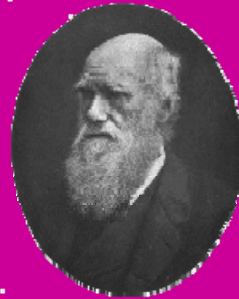


# PHI 320

## Distance Delivery

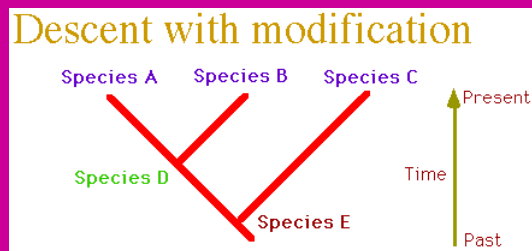
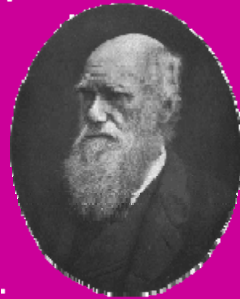
# Critical Thinking

## EVOLUTION

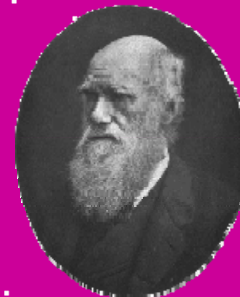


- Technical terms
- Biological change
- History of biological change
- Descent with modification
- Common descent
- Vertical evolution
- Horizontal evolution

## DESCENT WITH MODIFICATION

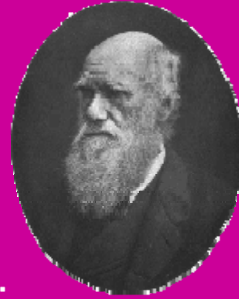


## EVIDENCE FOR DESCENT WITH MODIFICATION



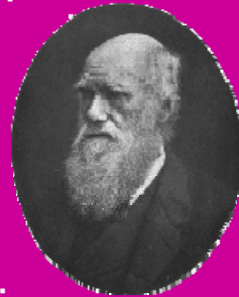
- Inference to the best explanation
- Johnson's "recipe"
- Schematizing
- Evidence in Darwin's time
- Power of Darwin's presentation
- General acceptance of this part

## EXPANDED AGE OF THE EARTH



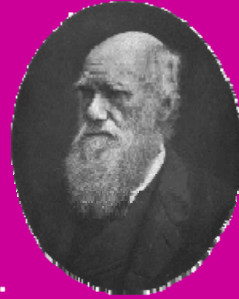
- Biblical calculation
- Tens of thousands of years
- Geological time
- Uniformativism
- Darwin's arguments
- 4.6 billion years

## CASE FOR COMMON DESCENT



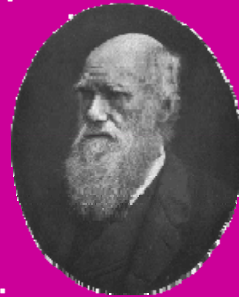
$e_1$ . Expanded age of the earth.

## DATA FROM THE FOSSIL RECORD



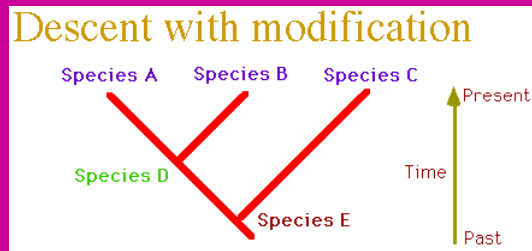
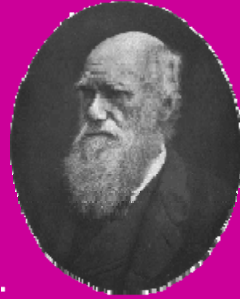
- Fossil record
- Cuts both ways
- Darwin on difficulties of fossils
- Clear evidence of change

## CASE FOR COMMON DESCENT

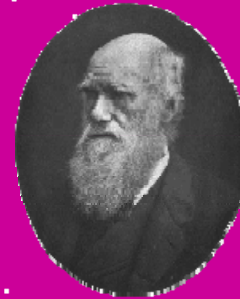


- $e_1$ . Expanded age of the earth.
- $e_2$ . Fossil record.

