Interactions & Ecosystems

Cycles in the Environment

The Cycle of Life

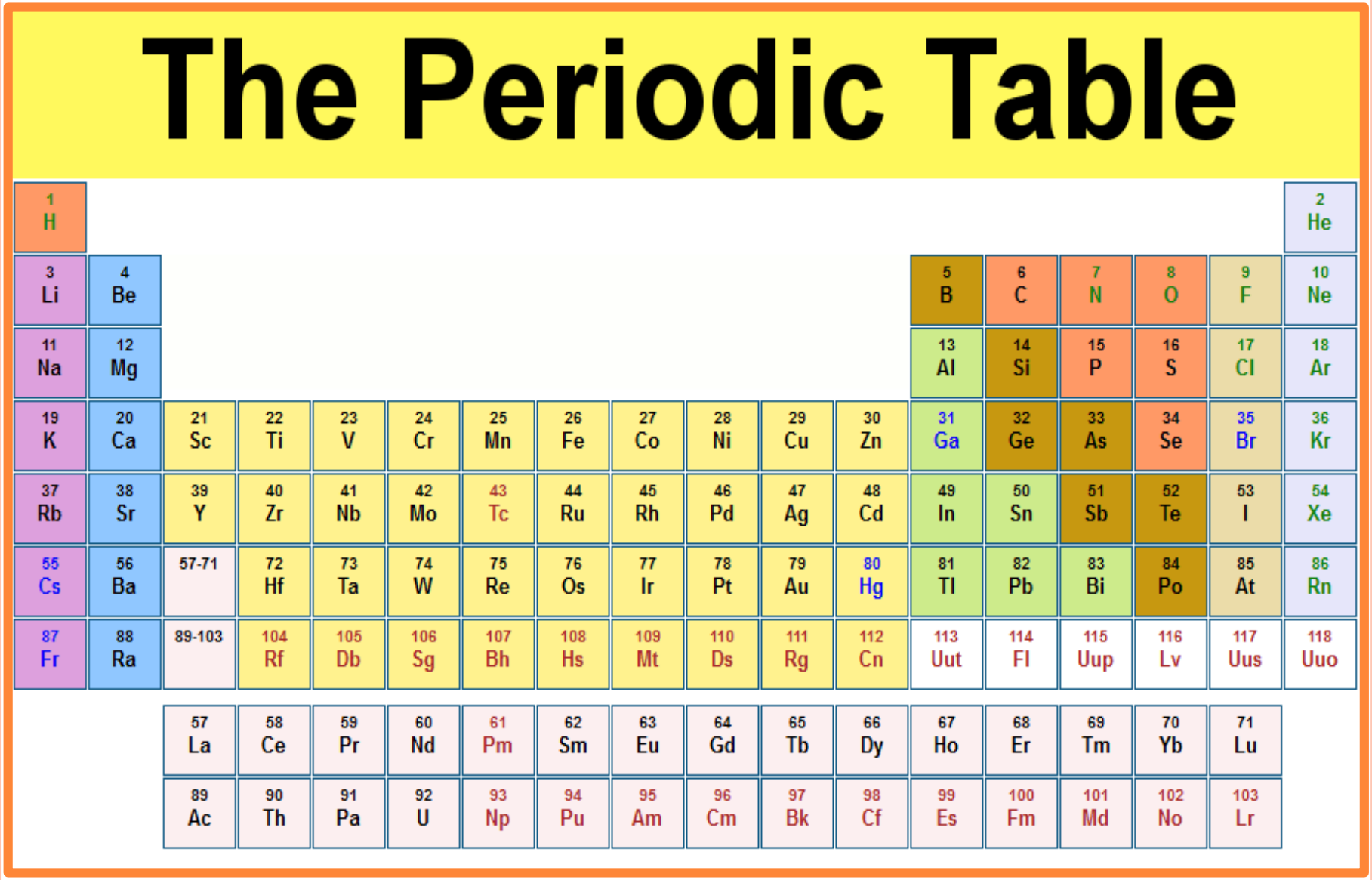
- Everything and everyone is cycled back into the environment

- What is the life cycle of a dead tree?

The Carbon Cycle

- Plankton, microscopic plants, animals, Trees, Humans, Sugar, Yummy Fats, Protein, etc … what do they have in common?
- They are all made carbon!
- What is carbon?

Clue…


The Periodic Table
1 H
2 He
3 Li
4 Be
5 B
6 C
7 N
8 O
9 F
10 Ne
11 Na
12 Mg
13 Al
14 Si
15 P
16 S
17 Cl
18 Ar
19 K
20 Ca
21 Sc
22 Ti
23 V
24 Cr
25 Mn
26 Fe
27 Co
28 Ni
29 Cu
30 Zn
31 Ga
32 Ge
33 As
34 Se
35 Br
36 Kr
37 Rb
38 Sr
39 Y
40 Zr
41 Nb
42 Mo
43 Tc
44 Ru
45 Rh
46 Pd
47 Ag
48 Cd
49 In
50 Sn
51 Sb
52 Te
53 I
54 Xe
55 Cs
56 Ba
57-71
72 Hf
73 Ta
74 W
75 Re
76 Os
77 Ir
78 Pt
79 Au
80 Hg
81 Tl
82 Pb
83 Bi
84 Po
85 At
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88 Ra
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107 Bh
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109 Mt
110 Ds
111 Rg
112 Cn
113 Uut
114 Fl
115 Uup
116 Lv
117 Uus
118 Uuo
57 La
58 Ce
59 Pr
60 Nd
61 Pm
62 Sm
63 Eu
64 Gd
65 Tb
66 Dy
67 Ho
68 Er
69 Tm
70 Yb
71 Lu
89 Ac
90 Th
91 Pa
92 U
93 Np
94 Pu
95 Am
96 Cm
97 Bk
98 Cf
99 Es
100 Fm
101 Md
102 No
103 Lr

