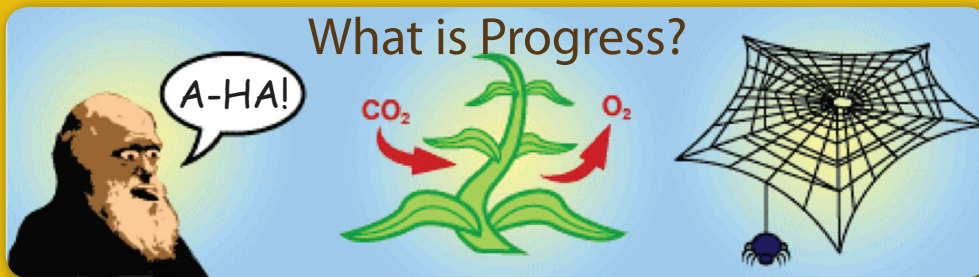


# Evolution isn't perfect or progressive

Each adaptation is better only in the context of the environment in which it arose.

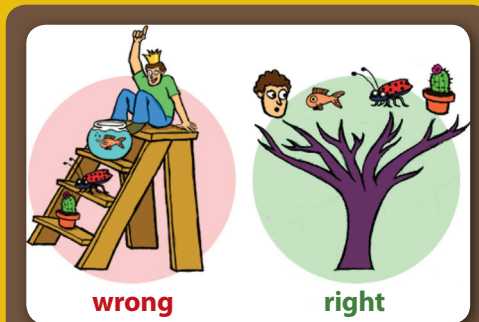


Big Brains?

Cool Chemistry?

Wonderful Webs?

pics source: www.evolution.berkeley.edu



Evolution doesn't progress from simple organisms (at the bottom) to humans (at the top). Although humans and fish had a common ancestor millions of years ago, modern fish are not a step towards future humans.

## Examples of trade-offs

In order for an organism to...	It is less likely to... (and vice-versa)
Digest grass well	Digest meat well
Fly well	Walk well
Extract oxygen from water	Extract oxygen from air
Maximise sunlight uptake with many large leaves	Conserve water with small leaves



science & technology

Department:  
Science and Technology  
REPUBLIC OF SOUTH AFRICA

# evolution

Evolution is probably the most important and elegant scientific theory to have emerged from biology over the last two centuries. Its elegance lies in the simplicity of its explanation for the origin and diversity of life. Its importance stems from its explanation of who and what we are. It is also the most misunderstood idea of our time. This leaflet describes the process of evolution by natural selection and corrects commonly held misconceptions about evolution.

## The process of Natural Selection

### NATURAL SELECTION

Natural selection is one of the basic mechanisms of evolution.

Imagine a population of beetles.

### THERE IS VARIATION IN TRAITS

For example, some beetles are green and some are brown.

### THERE IS DIFFERENTIAL REPRODUCTION

Since the environment can't support unlimited population growth, not all individuals get to reproduce to their full potential.

In this example, green beetles tend to get eaten by birds and survive to reproduce less often than brown beetles do.

### THERE IS HEREDITY

The surviving brown beetles have brown baby beetles because this trait has a genetic basis.

### END RESULT

The more advantageous trait (brown coloration - which allows the beetle to have more offspring) becomes more common in the population. If this process continues, eventually, all individuals in the population will be brown.

If there is **variation**, **differential reproduction** and **heredity**, evolution by natural selection can occur. It is as simple as that.

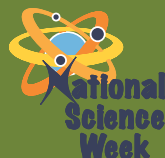
$$\text{variation} + \text{differential reproduction} + \text{heredity} = \text{Natural selection}$$

More brown than green beetles

evolution



ACKNOWLEDGEMENTS  
Content: Prof. David Jacobs (UCT, Zoology Department); UCT Faculty of Science Marketing Committee  
Design and layout: Evolution Marketing CC



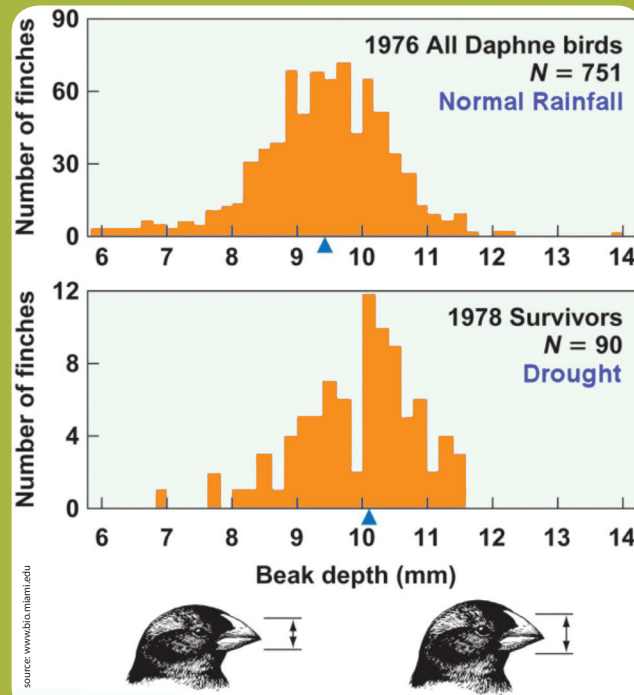
SAASTA  
South African Agency for Science and Technology Advancement

