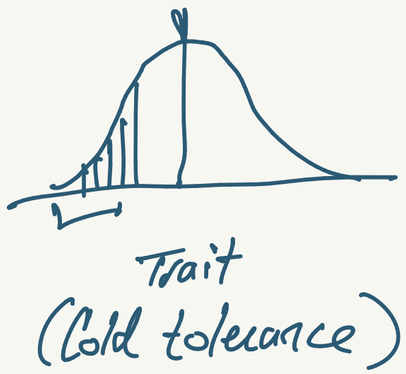
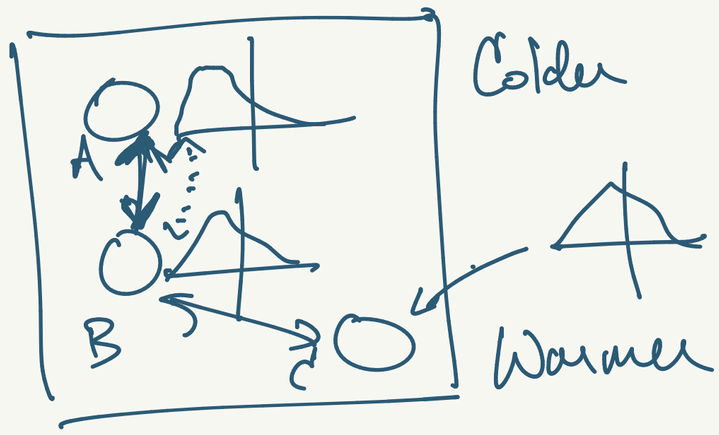




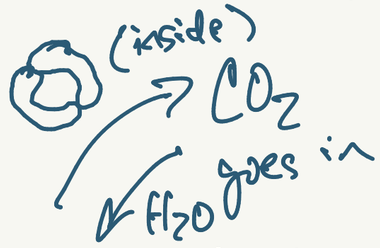
Ecotypes: populations w/ adaptations to unique environments

- Salivary amylase copy number

Temperature

- fundamental abiotic ~~gradient~~ force b/c it varies across the planet and dictates the rate at which chemical rxns can take place (enzyme activity)
- Temp. dictates water availability: the warmer the air, the more water vapor it can hold
  ↳ rate of water loss ↑ as temperatures ↑

- Plants: control temperature via transpiration through leaf stomata



  - evaporation of water from plant to air
  - Evaporative cooling ~ requires a dependable water supply

- Animals: Ectotherms - body temperature that is determined by environment (& metabolic rate)

  Endotherms - regulate their internal body temperature to be roughly constant (metabolic rate)

Some Terminology... all animals regulate temperature; it's just a matter of HOW

Ectotherms = animals whose temperature is regulated by external temperature
Endotherms = Animals whose temperature is not regulated by external temperature

EITHER/OR

Poikilotherms = Animals whose temperatures fluctuate
Homeotherms = Animals whose temperatures are constant

SPECTRUM

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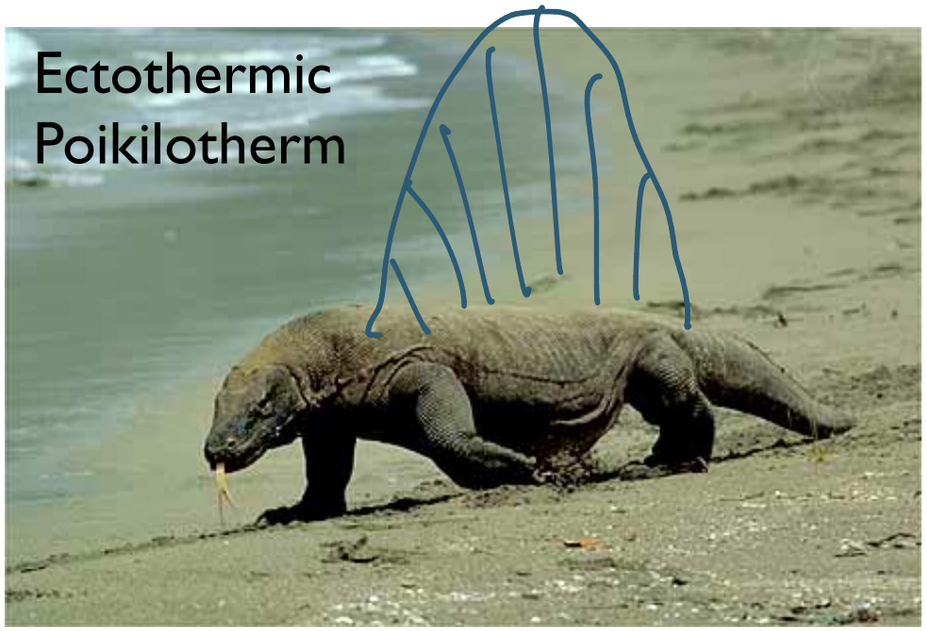