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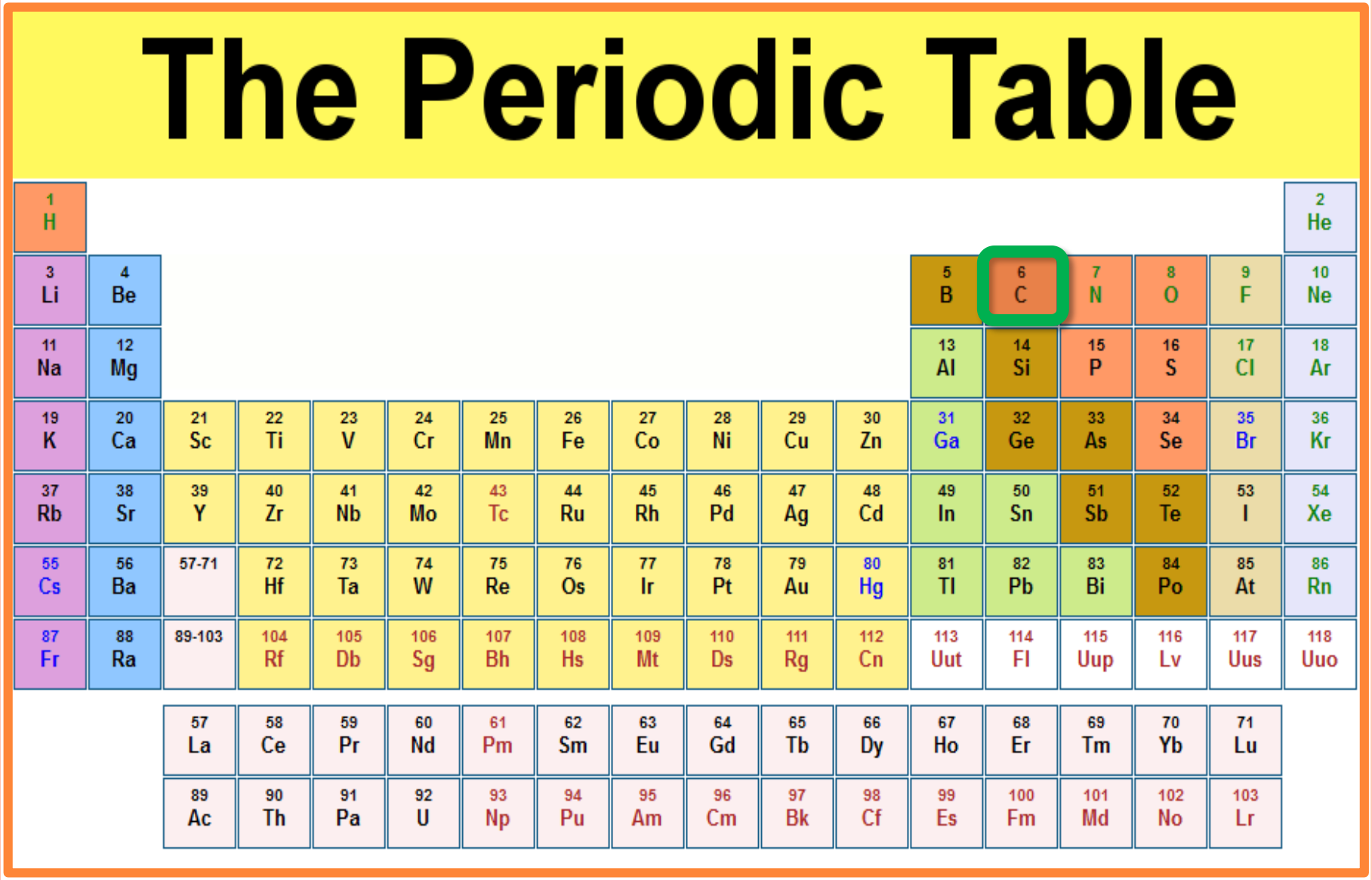
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Carbon

- It is an element on the periodic table
- Considered the building block of life
- Why?
  - Found in DNA
  - Required for photosynthesis
    (photosynthesis is when plants
    convert CARBON dioxide into sugar.)
  - Required for cellular respiration
  - Key factor in fossil fuels

What Are Trees Made Of?

- Answer
- Sugar!
- Every part of the tree is made of sugar.
- The wood is made of cellulose (A type of sugar)
- The leaves are also made of a type of fibrous sugar.
- There are juices inside of a tree (ex. Sap). And they are made of sugar.
- Trees (and all plants for that matter) are giant blobs of sugar.

How do trees make sugar so that they can build their own wooden, leafy and sappy parts?

- Photosynthesis!
- Photosynthesis is when plants breath in carbon dioxide (which contains carbon), and convert it into sugar (which are the plant's body parts)
- Fun Fact of the day: The main ingredient in sugar is CARBON!

How Do We Become a Tree? How Do Trees Become Us?