## DESCENT WITH MODIFICATION

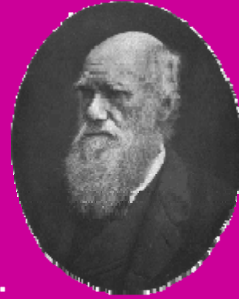


## *Scala Naturae*



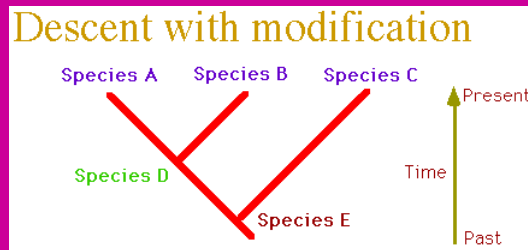
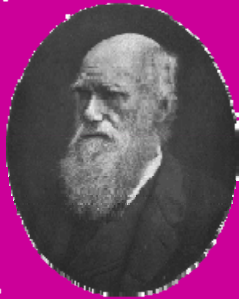
- Natural system problem
- Linnaeus
- Biological categorization
- Where does the order come from?
- Why is it hieratical?

## CASE FOR COMMON DESCENT

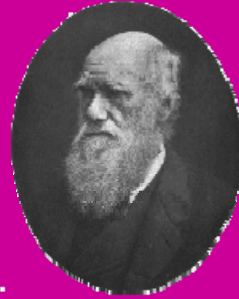


- $e_1$ . Expanded age of the earth.
- $e_2$ . Fossil record.
- $e_3$ . *Scala Naturae*

## DESCENT WITH MODIFICATION

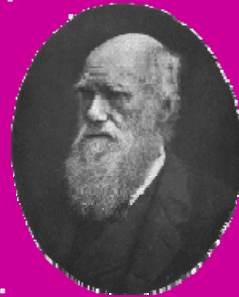


## GEOGRAPHICAL DISTRIBUTION



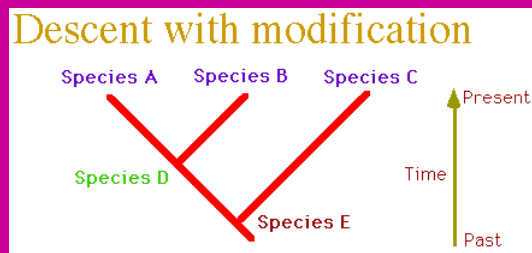
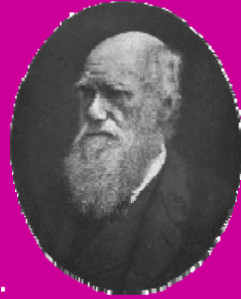
- Biogeography
- First line of *Origin of Species*
- Why the patterns between species and geography?
- The Galapagos

## CASE FOR COMMON DESCENT

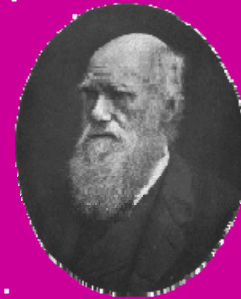


- $e_1$ . Expanded age of the earth.
- $e_2$ . Fossil record.
- $e_3$ . *Scala Naturae*
- $e_4$ . Patterns of geographical distribution.

## DESCENT WITH MODIFICATION



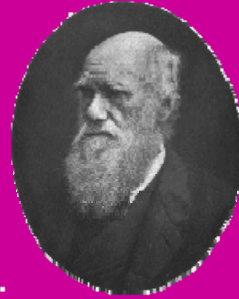
## MORPHOLOGY



- Etymology
- Study of form
- Examples:
  - Tetrapod structure
  - Structural similarity in birds
  - Forelimbs of mammals
  - Vestigial organs

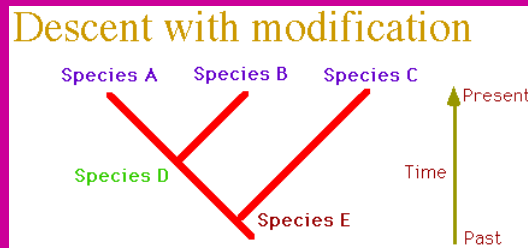
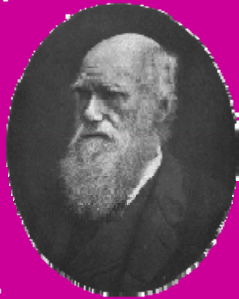


## CASE FOR COMMON DESCENT

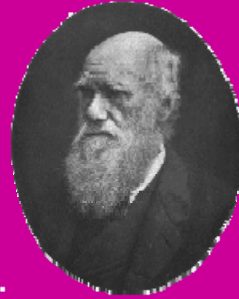


- $e_1$ . Expanded age of the earth.
- $e_2$ . Fossil record.
- $e_3$ . *Scala Naturae*
- $e_4$ . Patterns of geographical distribution.
- $e_5$ . Morphological considerations