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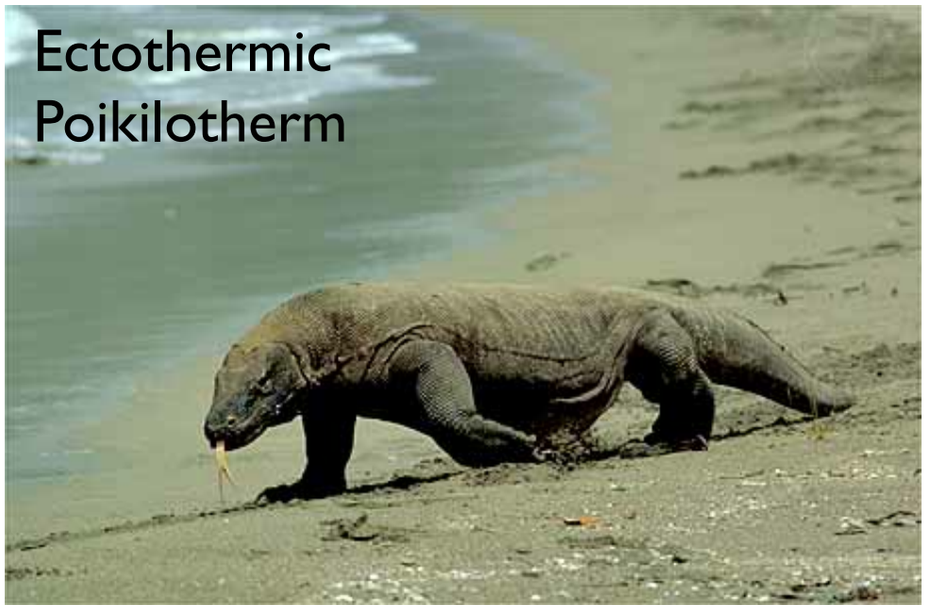

Ectothermic Homeotherm

- behavior to maintain constant temperature

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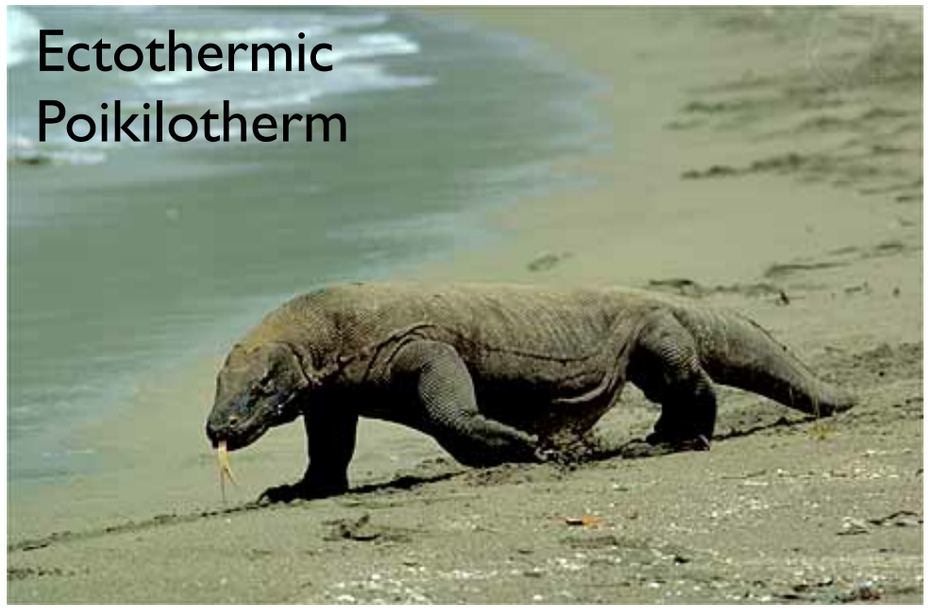
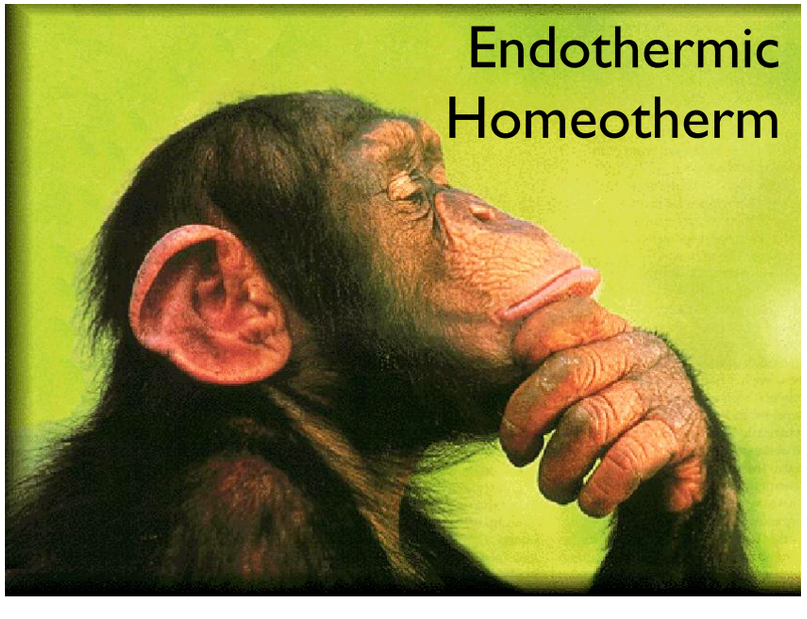