- We eat plants.
- Animals eat plants and store the carbon in plants as muscle and fat. Yes body fat is made of carbon.
- Our bodies burn the sugar inside of the plants, and release the carbon as carbon dioxide gas.
- The carbon now floats back into the air to be consumed by another plant.
- The plant then uses that carbon to grow bigger.

In other words: carbon cycles between plants and animals

- Every breath you exhale releases carbon. This carbon came from burning your body fat through cellular respiration. **Cellular Respiration** just means your body is burning body fat for energy.

- Plants use that same carbon that humans and animal breath out to grow bigger, taller, and to add mass.
- Then humans/animals eat the plants and this puts the carbon back into our bodies. We burn that carbon as energy and store the extra carbon as fat tissue.
- We then burn body fat when engaging in physical activity and release the carbon back into the air.

Carbon Cycle In Action

Where did the carbon in the plant parts of the burger come from?

Where did the carbon in the boy's body come from?

How is the carbon stored in the boy?

How is the carbon released from the boy?

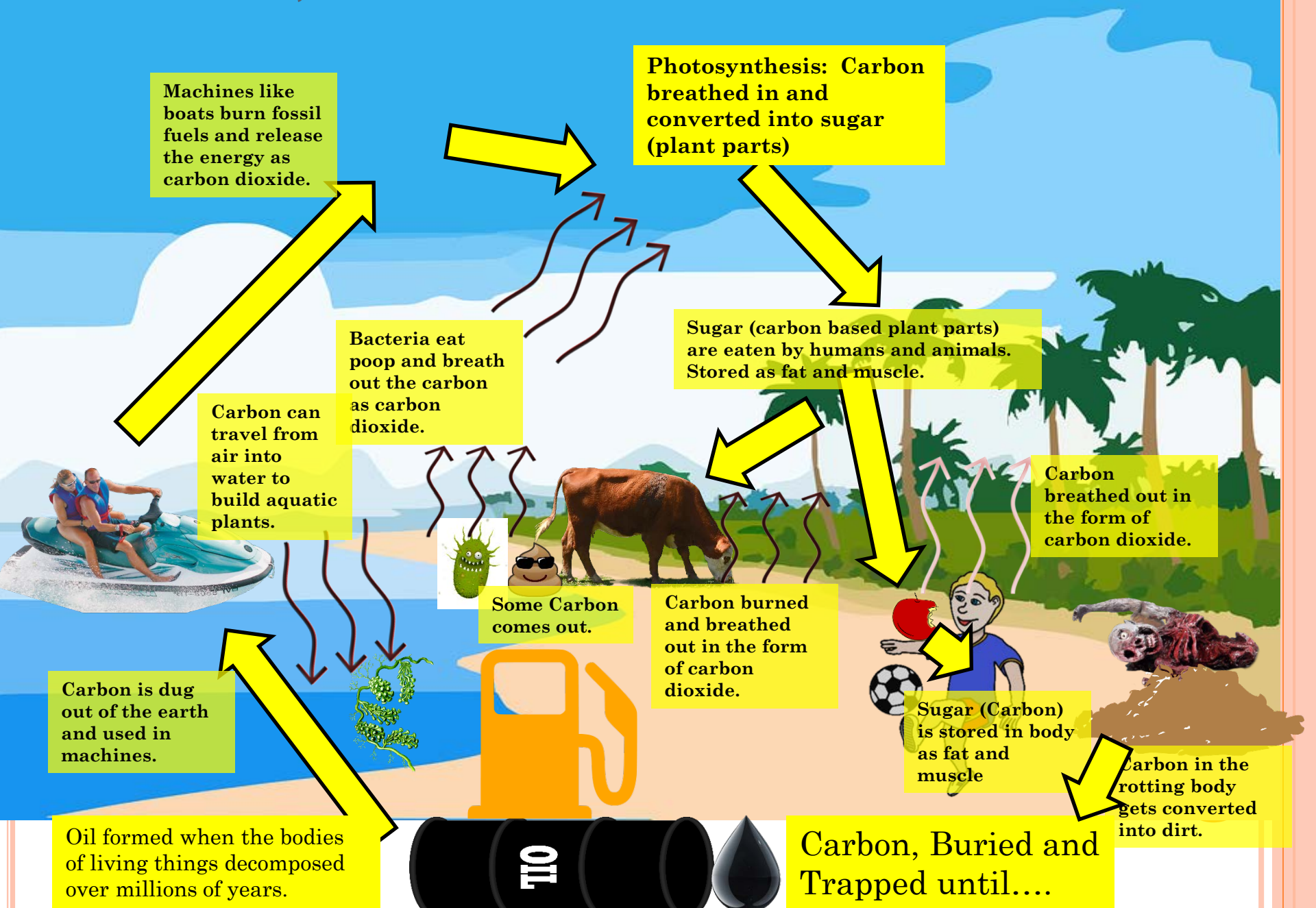
Part of YOU becomes a TREE!

Where Do Trees Get Their Mass From?

