

## Theory of Evolution

- Charles Darwin – “Darwinism”
- Voyage of the Beagle in 1831 to map South American coast
- Darwin spent time observing flora and fauna
- Notion of Divine Creation dominated thinking at this time

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See Fig. 1.5 in text

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## 5 Theories of Darwinism

1. Perpetual change
  - Documented by fossil record

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See Fig. 1.14 in text

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**5 Theories of Darwinism**

**1. Perpetual change**

**2. Common descent**

- Phylogeny
- Branching trees form nested hierarchies of species
- Morphology
- Homologous structures
  - Character states derived from the same character state in a common ancestor
- e.g. vertebrate forelimbs (different functions) Fig 1.16

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See Fig. 1.16 in text

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## 5 Theories of Darwinism

### 1. Perpetual change

### 2. Common descent

- Phylogeny
- Branching trees form nested hierarchies of species
  
- Homologous structures
- e.g. vertebrate forelimbs (different functions) Fig 1.16

- Biogenetic Law (Haeckel) believed "Ontogeny recapitulates phylogeny"

**Not True**

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See Fig. 1.19 in text

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## 5 Theories of Darwinism

### 1. Perpetual change

### 2. Common descent

### 3. Multiplication of species

- Reproductively distinct
- Speciation
- Allopatric speciation
  - Geographic isolation
  - Founder events
- Sympatric speciation (Fig 1.21)
- Adaptive radiation
  - Darwin's finches (Fig 1.22 and 1.23)

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See Figs. 1.20 – 1.23 in text

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**5 Theories of Darwinism**

1. Perpetual change
2. Common descent
3. Multiplication of species
4. Gradualism
  - Small changes over long time periods
  - Populational gradualism
    - Gradual spread of trait among population
    - Well accepted
  - Phenotypic gradualism
    - Gradual production of the trait itself
    - Controversial (e.g. selective breeding)

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See Figs. 1.25 and 1.26 in text

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## 5 Theories of Darwinism

1. Perpetual change
2. Common descent
3. Multiplication of species
4. Gradualism
5. Natural selection
  - Mechanism for adaptation

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## Natural Selection

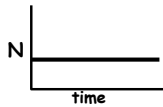
Mechanism for adaptation and biological diversity

### 4 Observations

1. Potential for exponential increase



2. Population size tends to be stable



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## Natural Selection

**Inference:**

**Many more offspring  
are produced  
than can survive  
and reproduce**

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**Natural Selection**

**3<sup>rd</sup> Observation**

Variation among individuals is the rule in nature

**4<sup>th</sup> Observation**

Some of this variation is inherited

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**Natural Selection**

**Inference:**

Individuals with inherited states of variable traits that on average confer a higher rate of survival and reproduction will tend to increase generation after generation at the expense of those with less advantageous states

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**Evolutionary responses to selection**

**3 Types**

1. Stabilizing

2. Directional

See Fig. 1.31 in text

3. Disruptive

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