Ectothermic Homeotherm



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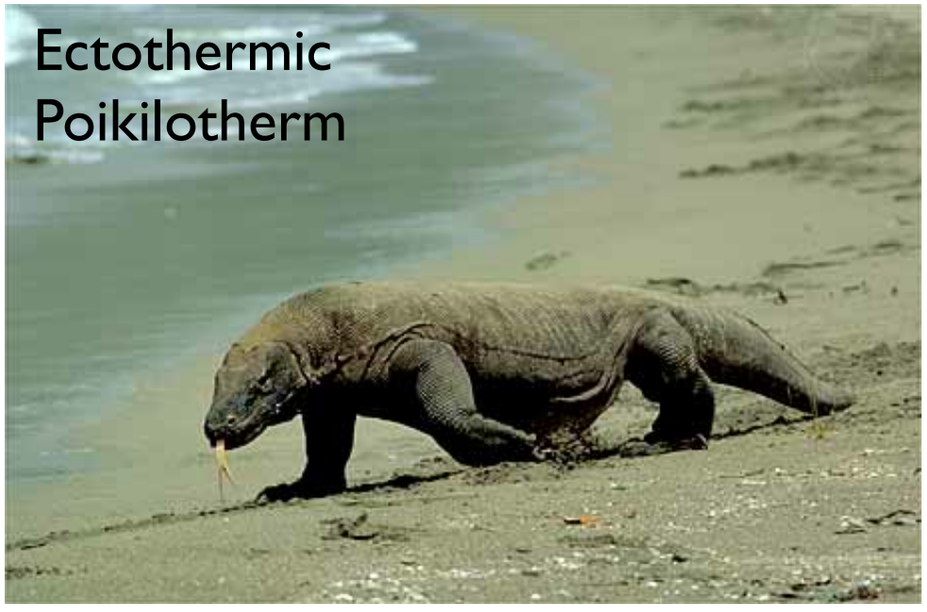
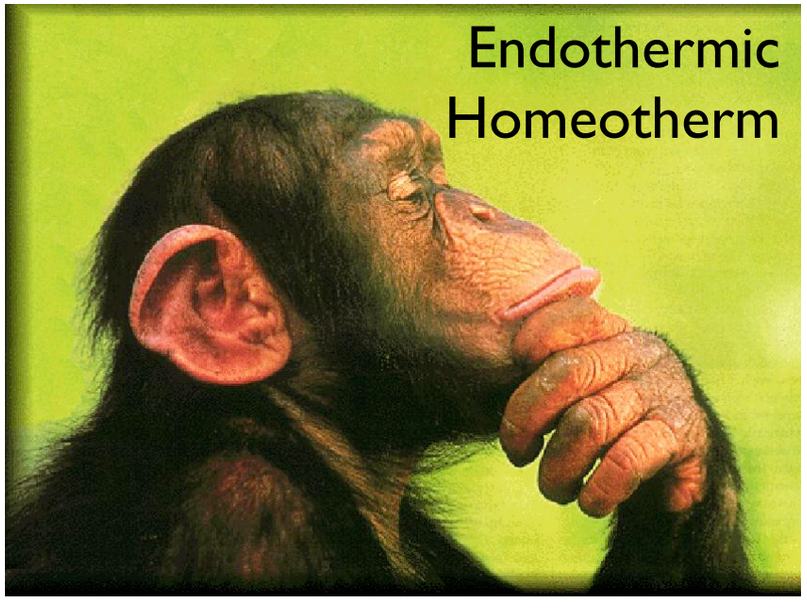


Ectothermic Homeotherm



Endothermic Poikilotherm

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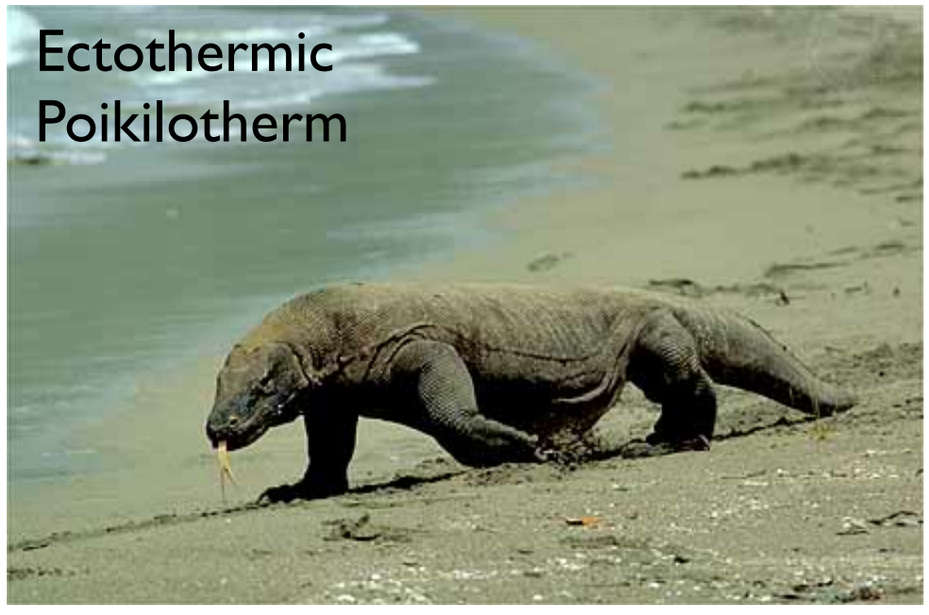
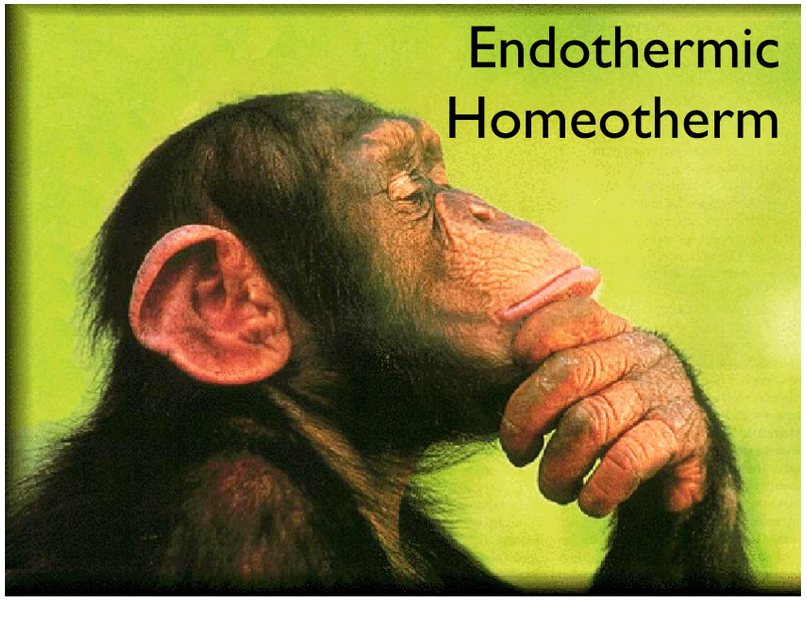


