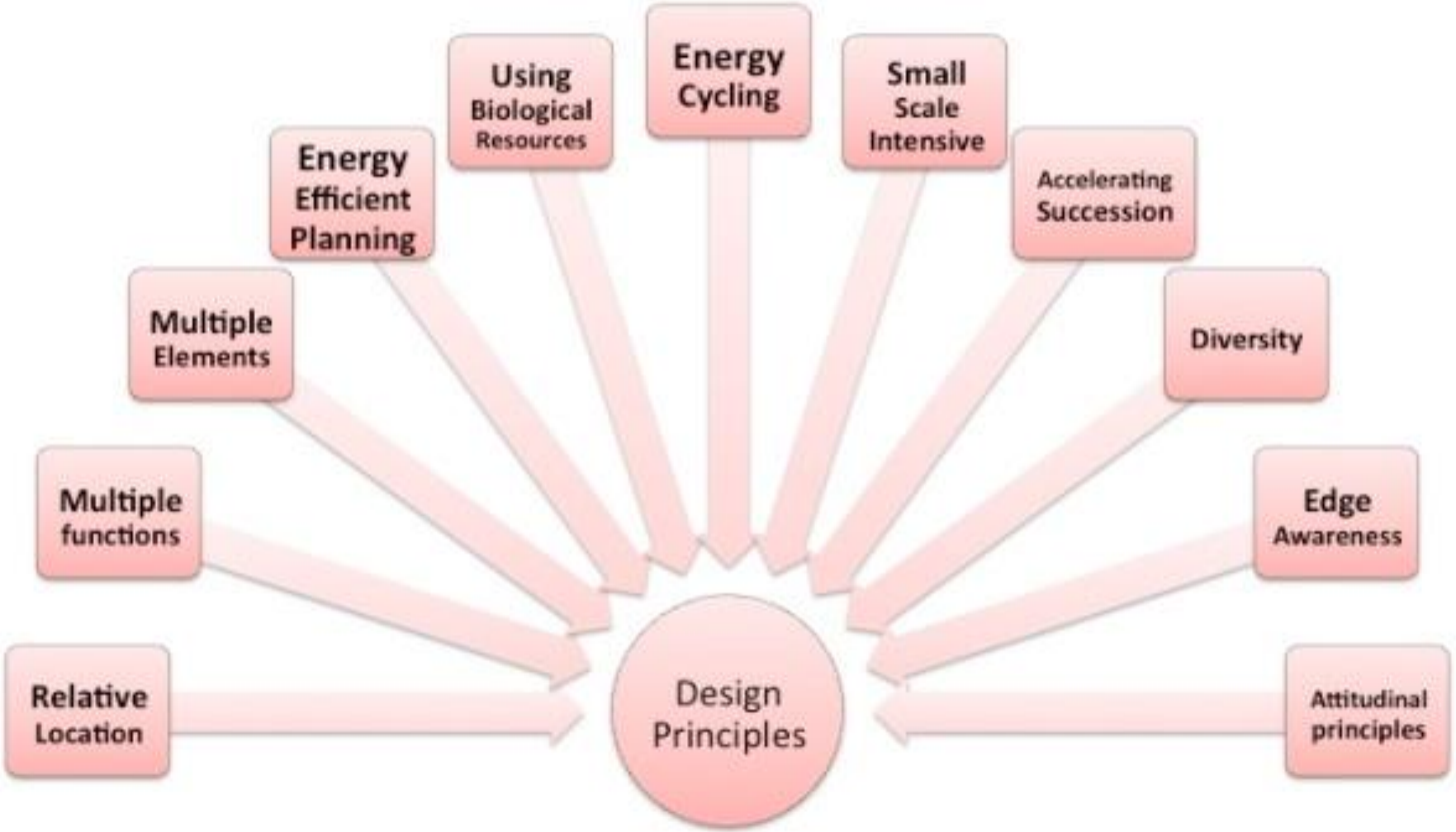
Principles of natural systems

- Multiple functions for every element
- Essential functions always supported by multiple elements
- Diversity
- Stacking
- Symbiosis – beneficial relationships
- No bare soil - Succession
- Edge effect
- No waste - cycling
- Local resources
- Biological resources

Permaculture Principles

- Ethics
- Observation
- Conscious design
- Pathways
- Sectors
- Zones
- Change as opportunity

Permaculture Principles



Problems into solutions

From erosion to accumulation

1 Observe and Interact

Beauty is in the eye of the beholder

2 Catch and Store Energy

Make hay while the sun shines

3 Obtain a Yield

You can't work on an empty stomach

4 Apply Self-regulation and Accept Feedback

The sins of the fathers are visited on the children unto the seventh generation

5 Use and Value Renewable Resources and Services

Let nature take it's course

6 Produce No Waste

A stitch in time saves nine

Waste not, want not

7 Design from Patterns to Details

Can't see the wood for the trees

8 Integrate Rather than Segregate

Many hands make light work

9 Use Small and Slow Solutions

The bigger they are, the harder they fall
Slow and steady wins the race

10 Use and Value Diversity

Don't put all your eggs in one basket

11 Use Edges and Value the Marginal

Don't think you are on the right track just because it is a well-beaten path

12 Creatively Use and Respond to Change

Vision is not seeing things as they are but as they will be

Thank you very much

- @misterjones2u
- www.sector39.co.uk

Diolch yn fawr iawn