Back to the Carbon Cycle

- As carbon is a major component of life it is cycled through the environment
- Over time, and **great pressure**, decomposing plankton, plants, and other dead bodies buried deep in the earth do what?
  - Turn into fossil fuels!
  - They still have carbon! Yup!
- Enter the Carbon Cycle…

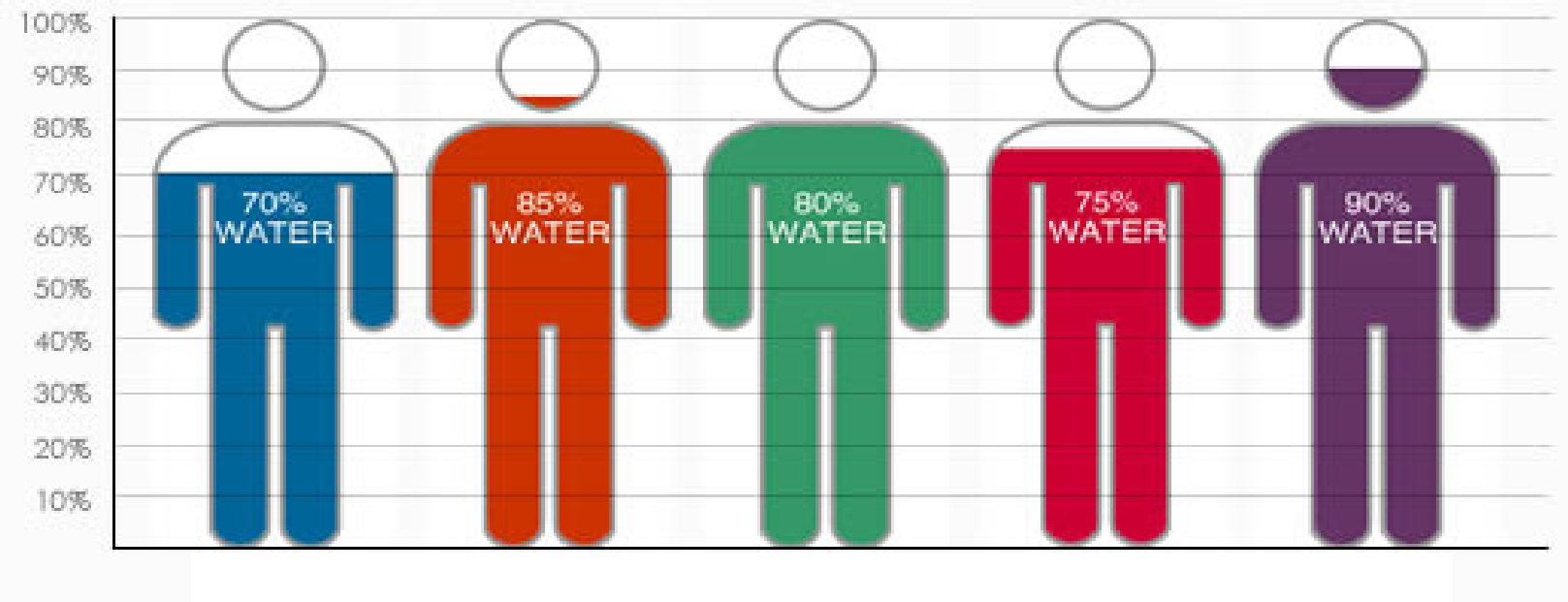
Behold, The Carbon Cycle!



The Water Cycle

- What do we know about water?
- All ***living things require*** water!

- Did you know … Body – Blood – Brain – Muscles – Cells..?