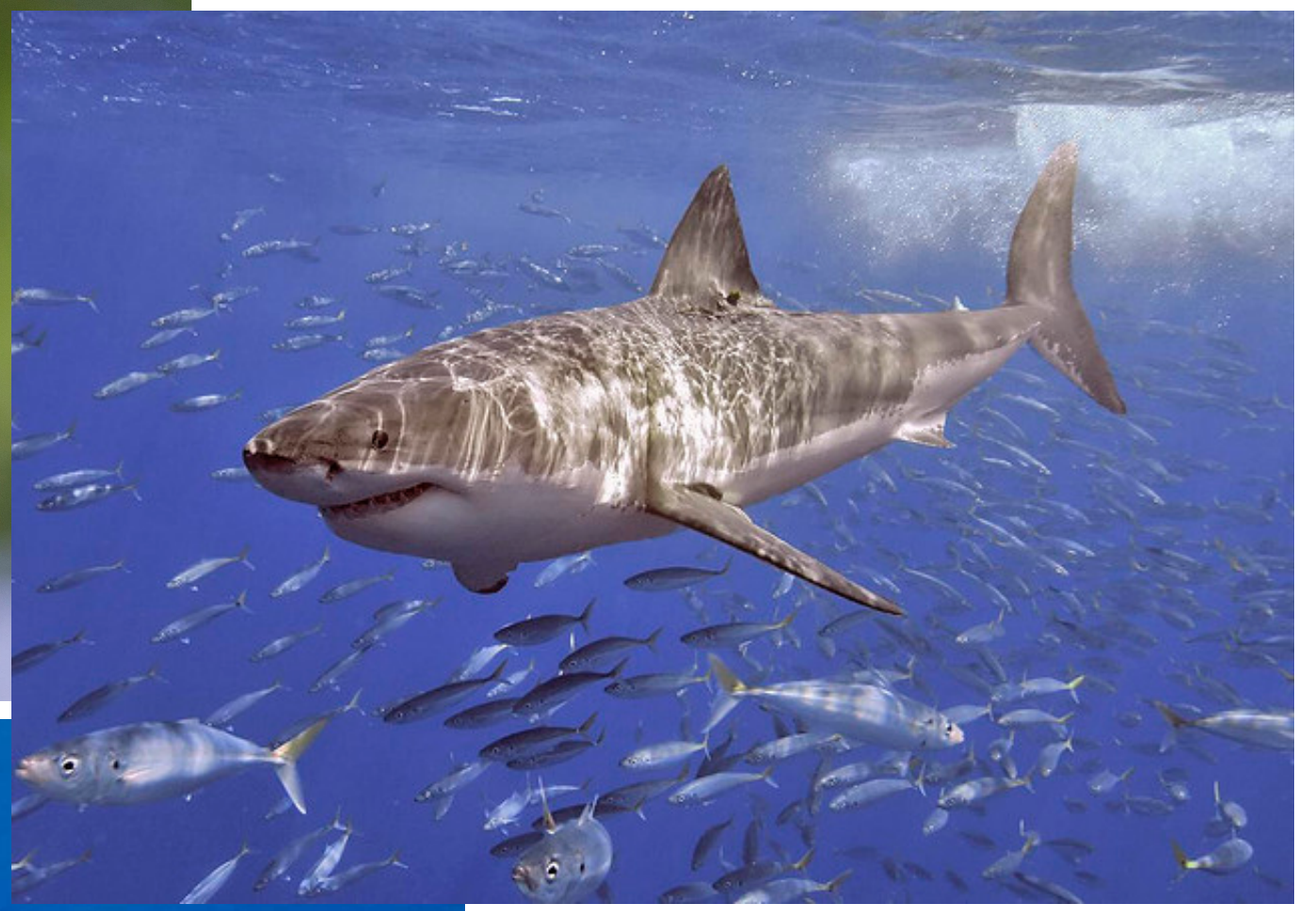
Ectothermic Homeotherm

FUNCTIONALLY
homeothermic



Endothermic Poikilotherm

Regulating your temperature - not just mammals



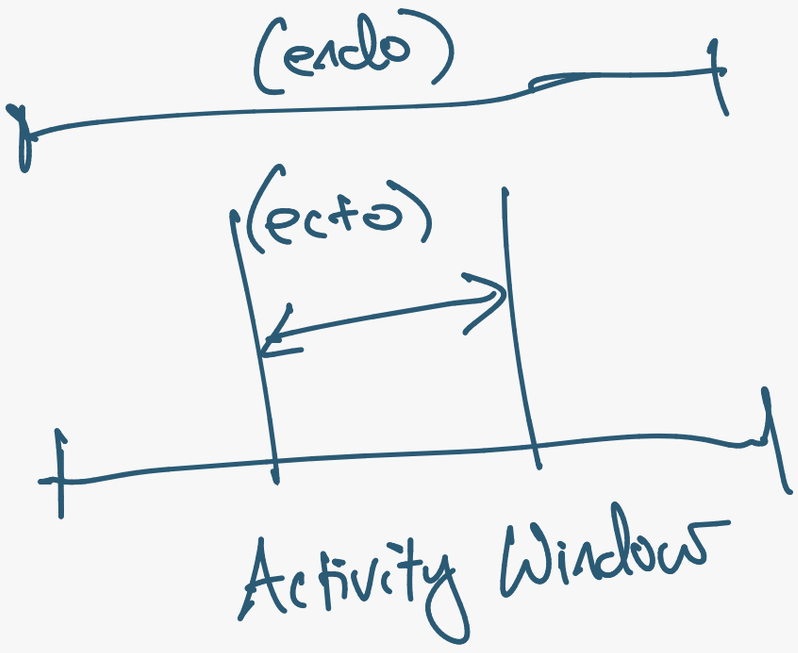
mesotherms

Endotherms must maintain metabolically generated heat

- Fur, feathers, fat (hair)
- These tissues don't make sense on ectotherms

