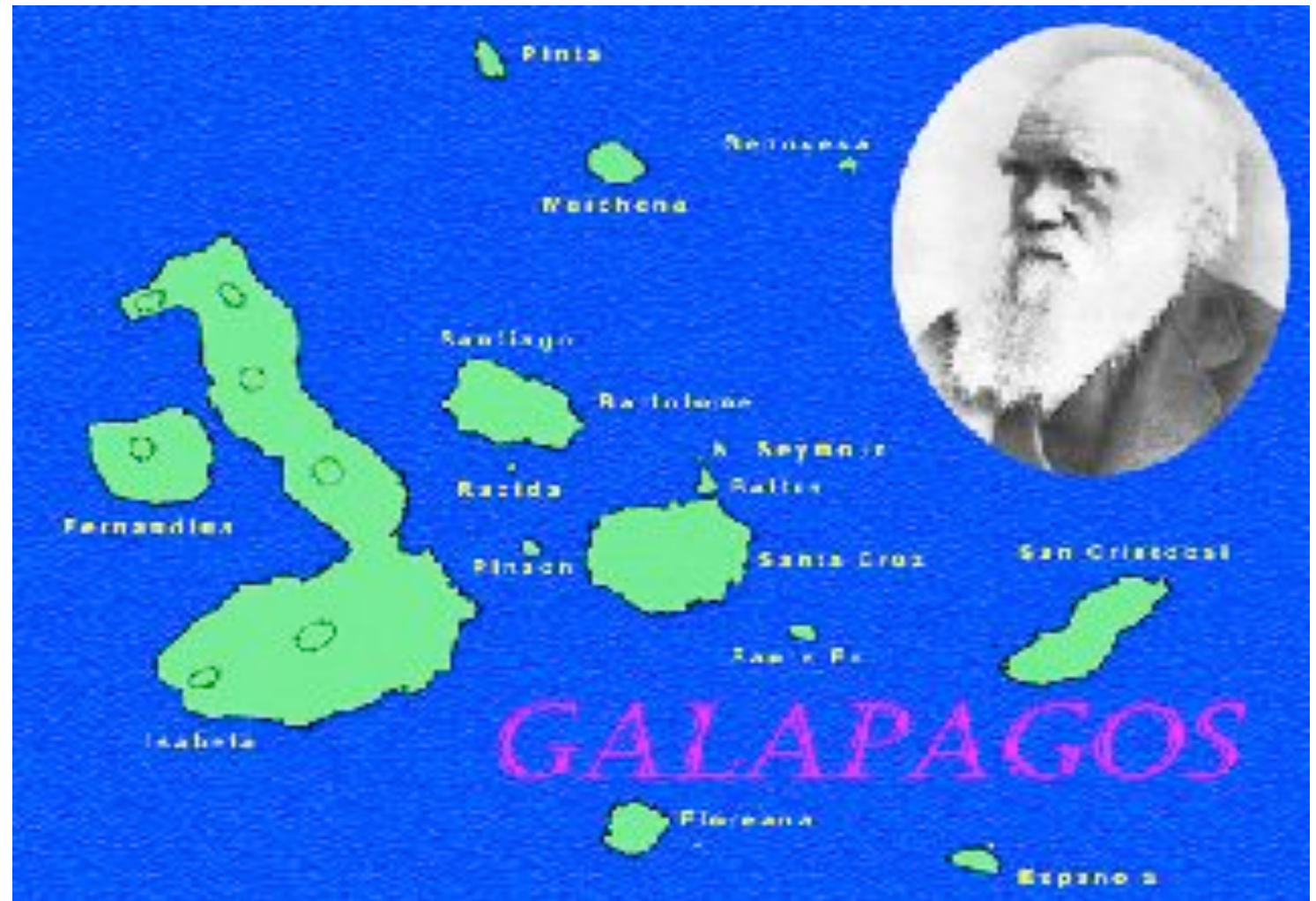


# Evolution 1

# Theory of evolution

## Where did it all start?



# Theory of evolution

- [Evolution](#) video

