Rapid phsyiological change in response to change in a single adaptagent is called acclimation while change in response to a suite of new conditions is acclimatization. Neurological or behavioral adjustments to new stimuli are called habituation.

Species that can tolerate a wide range of temperatures are called eurythermic. If that same species expends energy maintaining body temperature within a certain range (despite changes in the outside temperature) we also call it thermal regulator. Finally, while that species maintains body temperature within this range, it is a wide range and the body temperature is quite variable. That species is therefore also poikilothermic.

Evolution should alter genotypes to maximize phenotype fitness in the occupied environment.

Phenotypic plasticity results in changes to a phenotype due to gene by environment interactions.

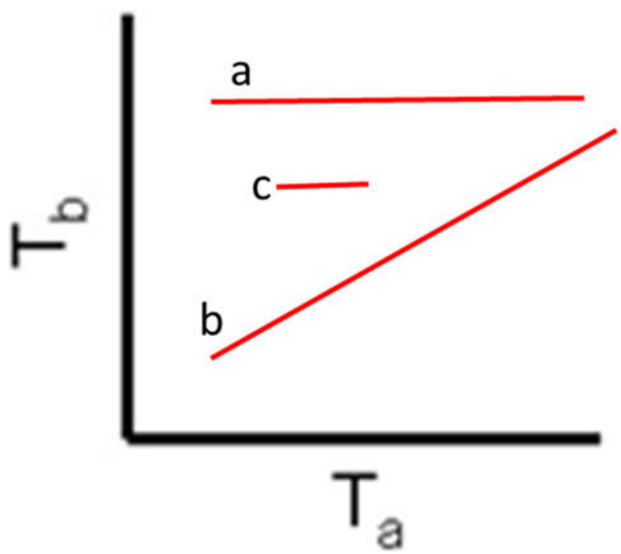
If a structure size or process rate scales evenly with size, we say that structure or process is isometric. However, if something increases proportionately faster than size we call it positive allometry and if it decreases with size it is negative allometry.

Duplication of genes can result in multiple copies of a gene that may all evolve independently. The term gene family refers to a group of related genes that have a common phylogenetic history but may now code for different proteins.

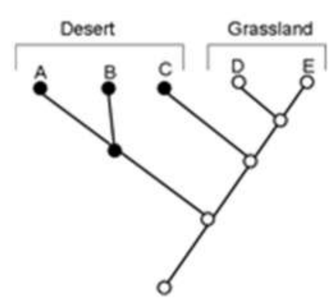
a. eurythermic regulator

b. eurythermic conformer

c. stenothermic regulator



This phylogeny better supports the hypothesis as there have been two independent events of the trait changing in a desert environment (taxa C and the common ancestor to A and B).



For a given phenotypic trait, if a=20 and b=0.85, what is the expected trait value for an organism with a mass of 5kg? $20*5^{0.85} = 78.55$

At low Reynolds numbers, viscous forces are more important than inertial forces. This relationship reverses itself at higher Reynolds numbers.

Facilitated diffusion moves ions with a concentration gradient faster than standard diffusion and does not require energy. The only way to move ions against a concentration gradient is active transport, which requires ATP.

Reynolds numbers for an object moving through a fluid medium are calculated based on: 1) the viscosity of a fluid, 2) the size of the object, 3) the speed of the object moving through that fluid and 4) density of the fluid.

A hyperosmotic regulator maintains internal osmotic conditions above the surrounding water. Freshwater teleost is an example of a hyperosmotic regulator.

The Fick's law of Diffusion describes the basic diffusion rate of something based on a diffusion constant, area and a concentration gradient.

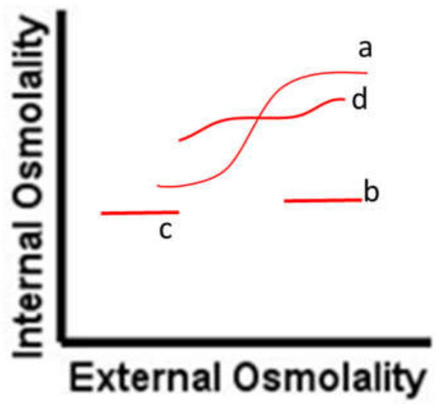
The Nernst Equation allows you to calculate an electrical potential due to a concentrations gradient of ions.

a. shark

b. tuna (marine teleost)

c. goldfish (freshwater teleost)

d. intertidal copepod



Honeybees and jets – a bee has a low Reynolds number, viscous forces are more important. As you increase size and speed, inertial forces become more important.

Kidney medullary area – Nephron lengths are generally constrained by adequate blood pressure to drive filtration. Smaller mammals can have proportionately larger medullary area resulting in negative allometry in relative medullary area. In addition, mammals from dry environments have greater meduallary area (proportionality constants differ, slopes generally the same). Medullary area determines the ability to concentrate urine (and conserve water).

Freezing point - 3.25/1.86 = 1.75 mOSm solution

Osmotic coefficient = 1.75 / (3*1.5) = 0.388