Gigantotherm: so much volume

- the problem is getting rid of heat



- eat
- reproduce

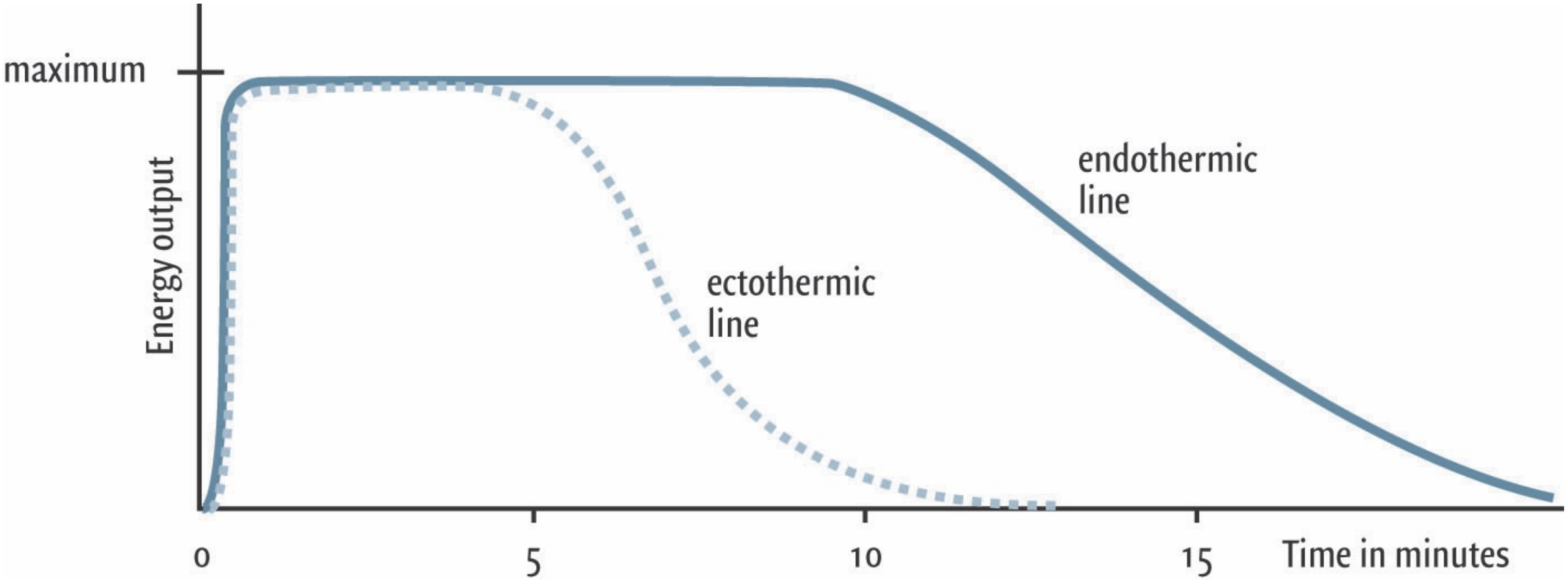
Regulating your temperature - not just animals

Eastern skunk cabbage

Dead horse arum lily

Carrion flower

Not just Temperature control; these 'lifestyles' describe the whole of metabolic processes.