## DESCENT WITH MODIFICATION

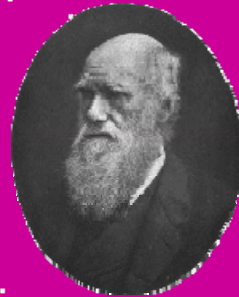


## EMBRYOLOGY



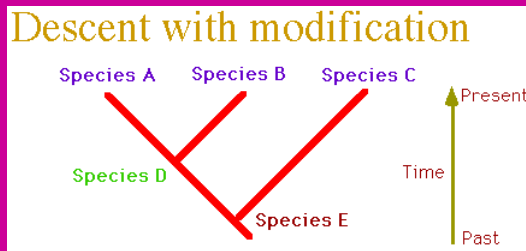
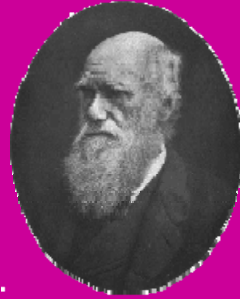
- **Ontology**
- **Links to *Scala Naturae***
- **Chickens, fish, humans**
- **Human embryological development**

## CASE FOR COMMON DESCENT

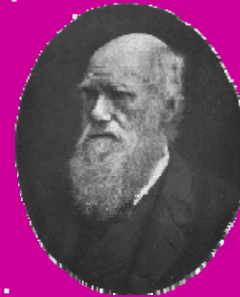


- e<sub>1</sub>. **Expanded age of the earth.**
- e<sub>2</sub>. **Fossil record.**
- e<sub>3</sub>. ***Scala Naturae***
- e<sub>4</sub>. **Patterns of geographical distribution.**
- e<sub>5</sub>. **Morphological considerations**
- e<sub>6</sub>. **Embryological development**

## DESCENT WITH MODIFICATION

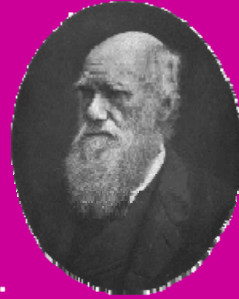


## CASE FOR COMMON DESCENT



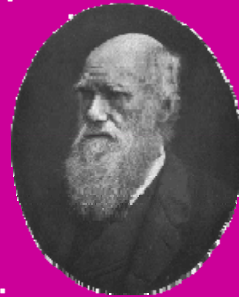
- e<sub>1</sub>. Expanded age of the earth.
- e<sub>2</sub>. Fossil record.
- e<sub>3</sub>. *Scala Naturae*
- e<sub>4</sub>. Patterns of geographical distribution.
- e<sub>5</sub>. Morphological considerations
- e<sub>6</sub>. Embryological development
- =====
- t<sub>0</sub>. Descent with modification

## ALTERNATIVE EXPLANATIONS



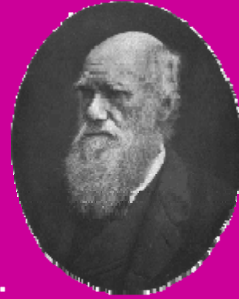
- t<sub>0</sub>. Descent with modification
- t<sub>1</sub>. Lamarckian evolution
- t<sub>2</sub>. Special creation
- t<sub>3</sub>. Something as yet undiscovered

## RANK ORDER



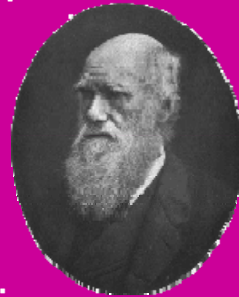
- Darwin's ranking
- Darwin's contemporaries' ranking
- Contemporary ranking
- Your own ranking
  - Doesn't have to deny God
  - What your intellectual conscience tell you - not your heart

## Natural Selection



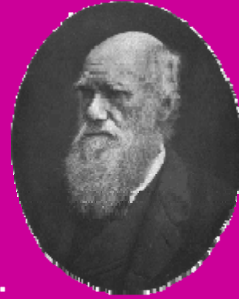
- Why the biological change implied by common descent?
- Lamarckian evolution - acquired characteristics
- Selection metaphor
- Artificial selection
- Background:
  - Expanded age of the earth
  - Malthus

## CASE FOR NATURAL SELECTION



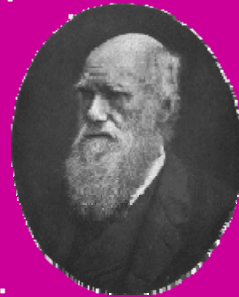
- $e_1$ . Through  $e_6$ .
- $e_7$ . Artificial selection