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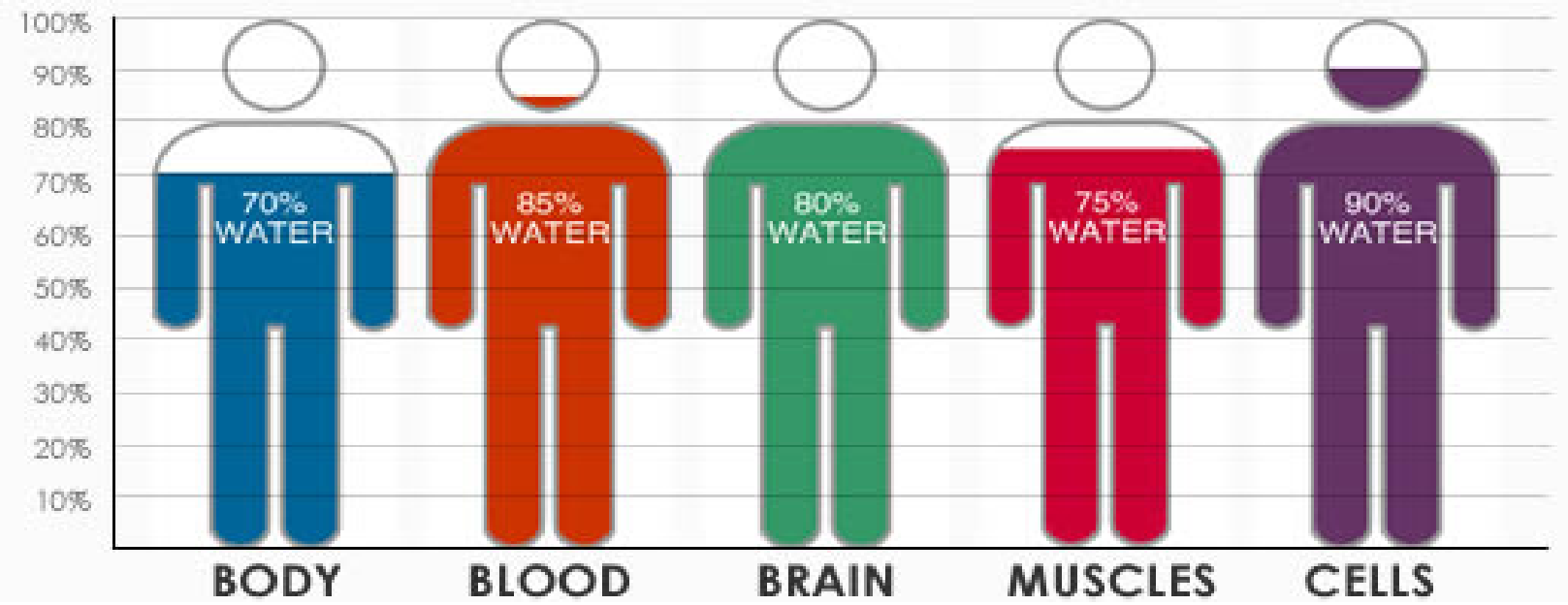
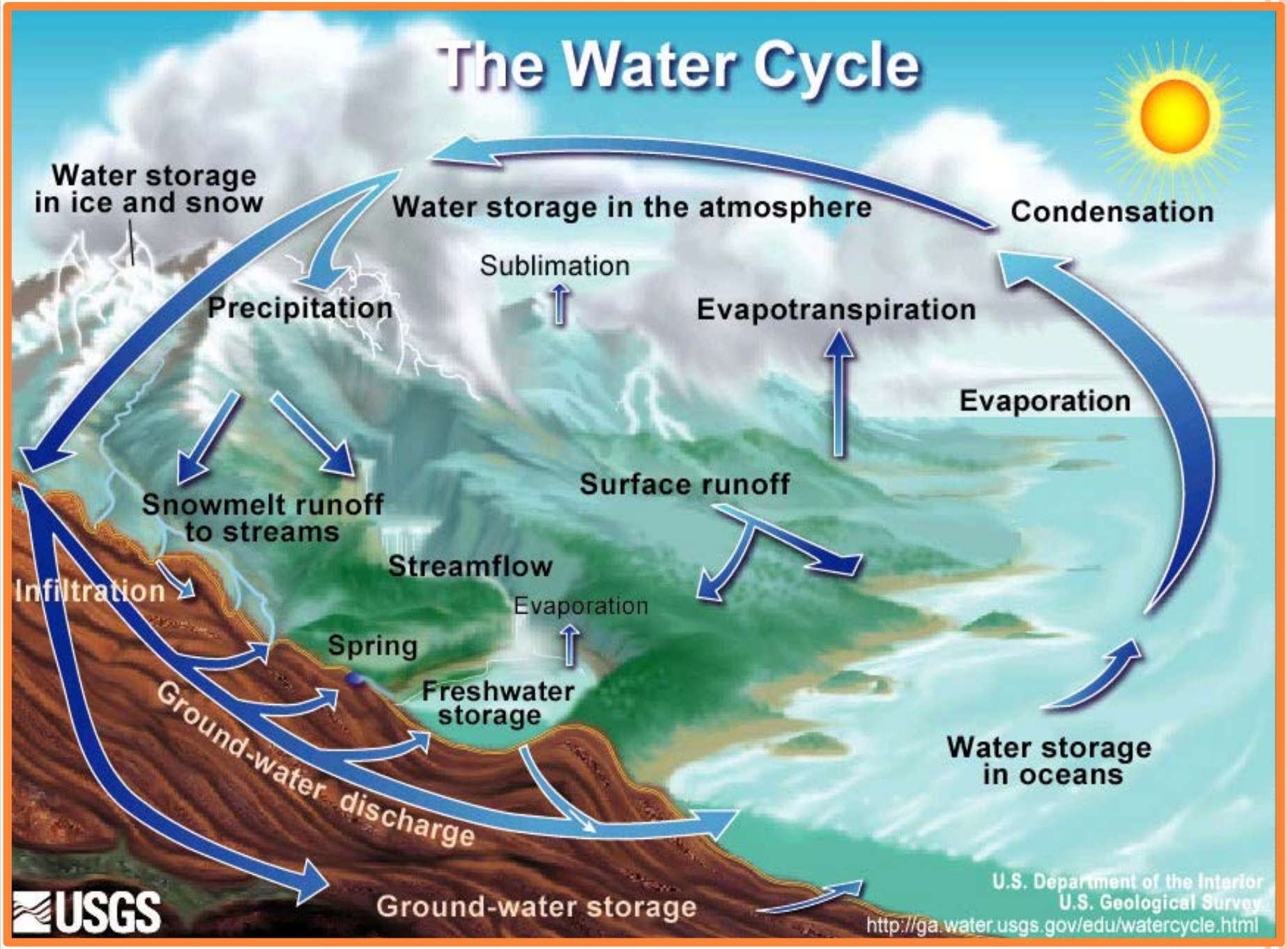


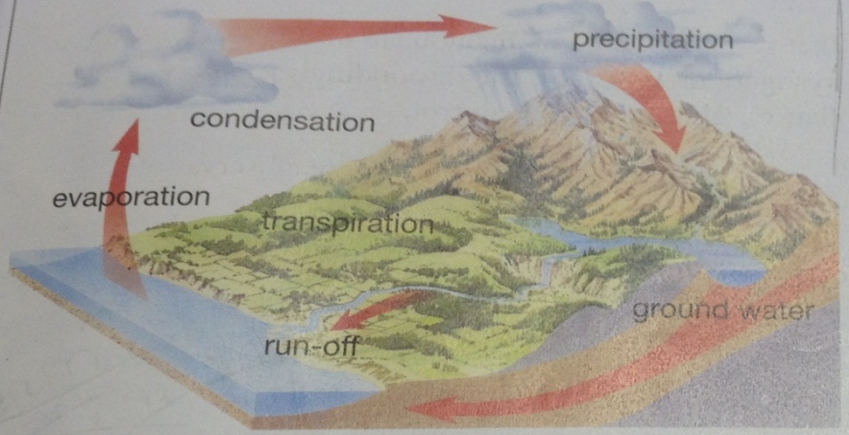

The Water Cycle
Water storage in ice and snow
Water storage in the atmosphere
Condensation
Sublimation
Precipitation
Evapotranspiration
Evaporation
Surface runoff
Snowmelt runoff to streams
Streamflow
Infiltration
Evaporation
Spring
Freshwater storage
Ground-water discharge
Water storage in oceans
Ground-water storage
USGS
U.S. Department of the Interior
U.S. Geological Survey
http://ga.water.usgs.gov/edu/watercycle.html