Endothermy vs. Ectothermy: both have different metabolic consequences...

For a given activity, the Energy that is required for an ectotherm and an endotherm is the same, but:

1) an ectotherm produces less energy before it hit's the 'wall' (where anaerobic respiration begins ~ lactic acid buildup)
2) an endotherm can produce energy for a longer period of time before it hit's the 'wall'. (It can produce the same amount of energy LONGER) This is partly because an endotherm's resting metabolic rate is HIGHER than an ectotherms

It's good to be an ectotherm because:

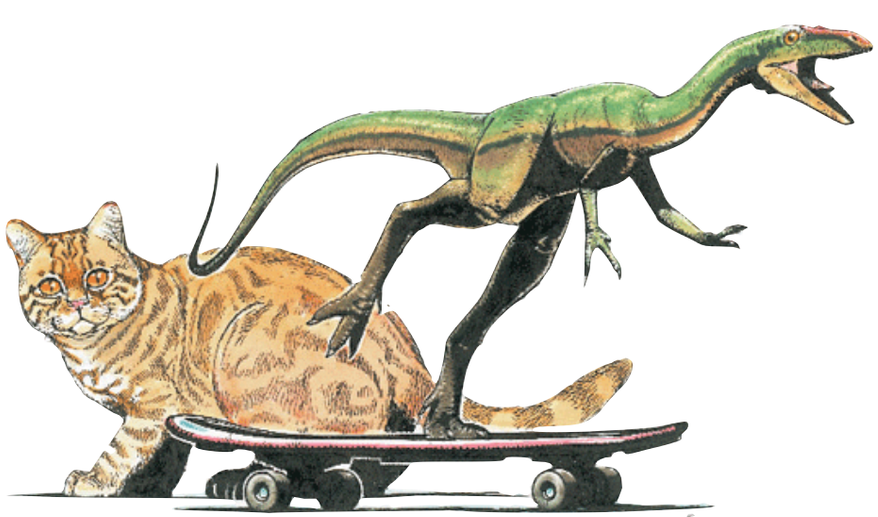
1) Energetically cheaper
   Lower resting metabolic rate
2) Potentially higher quick bursts of energy

<u>Costs:</u>
Cannot expend a lot of energy for a long period of time

It's good to be an endotherm because

1) You can expend more energy for a longer period of time

<u>Costs:</u>
Energetically EXPENSIVE



<u>Consequences:</u>
For a given 'energy landscape' You can support more ectotherms b/c they are more economical

<u>Conclusion:</u>
Endothermy is not superior.
It is just another lifestyle

<u>Deciding Factor:</u>
What is the best strategy for survival in a given ecological scenario? Varies from scenario to scenario

Energy

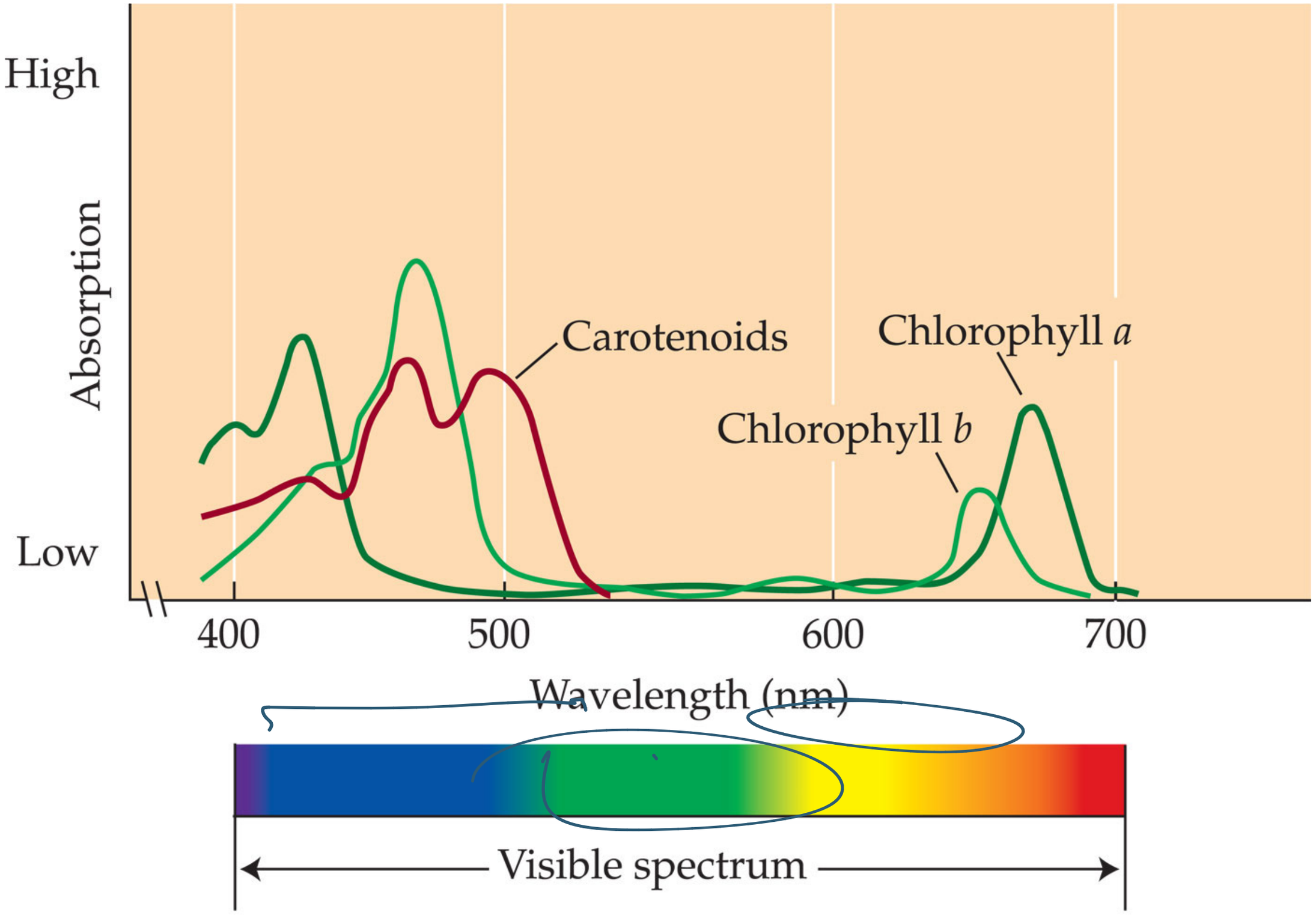
- 3 primary sources of energy
  1) Sunlight
  2) Inorganic chemical cmpds
  3) Organic ~~com~~ cmpds