**CASE FOR  
NATURAL  
SELECTION**



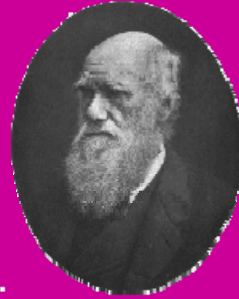
- $e_1$ . Through  $e_6$ .
- $e_7$ . Artificial selection
- $e_8$ . Fecundity of all species

**CASE FOR  
NATURAL  
SELECTION**



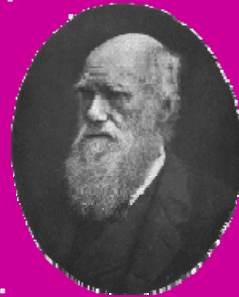
- $e_1$ . Through  $e_6$ .
- $e_6$ . Artificial selection
- $e_7$ . Fecundity of all species
- $e_8$ . General stability of populations

## CASE FOR NATURAL SELECTION



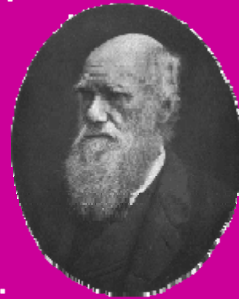
- $e_1$ . Through  $e_5$ .
- $e_7$ . Artificial selection
- $e_8$ . Fecundity of all species
- $e_9$ . General stability of populations
- $e_{10}$ . Limited natural resources

## FIRST INFERENCE



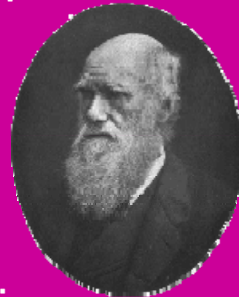
- $e_1$ . Through  $e_5$ .
  - $e_6$ . Artificial selection
  - $e_7$ . Fecundity of all species
  - $e_8$ . General stability of populations
  - $e_9$ . Limited natural resources
- =====
- $t'_0$ . Struggle for existence

**CASE FOR  
NATURAL  
SELECTION**



- $e_1$ . Through  $e_6$ .
- $e_7$ . Artificial selection
- $e_8$ . Fecundity of all species
- $e_9$ . General stability of populations
- $e_{10}$ . Limited natural resources
- =====
- $t'_0$ . Struggle for existence
- $e_{11}$ . No two individuals are the same

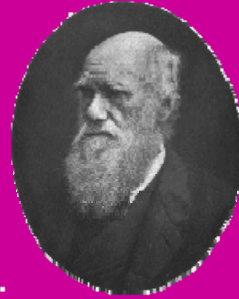
**CASE FOR  
NATURAL  
SELECTION**



- $e_1$ . Through  $e_6$ .
- $e_7$ . Artificial selection
- $e_8$ . Fecundity of all species
- $e_9$ . General stability of populations
- $e_{10}$ . Limited natural resources
- =====
- $t'_0$ . Struggle for existence
- $e_{11}$ . No two individuals are the same
- $e_{12}$ . Much of this variability is heritable

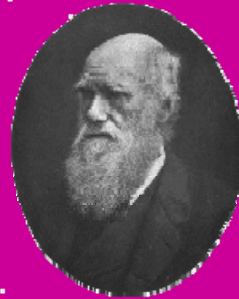


## SECOND INFERENCE



- e<sub>1</sub>. Through e<sub>6</sub>.
- e<sub>7</sub>. Artificial selection
- e<sub>8</sub>. Fecundity of all species
- e<sub>9</sub>. General stability of populations
- e<sub>10</sub>. Limited natural resources
- =====
- t'<sub>0</sub>. Struggle for existence
- e<sub>11</sub>. No two individuals are the same
- e<sub>12</sub>. Much of this variability is heritable
- =====
- t''<sub>0</sub>. Struggle is not completely random - natural selection

## THIRD INFERENCE



- e<sub>1</sub>. Through e<sub>6</sub>.
- e<sub>7</sub>. Artificial selection
- e<sub>8</sub>. Fecundity of all species
- e<sub>9</sub>. Stability of populations
- e<sub>10</sub>. Limited natural resources
- =====
- t'<sub>0</sub>. Struggle for existence
- e<sub>11</sub>. No two individuals are the same
- e<sub>12</sub>. Much of this variability is heritable
- =====
- t''<sub>0</sub>. Struggle is not completely random - natural selection
- =====
- t'''<sub>0</sub>. Over many generations - origin of new species