

EVOLUTION (Ch. 4)

1. INTRODUCTION

central theme of biology

- explains history & diversity of life
- social abuse & religious conflicts

individual variability

- small genetic differences among organisms
- increase between generations over time
- leads to development of diff species

Lamarck - 1809, inheritance of acquired characteristics
(use & disuse)

Darwin - 1859, natural selection

- neo-darwinism - include genetics

2. NATURAL SELECTION

1. genetic variation among individuals in a population
2. more organisms are produced than can survive
3. competition for resources necessary for survival
4. individuals better adapted to environment are more likely to survive & reproduce
5. small changes over time lead to the evolution of different species

criteria for fitness - survival & reproduction

3. EVIDENCE

number of species - millions

observations - London Pepper Moths

experiments - selective breeding

adaptations - anatomy, physiology, behavior

homology - similar origins of structures

- versus analogy (similar functions of structures)

vestigial structures - no function

development - similarities in embryos

biochemistry - similarities in DNA & protein

fossils - physical evidence of past life

biogeography - global distribution of species

plate tectonics - includes continental drift

- Pangaea - supercontinent 225 m.y., now 15 plates

4. VARIABILITY

variation - individual differences

- promoted by natural selection

mutations - random changes in gene

- mostly lethal, spread only if beneficial

meiosis - crossing-over of genes

- segregation & independent assortment

sexual reproduction - combines sperm & ova

- dioecious requires cross-fertilization

geographical variations

- Bergman's rule - body size
- Allen's rule - length of appendages
- Gloger's rule - coloration

5. SPECIATION

species - "a group of interbreeding organisms that are reproductively isolated from other such groups"

speciation - development of new species

- most require geographical isolation

isolating mechanisms - maintain separation of species

- pre-mating - prevents mating
- post-mating - prevents survival of hybrid offsprings

extinction - if overadapted to single environment

- undermined when habitat changes

6. PATTERNS OF EVOLUTION

adaptive radiation - 1 species evolve into many different species in new environment

divergent evolution - 2 related species become different to avoid competition

convergent evolution - 2 unrelated species become similar in same habitat

parallel evolution - 2 distant-related species become similar independently

coevolution - 2 different species influence each other's evolution

sexual selection - sexual dimorphism
- males emphasize reproduction over survival

punctuated equilibrium - rate of evolution varies

7. ORIGIN OF LIFE

4.6 by - earth (big bang event)

4.0 by - rocks (igneous)

3.4 by - fossils (bacteria)

primordial soup - lab expt recreates ancient environment

- combine H^+ , CH_4 , NH_4 , H_2O , heat/electricity
- 24 hours (half C's in amino acids)
- later (form all other organic molecules)
- protenoid microspheres (membrane, chemical reactions, division)

chemical evolution - demonstrates possible origin of life
- requires lots of time

8. HUMAN EVOLUTION

paleoanthropology

- evolution of humans from primate ancestors

Hominoidea - humans

- apes (gibbon, orangutan, gorilla, chimpanzee)
- not monkeys