} autotrophs < photosynthetic / chemosynthetic

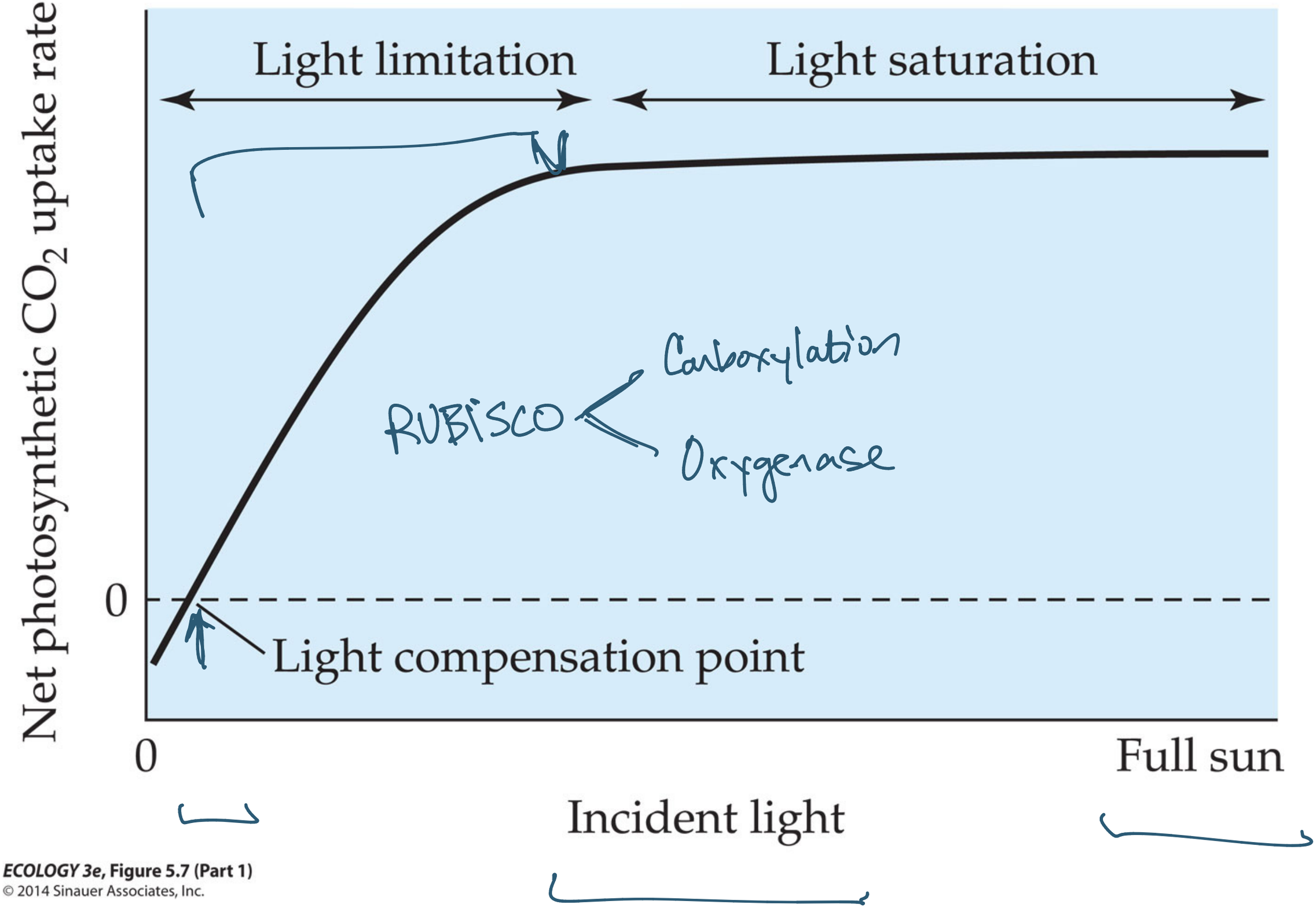
— heterotrophs
- obtain energy rich material from other organisms

