

# 5 Evolution and biodiversity

## 5.1 Evidence for evolution

### Pentadactyl limbs

- pattern of bones or a modification of it is present in all amphibians, reptiles, birds, mammals
- differences are seen in relative lengths and thickness of the bones

### Industrial melanism

- dark varieties of typically light-colored insects are called melanistic
- example of peppered moth: natural selection as the melanistic variety became commoner in polluted industrial areas where it is better camouflaged
- in unpolluted areas tree branches are covered in pale-colored lichens; sulphur dioxide pollution kills lichens and soot from coal burning blackens tree branches
- there might be other factors influencing the survival

## 5.2 Natural selection

### Galápagos finches

- sizes and shapes of finches vary as does their diet
- Peter and Rosemary Grant have shown that beak characters and diet are closely related and when one changes so does the other
- *G. fortis* on island Daphne Major: drought causes shortage of small seeds so *G. fortis* feeds on larger harder seeds which only birds with larger beaks can open; severe El Niño event causes heavy rain and only small soft seeds are present so *G. fortis* has longer narrower beaks
- though mostly controlled by genes, environment can have effects too
- variation due to genes is called heritability

### Antibiotic resistance

- antibiotic resistance is due to genes in bacteria: can be inherited
- evolution of multiple antibiotic resistance has occurred in just a few decades
- very widespread use of antibiotics for treating diseases and in animal feeds
- bacteria reproduce very rapidly (one generation in less than an hour)
- populations are huge: chance for antibiotic resistance due to mutation
- bacteria can pass on genes via plasmids so one species can give it to another

## 5.3 Classification of biodiversity

### Plants

see p. 266 for full table

- all plants are classified in one kingdom
- four main phyla: Bryophyta (mosses, liverworts, hornworts), Filicinophyta (ferns), Coniferophyta (conifers), Angiospermophyta (flowering plants)

### Animal phyla

- Porifera, Cnidaria, Platyhelminthes, Mollusca, Annelida, Arthropoda

see p. 267 for full table

### Vertebrates

- most species of chordate belong to one of five major classes: bony ray-finned fish, amphibians, reptiles, birds, mammals
- all are vertebrates because they have backbones composed of vertebrae

see p. 268 for full table

## 5.4 Cladistics

### Primate cladograms

- closest relatives of humans are chimpanzees and bonobos
- numbers on cladograms show estimates of population sizes and dates when splits occurred
- based on a molecular clock
- primates are an order of mammals that have adaptations for climbing trees

## Classification of the figworts family

- more than 400 families of angiosperm
- figwort family was based on morphology and continuously enlarged with new species
- taxonomists investigated the evolutionary origins and compared base sequences: found that species in figwort family were not a true clade and five clades had been incorrectly combined
- major reclassification and less than half was retained in the family