Water Cycle Key Terms

The water cycle is the continuous movement of water through an ecosystem (see Figure 1.41). This cycle involves four main processes. The first two processes — evaporation and transpiration — move water up from Earth into the atmosphere. The second two — condensation and precipitation — return water to Earth.

ago in the days of your great-great-great-great-great-grandparents are still around today.

Important



Evaporation *is the process in which a liquid changes into water vapour. Liquid water evaporates to form invisible water vapour.*

Transpiration *is the process in which water that is taken in through a plant's roots evaporates from the plant's leaves, stem, and flowers.*

Condensation is the process in which water vapour changes into a liquid. Warm air contains water vapour. As air cools, however, it is able to hold less and less water. Condensation happens when air becomes so cool that it can no longer hold as much water vapour, and liquid water is released. This creates clouds, fog, or dew.

Precipitation is the process in which liquid water forms from condensation occurring inside clouds, and then falls as rain, sleet, snow, and hail.

Ground water is water in the soil. Plant roots can grow down to reach ground water. People can reach ground water by digging wells.

Run-off is water that runs off the ground into lakes, rivers, or streams.

Figure 1.41 *The water cycle is the continuous movement of water through an ecosystem.*

Pollution & Environment

- Pollution
  - When a substance is added to the environment at such a fast rate that it cannot be broken down, stored ,or recycled. It just keeps building up, bro!
- Pollutants
  - Substances that cause pollution
- What are some examples of pollutants?

Pollution & Environment

- Acid Rain
  - What is it?
  - What caused it?

- When we burn fossil fuels carbon is released. Carbon doesn't make acid rain. Nitrogen, Sulfur, and Phosphorus are also released as waste when fossil fuels are burned…
  - As they are released they mix with water vapour in the air.
  - This causes the water vapour to be acidic
  - We have acid rain

- What can this cause/do to ecosystem?

Pollution & Environment

Pollution & Environment

Acid Rain Effects on Sculptures

1908 1969

C. Ophardt, c. 2003

Pollution & Environment

Pollution & Environment

Movement of Pollutants

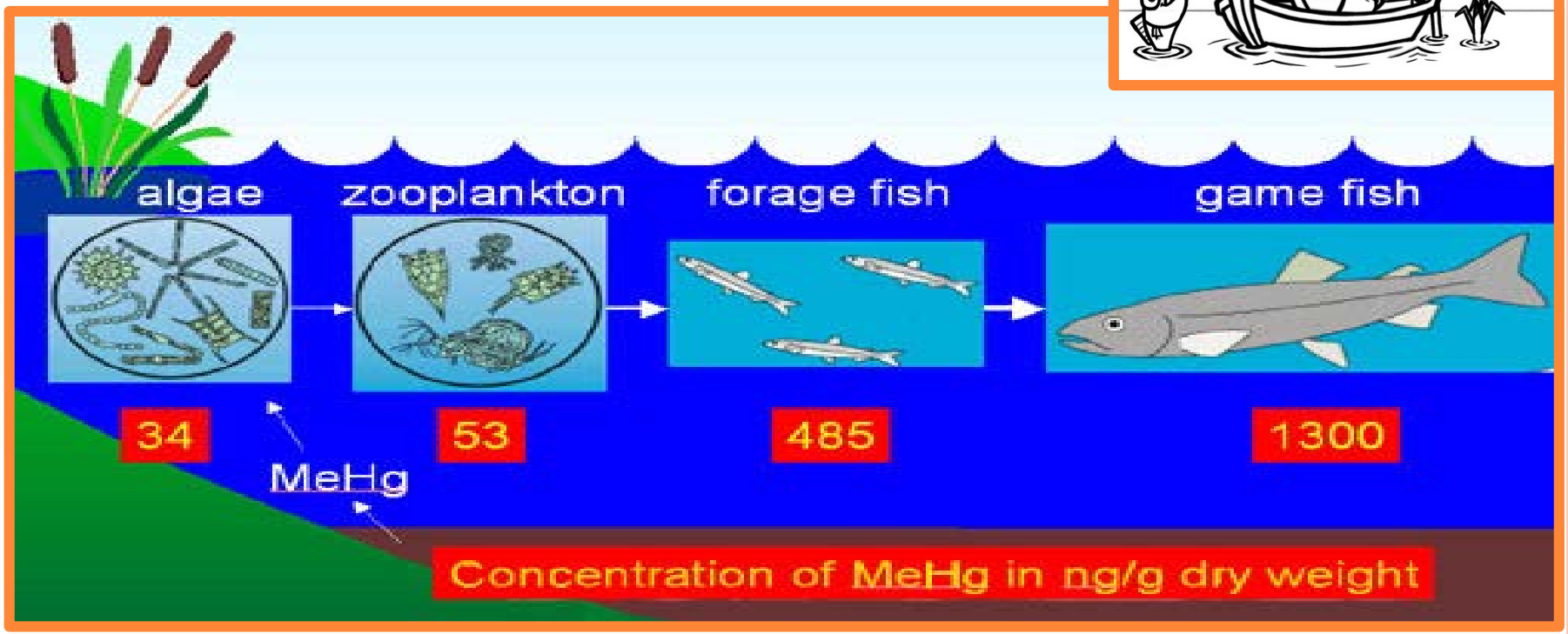
- Many different pollutants moving through the environment constantly

- Examples…
  - PCBs (old paint/packaging material)
  - Mercury (mining, thermometers, disposed as waste)
  - DDT (pesticide from the 40s-60s)

- The question is how do they get around?