↺ Heterotrophs { carnivores ↑ herbivores ↑ plants ↑ Autotrophs ↑ Reservoir (Sun, inorganic chemicals)

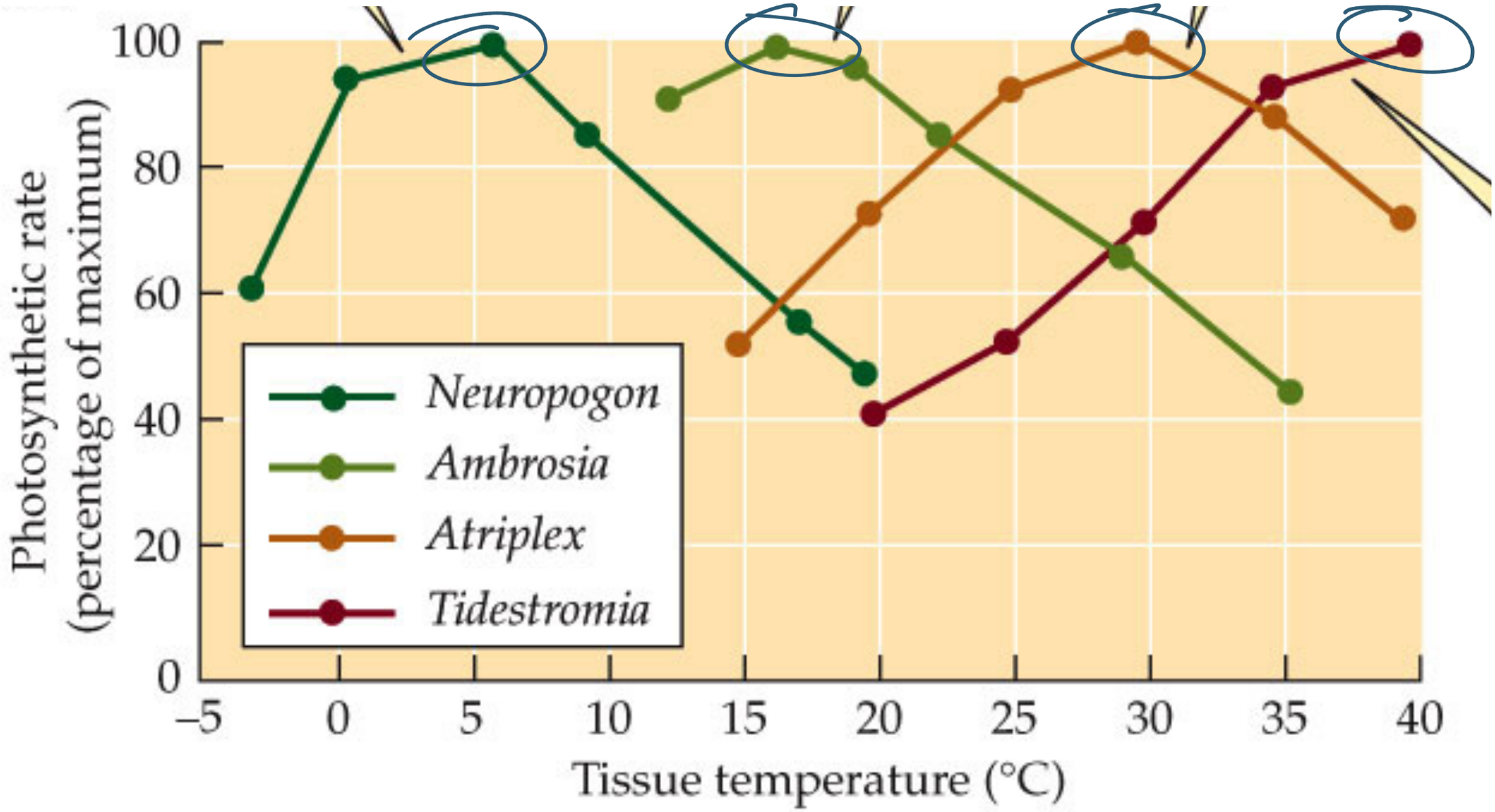
Photosynthesis : Plants have sev. light absorbing pigments



***ECOLOGY 3e*, Figure 5.6**



***ECOLOGY 3e*, Figure 5.7 (Part 1)**



Species have evolved to different conditions

so we observe different optimum temperatures

for different species

Environmental constraints have resulted in evolution of biochemical pathways that improve efficiency of photosynthesis.

1) C_3
2) C_4
3) CAM

RUBISCO: Catalyzes 2 competing rxns

- Carboxylase rxn: CO_2 taken up, sugars synthesized, O_2 released
- Oxygenase rxn: O_2 is taken up → breakdown of carbon compounds, releasing CO_2 = photorespiration

- Depends $[CO_2]:[O_2]$ ↓ photosynthetic efficiency ↓

As Temperature ↑ photosynthetic efficiency ↓

C_3 - photosynthetic pathway ~ Evolved in high CO_2 environments

C_4 - photosynthetic pathway

C_4 plants evolved independently in 18 families

2 create a miniature atmosphere of high $[CO_2]$ with in specialized cells → ↑ photosynthetic efficiency (Bundle sheath cells)

U.O.D.

C_4 (lowercase)