# A real life example of natural selection in action

(Island of Daphne, Galapagos Islands)

## Normal Rainfall

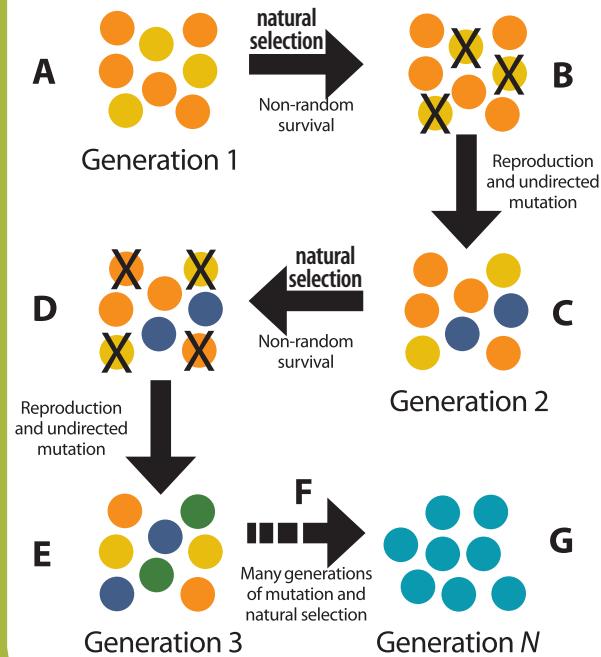
- > Small, soft seeds and big, hard seeds available.
- > Most birds survive and reproduce - wide range of beak sizes in Darwin's finches.
- > Average beak depth is about 9.5 mm.
- > Average is estimated by plotting the different beak depths against the number of birds that have a particular beak depth (see graph). The average would be the beak depth that most of the birds have i.e. where the graph peaks.



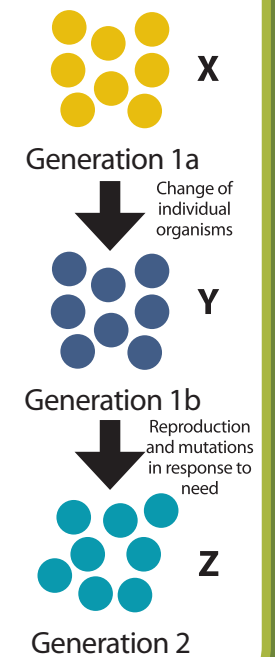
## Drought

- > Only big, hard seeds available.
- > Birds that have small beaks don't get enough food.
- > Birds with big beaks are favoured, leave behind more offspring and the average beak depth increases to just over 10 mm.

## CORRECT

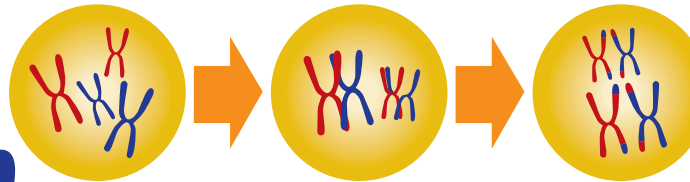
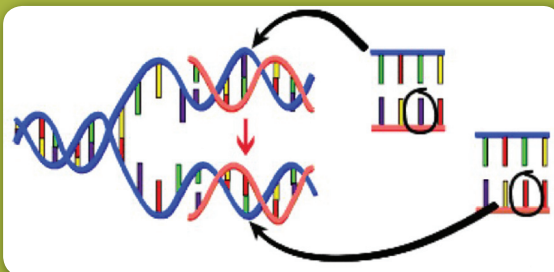


## INCORRECT



# Sources of Variation

**Mutations** are a source of variation (an incorrect DNA unit is inserted into the DNA strand of the sperm or egg).



**Genetic shuffling** is a source of variation (during the formation of sperm and egg cells bits of DNA are exchanged between chromosomes so that the eggs and sperm have a different genetic make-up to the parent).

Siblings will inherit **different DNA** from each parent so that offspring differ from parents and from each other.

