

# Darwin: Pigeon Fancier?

## The rock pigeon: a versatile progenitor

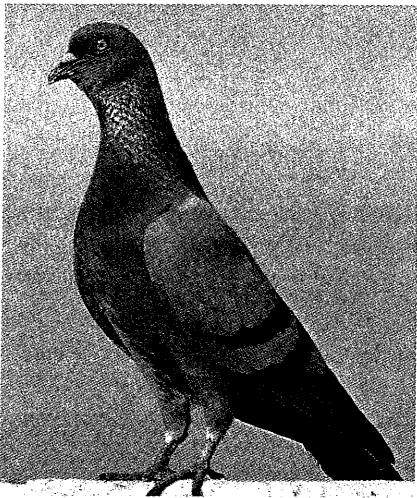


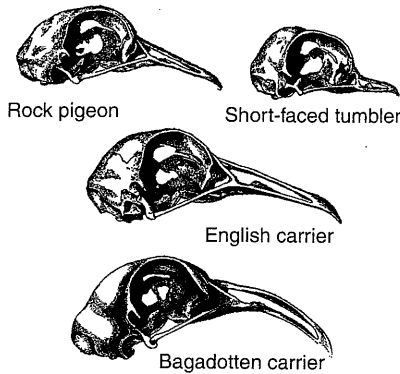
Photo: JM Garg, CC 3.0, Wikipedia

The rock pigeon or rock dove (*Columba livia*) includes the domestic pigeon (including the fancy pigeons on which Darwin worked) and domestic pigeons which become feral. It is a highly adaptable species and shows a range of phenotypes. Feral pigeons for example show many different plumage colorations.

## Pigeon Fanciers and Selective Breeding

"... from so simple a beginning endless forms most beautiful and most wonderful have been, and are being evolved." This quotation closes Charles Darwin's most famous work *"The Origin of Species by Means of Natural Selection"*. Most students of biology know of Darwin's voyage aboard *The Beagle* and his precise and careful documenting of the variety of species he encountered on his travels, to the Galapagos in particular. But the naturalist's careful attention to biological detail extended to his work at home in England. Darwin began to formulate his theory of evolution during his five year voyage aboard *The Beagle*, but this work continued in earnest when he returned home to England and established a home (and research station) at Down House. Darwin delayed publishing his greatest work, fearing ridicule in the deeply religious English society. He wanted to gather more evidence to support his idea that species could change. He found this evidence by studying domesticated species that he knew could be shaped through breeding. Pigeons, rabbits, cabbages, gooseberries; these organisms would become his window into the workings of selection. Thus Darwin became a pigeon fancier. Indeed, the humble pigeon, loved by generations of English people, played a most important part in his work on both *'The Origin of Species'* (1859) and *'Variation in Domestication'* (1868). He said *"Believing that it is always best to study some special group, I have . . . taken up domestic pigeons."*

Darwin excelled in careful observation and meticulous record keeping and he was a frequent correspondent with like-minded thinkers. As well as breeding his own pigeons, he managed to secure skins and skeletons from colleagues and acquaintances all over Britain. But Darwin was interested in evolution, not pigeon shows. He wanted a sense of how much variation existed within a single species in nature and saw selective breeding as a "speeded up version" of the process that gave rise to new species in nature. Darwin's pigeon work was much more than a hobby; it was a way to get his point across and to demonstrate the dramatic effects of selection. Darwin skeletonised and meticulously recorded the details of hundreds of specimens and concluded that if artificial selection could produce such diversity over decades, what might natural selection produce over millions of years?



Skulls of various pigeon breeds as drawn by Darwin. Relative sizes accurate. Darwin noted that difference in breed appearance extended even to the skeletal features. (Charles Darwin/Frances Darwin - out of copyright)



Pouters: This group includes breeds developed for the ability to inflate their crops. The pygmy pouter's bizarre appearance has made it one of the least popular breeds, except in shows.



The fantail is characterised by a fan-shaped tail composed of 30 to 40 feathers; more than most members of the pigeon family, which usually have only 12 to 14 feathers. A feather mutation called silky produces yet another variety.