Bioaccumulation

- They move from level to level in the food web
  - Stored essentially like food energy is
- Classic example: Mercury in fish …



Interactions & Ecosystems

Succession and Change in Ecosystems

How Does This……

Turn Into That!?

ENTER SUCESSION!!!

Succession

- The **gradual** process by which some species replace other species is called **succession**

- **Primary Succession**
  - The gradual growth of organisms over a period of time. Primary succession always begins with a rocky landscape. This could be due to a parking lot being paved or lava from a volcano converting a landscape into stone.

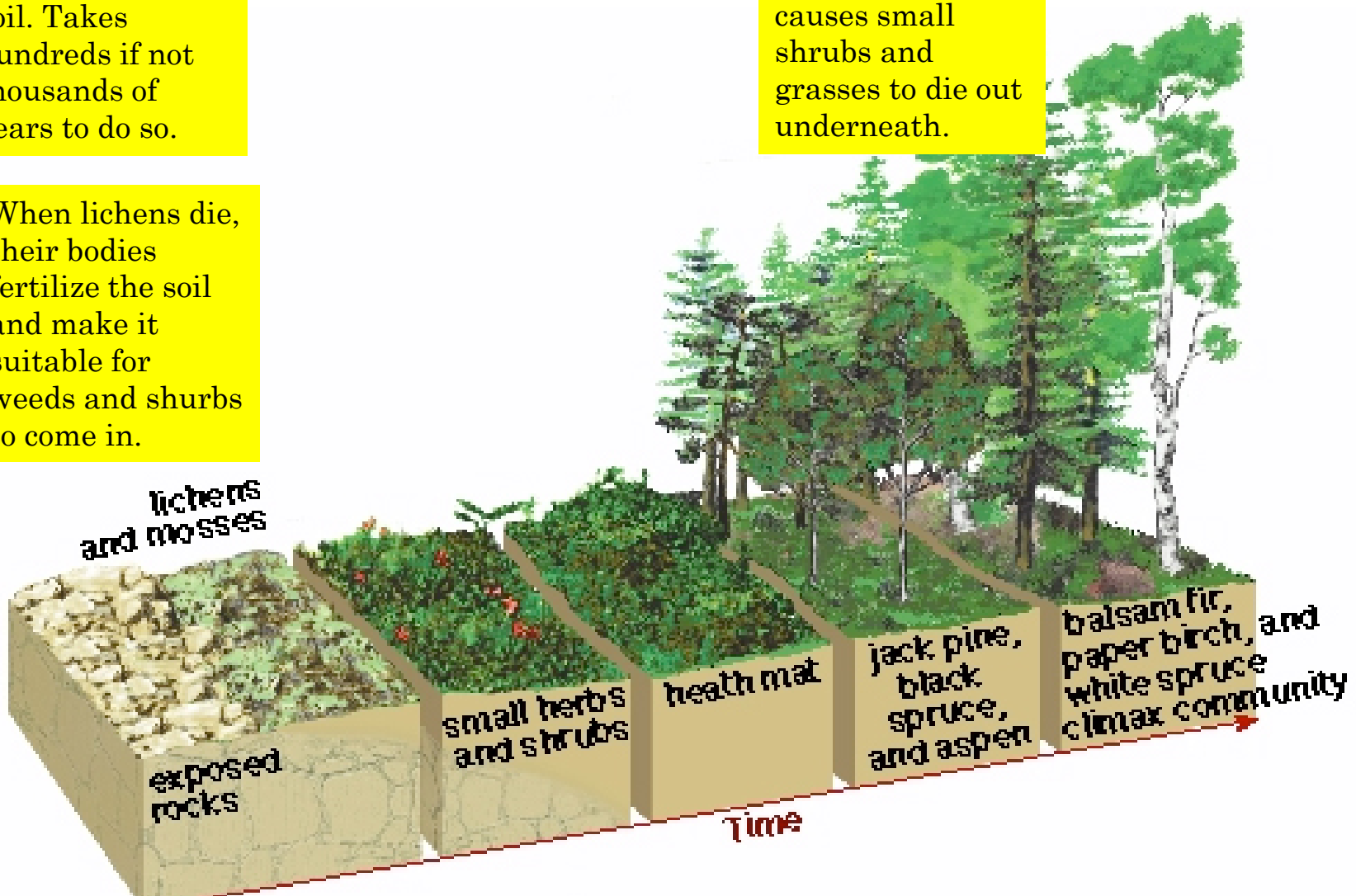
- **Secondary Succesion**
  - The gradual growth of organisms over a period of time. Secondary succession always begins with soil. The soil is already present. Plants have to just move in. This could happen after a forest fire when everything except the soil is destroyed.

