

**Part IV**  
**Evolution**



# Chapter 14

## Introduction

### 14.1 Homework

- Movie: *Darwin's dangerous idea*
- Study questions:

Give a short answer to the following questions:

1. On which occasion could Darwin gather some about animal species in the Galapagos Islands?
2. What was the prevailing view about the origin of species in Darwin's times?
3. What is striking about the Finches that Darwin brought back from the Galapagos Islands?
4. How would you characterize Darwin's attitude towards the scientific community of his times? Was he a loud revolutionary? (Compare his attitude to his brother's)
5. How do modern scientist determine when species diverge? Explain with the example of the rainforest vs mountain Hummingbirds in the Rainforest.
6. From whom did Darwin get the idea of the "struggle for life", due to overpopulation and scarcity of resources?
7. Explain how HIV is an example of evolution in action. Explain how, thanks to their understanding of evolutionary processes, physicians were recently able to develop a new strategy against the virus.
8. What were Darwin's religious views? What important event affected Darwin's relationships with the Church.
9. Was Darwin eager to publish? Why?
10. Explain how Kenneth Miller can be an "orthodox Catholic" and an "orthodox darwinist" at the same time? What is his view of God?
11. How is Darwin's theory a threat the religious views of his times?

12. Do chimps have cognitive abilities? which ones are shown in the movie?
13. Why is DNA a proof of the theory that all species stem from a common ancestor?
14. What prompted Darwin to publish his manuscript?
15. How was Darwin buried? What does this show about the reception of Darwin's ideas?

## 14.2 The Background: Victorian Natural Religion

**Victorian Times** – reign of Queen Victoria (1837-1901)

- British Empire
- Industrial Revolution – engineering, railways, steam machine, steam ship – “Science makes things happen”
- Influence of science – world fair

**Fixity of species and Natural Religion** – In the beginning of 19th century, the common view is that species are fixed and eternal. The view has less to do with the Bible than with Natural Religion

- Nothing that specific in the Bible about species
- Natural Religion: the idea that we can make religion “scientific”, i.e. that we can base religious belief on empirical observation
- An important part of natural religion: the work of the naturalists, who engaged in a detailed study of nature, including the classification of all living things, *in order to display the perfection of God's creation.*
- For species: the thought is that if God has created the species, then he must have created them perfect from the beginning, and there is no need for change.
- In particular, they were looking for the perfect adaptation of species to their environment.  
→ *The naturalists were searching for empirical proofs of the perfection of the creation.*

**The irony** is that, in doing so, they came to doubt the thesis of the fixity of species

- Linnaeus: the greatest classifier who gave us the binomial system (genus / species) saw himself as studying God's plan. Toward the end of his career, starts to doubt the fixity of species, and considers the idea of a common ancestor (closeness of species within the same genus)
- Erasmus Darwin (Charles' grandfather) has developed a theory of evolution: changes due to high stimulation of certain organs.

## 14.3 The Evolution of Darwin's ideas

**From medicine to ministry** – Darwin was born into a wealthy, unconventional, and free-thinking family 1809

- Edinburgh to study medicine (as father and grandfather)
- Cambridge in 1828: turns to ministry and naturalism – Sedgwick as a professor, Paley as a reader.

**Voyage on the *Beagle*** – data gathered

- 1831: Darwin believes in the fixity and perfection of species
- changed his mind during the voyage, observing that:
  1. Different kinds of environment are inhabited by similar kinds of species when the regions are close
  2. Similar environments are inhabited by different kinds of species when they are widely separated

Most important data gathering playground: Galapagos Islands

→ *Simple observations undermine the idea of the perfection adaptation of species to their environment*

- The story of the Finches: different species on different islands, and the ideas of:
  1. a common ancestor and,
  2. speciation by geographic isolation

**The influence of Malthus' theory of economics** – *Essay on population*

For Malthus, population increased in a geometric and subsistence means only in an arithmetic ratio

As early as 1838, Malthus's work suggested to Darwin the idea of a struggle for existence, in which favorable variations would be preserved and unfavorable ones destroyed

## 14.4 Darwin's life and character

**Darwin and the scientific community**

**Darwin and the issue of publication** – Back in England: 1836 – Publication: 1859 : what happened???

- 20 years of organizing his data and looking for more – barnacles for 8 years !
- due not so much to doubts about the theory than: 1. unwillingness to cause controversy, 2. make sure to amass enough evidence to make a persuasive case
- Wallace: 1858 – sends a paper to Darwin which contains very similar ideas

- Lyell and Hooker arranged for Darwin and Wallace to jointly present papers describing the new theory at the Linnaean Society meeting in London in 1858 and to publish extracts from their work

- Darwin conceived the *Origin* of 1859 as an "abstract" of a much longer work – hence the lack of footnotes, references, etc.

**Darwin: “ The gentlest of revolutionaries** Darwin ended up with a revolutionary theory, but he remains the gentlest of revolutionaries. He was extremely cautious: amass evidence and does not want to publish before Wallace’s letter forces him to.

It should not be forgotten that he also contributed to:

- botany
- the theory of classification
- and many other sciences

## 14.5 The reception of Darwin’s ideas

**Huxley vs Samuel Wilberforce** – coached by Darwin and Richard Owen, respectively

- Huxley: “Darwin’s Bulldog”
- The debate and the mother’s remark

**Darwin’s ideas’ influence on the Victorian society** – From Darwinism to Darwinisticism:

- Darwinisticism: application of Darwin’s principles to domains to which these principles were not supposed to apply (sociology, economics, politics)
- Example: Social Darwinism: the wealthiest is the fittest, laissez faire economics
- Far from Darwin’s caution !

**Darwin’s burial** - Westminster Abbey – not so bad

- Bishop of Carlisle, Harvey Goodwin: I think that the interment of the remains of Mr Darwin in Westminster Abbey is in accordance with the judgment of the wisest of his countrymen. It would have been unfortunate if anything had occurred to give weight and currency to the foolish notion which some have diligently propagated, but for which Mr Darwin was not responsible, that there is a necessary conflict between a knowledge of Nature and a belief in God.

## 14.6 Evolution today

**An expanding fossils record** – We’ll see that one of the main objections against the theory of evolution is the gaps in the fossil records. The fossil record has been amazingly expanded since Darwin’s times.

**The great unification with genetics** – Darwin has a theory of evolution, but no theory of how some new traits appear, and how certain traits are transmitted, between generations.

- the great unification with genetics gives one of the most important mechanism by which evolution proceeds: transmission with accidental mutations
- note that this is not the only way in which evolution works: genetic drift is another one

**Evolution in action: viruses** : the example of HIV

- Evolution of HIV
- New strategies: how to weaken a virus

**Humans and Monkeys** – what the studies show: great similarities between us and the great apes.

As already noticed by scientists in Darwin's times, there is more difference between an ape at the highest point of the ape scale and an ape at the lowest point of the scale, than between a human and an ape at the highest point of the scale.

## 14.7 Evolution and Religion

**Darwin on Religion** – correct movie?

There is controversy about Darwin's religious beliefs:

- raised as religious
- Daughter's death
- Agnosticism or Theism?
- *Not* Atheism, but *revealed* religion + institution of the Church

**Evolution and Religion** – possible compatibility

Biologist Kenneth Miller: describes himself as "orthodox Catholic" and "orthodox Darwinist"

What kind of God?