Mechanisms of Evolution

• Directed evolution/Internal mechanisms - “orthogenesis” etc.
• Inheritance of acquired characteristics (“Lamarckism”)
• Genetic drift
• Neutral theory
• Natural Selection
• Higher level sorting
Directed evolution

• Favorable variations arise because they are directed to do so -- by unknown internal or external forces
• a.k.a. "orthogenesis", "aristogenesis", "divine evolution", etc.

Gryphaea, Jurassic

Trueman (1922)
Inheritance of acquired characteristics ("Lamarckism")

Genetic drift

- Genetic variants can become established ("fixed") in a population by chance (esp. in small populations)
Neutralism

- Genetic variants that do not affect fitness ("neutral" traits) can become established in populations due to mutation alone.

Natural Selection

Definition: The non-random and differential reproduction of different genotypes acting to preserve favorable variants and eliminate less favorable variants.
“3 unarguable observations and 2 inescapable conclusions”

• Observations:
  – 1) There is variation
  – 2) At least some of it is inherited
  – 3) There is vast overproduction

• Conclusions:
  – 1) There is a “struggle for existence”.
  – 2) On average, those individual organisms with traits that confer some advantage in this struggle will leave more offspring.

Natural Selection -- Another way to remember it: VISTA

• Variation
• Inheritance
• Selection
• Time
• Adaptation
Higher level sorting
EVOLUTION OF A SON

TODDLERIUS
ADORABILUS

TYRANNUS
ERECTUS

TEFANDERTHAL
GROWNUPICUS