ENTER PRIMARY SUCCESSION—STARTS WITH ROCK

Lichens poop acid which breaks down rocks turning them into soil. Takes hundreds if not thousands of years to do so.

When lichens die, their bodies fertilize the soil and make it suitable for weeds and shurbs to come in.

In **Climax Community**, tall trees drown out the sun. This causes small shrubs and grasses to die out underneath.

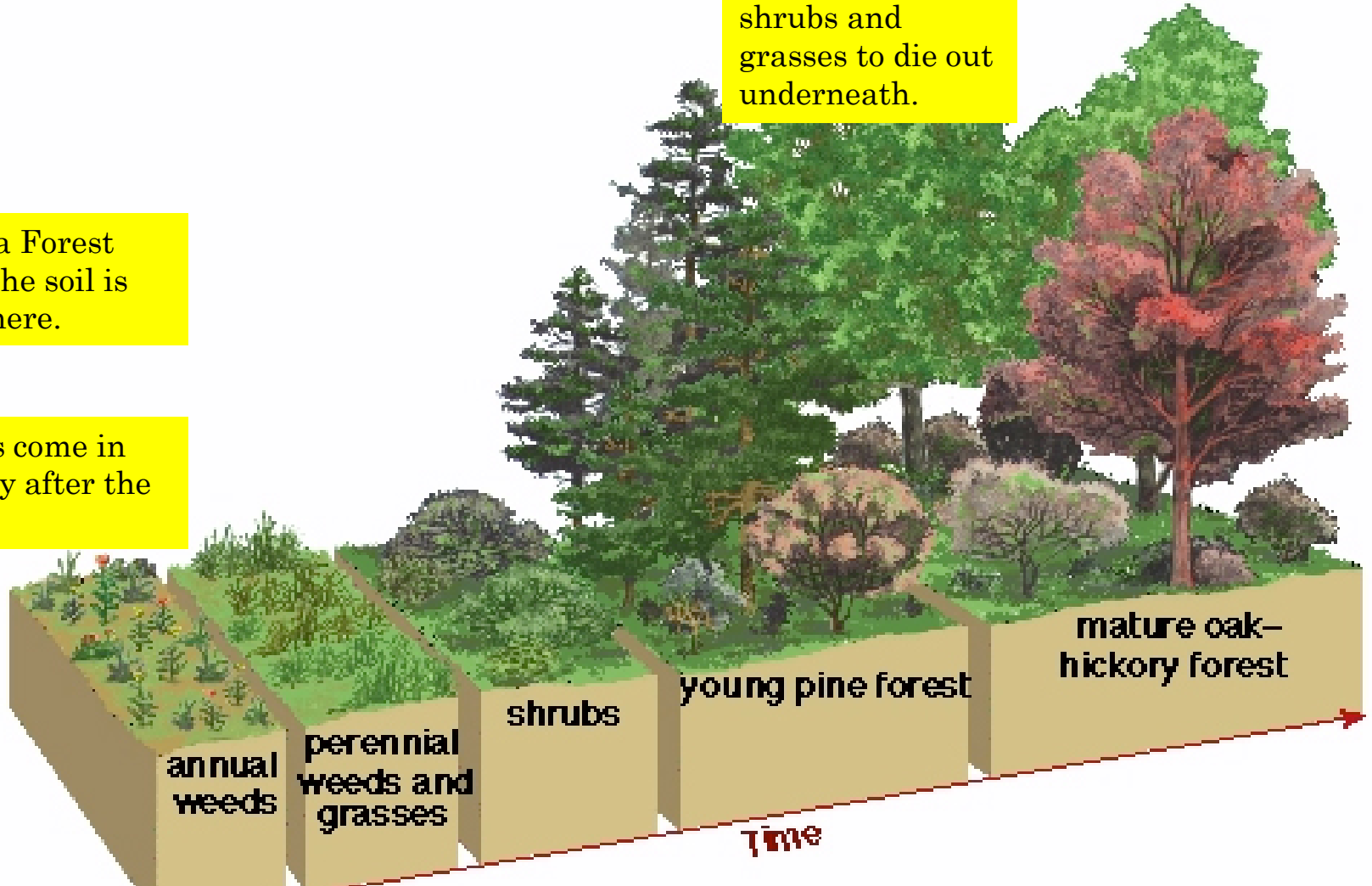


ENTER SECONDARY SUCCESSION—STARTS WITH SOIL

In **Climax Community**, tall trees drown out the sun. This causes small shrubs and grasses to die out underneath.

After a Forest Fire, the soil is still there.

Weeds come in quickly after the fire.



What kind of Succession is this?

What kind of Succession is this?

Pest Control

- Using pesticides is not good
- Why?
- Aside from potential **bioaccumulation** …?
- It kills other species in the area!

- What is the pest we are killing the most, inadvertently, which is causing problems for us?

Why All The Bees Are Dying

Biological Controls

- This is the addition of a new species to eliminate an unwanted species

- Example:
  - You have a gorilla problem
  - You introduce a herd of T-Rex
  - They eat the gorillas
  - No more gorilla problem

Introduce Species

- Introducing a new species to a new environment
- Tons of research goes into this before it is done to weight the pros & cons

- Famous examples of accidentally/intentionally introduce species?
  - Starlings
  - Purple Loosetrife

Species in Danger

- Being extinct = no longer existing
- Most common reasons?
  - Loss of habitat
  - Over Hunted
  - Introduced species

- The Canadian List of Endangered Species