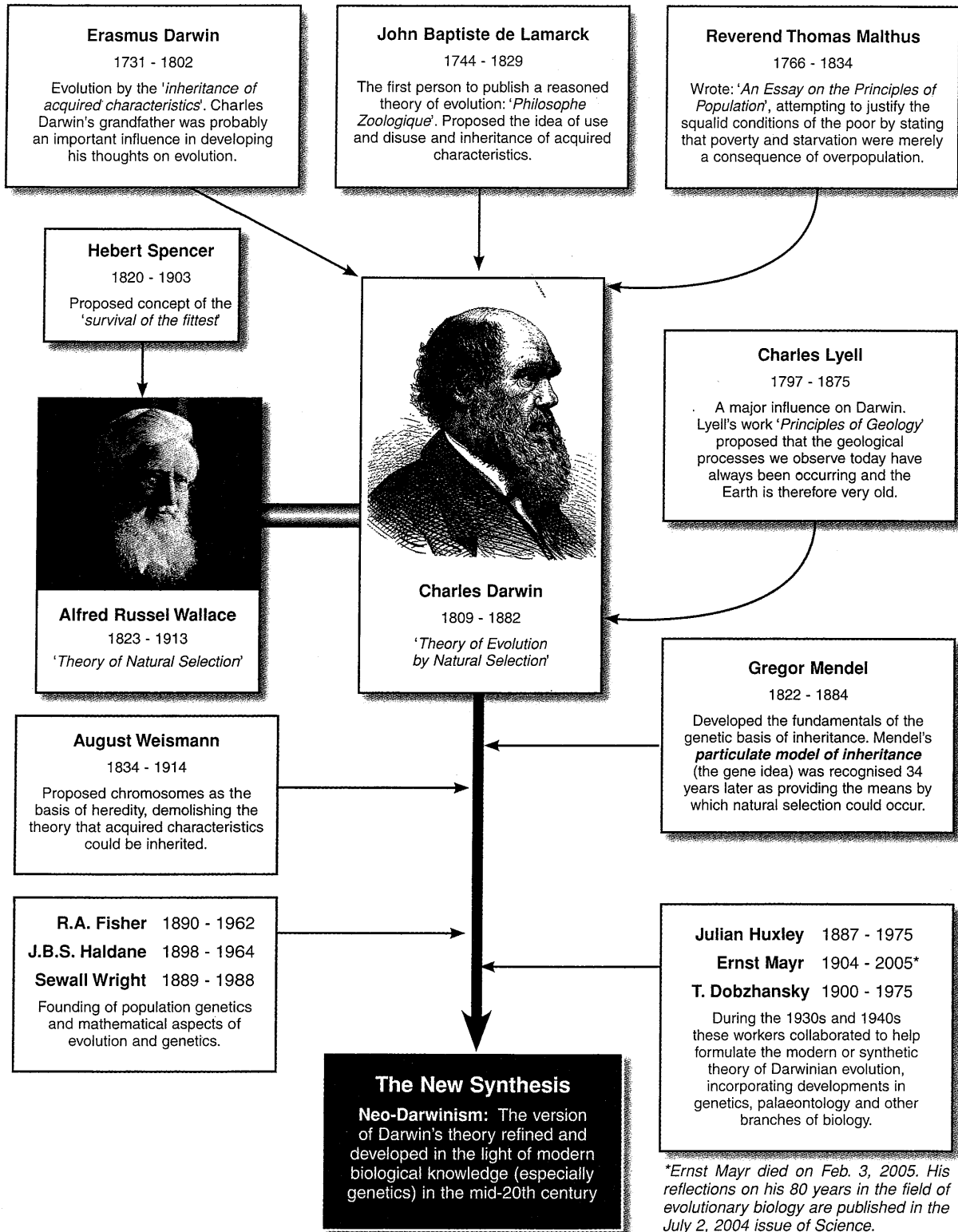
photos: Jim Gifford, Wikipedia (originally via Flickr)

1. Explain why Darwin sought support for his evolutionary theory from his pigeon breeding work: \_\_\_\_\_  
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2. Explain why his findings supported his ideas that species could change over time: \_\_\_\_\_  
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# The Modern Theory of Evolution

Although **Charles Darwin** is credited with the development of the theory of evolution by natural selection, there were many people that contributed ideas upon which he built his own. Since Darwin first proposed his theory, aspects that were problematic (such as the mechanism of inheritance) have now been explained. The development of the modern theory of evolution has a history going back at least two centuries. The diagram below illustrates the way in which some of the major contributors helped to form the

currently accepted model, or **new synthesis**. Understanding of evolutionary processes continued to grow through the 1980s and 1990s as comparative molecular sequence data were gathered and understanding of the molecular basis of development improved. More recently, in the new area of evolutionary developmental biology (**evo-devo**), biologists have shown how changes in patterns of gene expression during development can explain how novel characteristics might arise.



- From the diagram above, choose one of the contributors to the development of evolutionary theory (excluding Charles Darwin himself), and write a few paragraphs discussing their role in contributing to Darwin's ideas. You may need to consult an encyclopaedia or other reference to assist you.



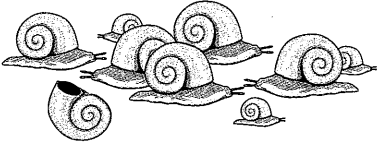
# Darwin's Theory

In 1859, Darwin and Wallace jointly proposed that new species could develop by a process of natural selection. Natural selection is the term given to the mechanism by which better adapted organisms survive to produce a greater number of viable offspring. This has the effect of increasing their proportion in the population so that they become more common. It is Darwin who is best remembered for the theory of evolution by natural selection through his famous book: '**On the origin of species by means of natural selection**', written 23 years after returning from his voyage on the Beagle, from which much of the evidence for his theory was accumulated. Although Darwin

could not explain the origin of variation nor the mechanism of its transmission (this was provided later by Mendel's work), his basic theory of evolution by natural selection (outlined below) is widely accepted today. The study of population genetics has greatly improved our understanding of evolutionary processes, which are now seen largely as a (frequently gradual) change in allele frequencies within a population. Students should be aware that scientific debate on the subject of evolution centres around the relative merits of various alternative hypotheses about the nature of evolutionary processes. The debate is not about the existence of the phenomenon of evolution itself.

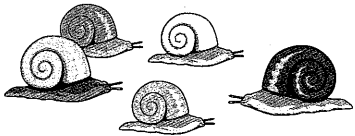
## Darwin's Theory of Evolution by Natural Selection

**Overproduction**  
Populations produce too many young: many must die



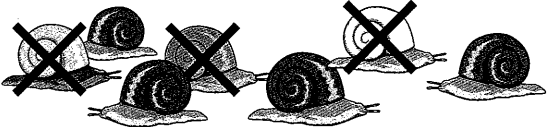
Populations tend to produce more offspring than are needed to replace the parents. Natural populations normally maintain constant numbers. There must therefore be a certain number dying.

**Variation**  
Individuals show variation: some are more favourable than others



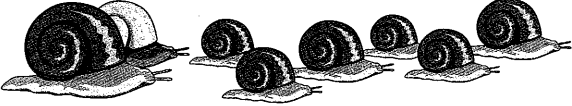
Individuals in a population vary in their phenotype and therefore, their genotype. Some variants are better suited in the prevailing environment and have greater survival and reproductive success.

**Natural Selection**  
Natural selection favours the best suited at the time



The struggle for survival amongst individuals competing for limited resources will favour those with the most favourable variations. Relatively more of those without favourable variations will die.

**Inherited**  
Variations are Inherited.  
The best suited variants leave more offspring.



The variations (both favourable and unfavourable) are passed on to offspring. Each new generation will contain proportionally more descendants of individuals with favourable characters.



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The banded or grove snail, *Cepaea nemoralis*, is famous for the highly variable colours and banding patterns of its shell. These **polymorphisms** are thought to have a role in differential survival in different regions, associated with both the risk of predation and maintenance of body temperature. Dark brown grove snails are more abundant in dark woodlands, whilst snails with light yellow shells and thin banding are more commonly found in grasslands.

1. In your own words, describe how Darwin's theory of evolution by natural selection provides an explanation for the change in the appearance of a species over time:

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