# Alfred Russel Wallace

1850's in Indonesia



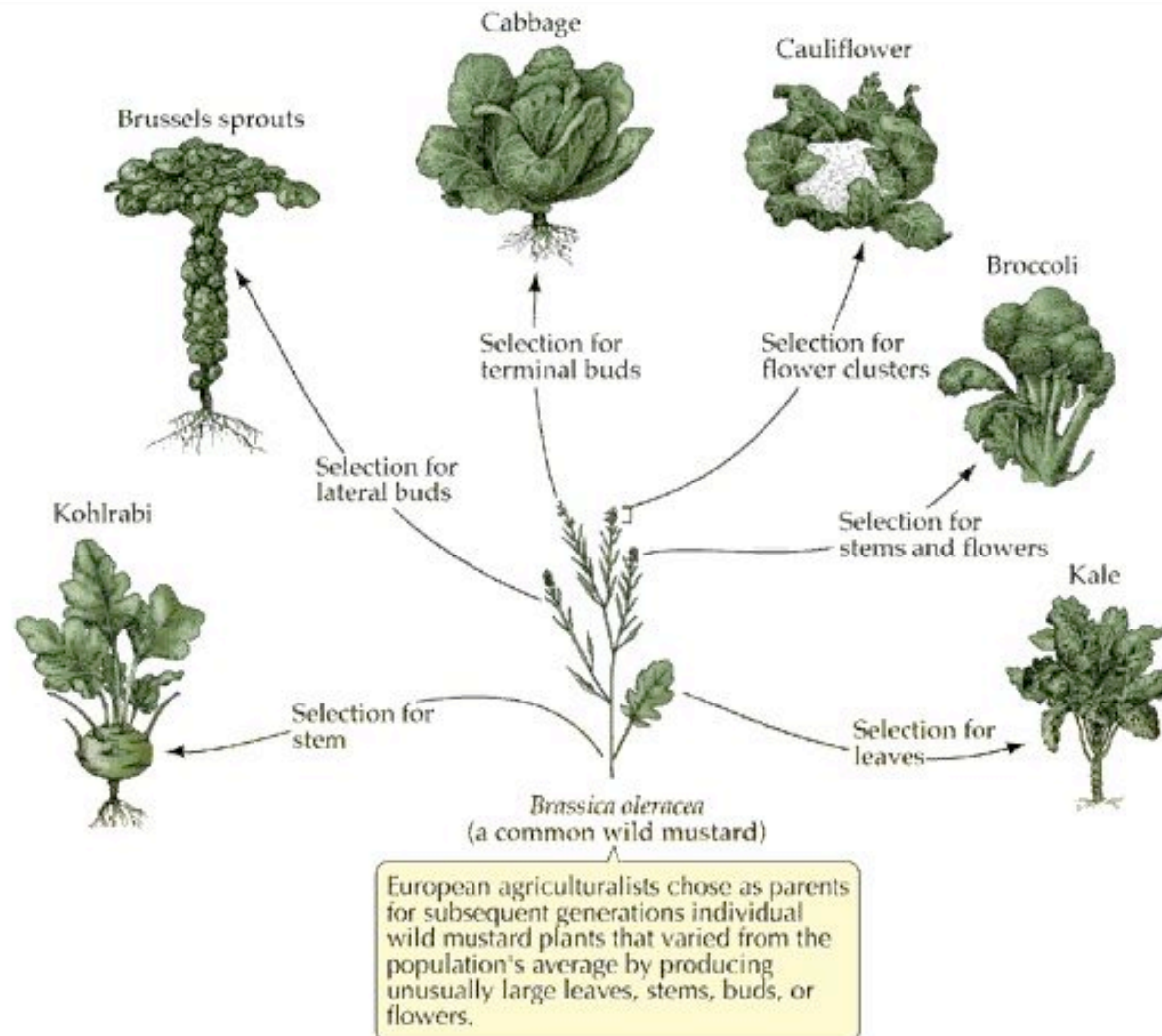
# Selective breeding

- Lots of other breeds for show  
AND all from one original species

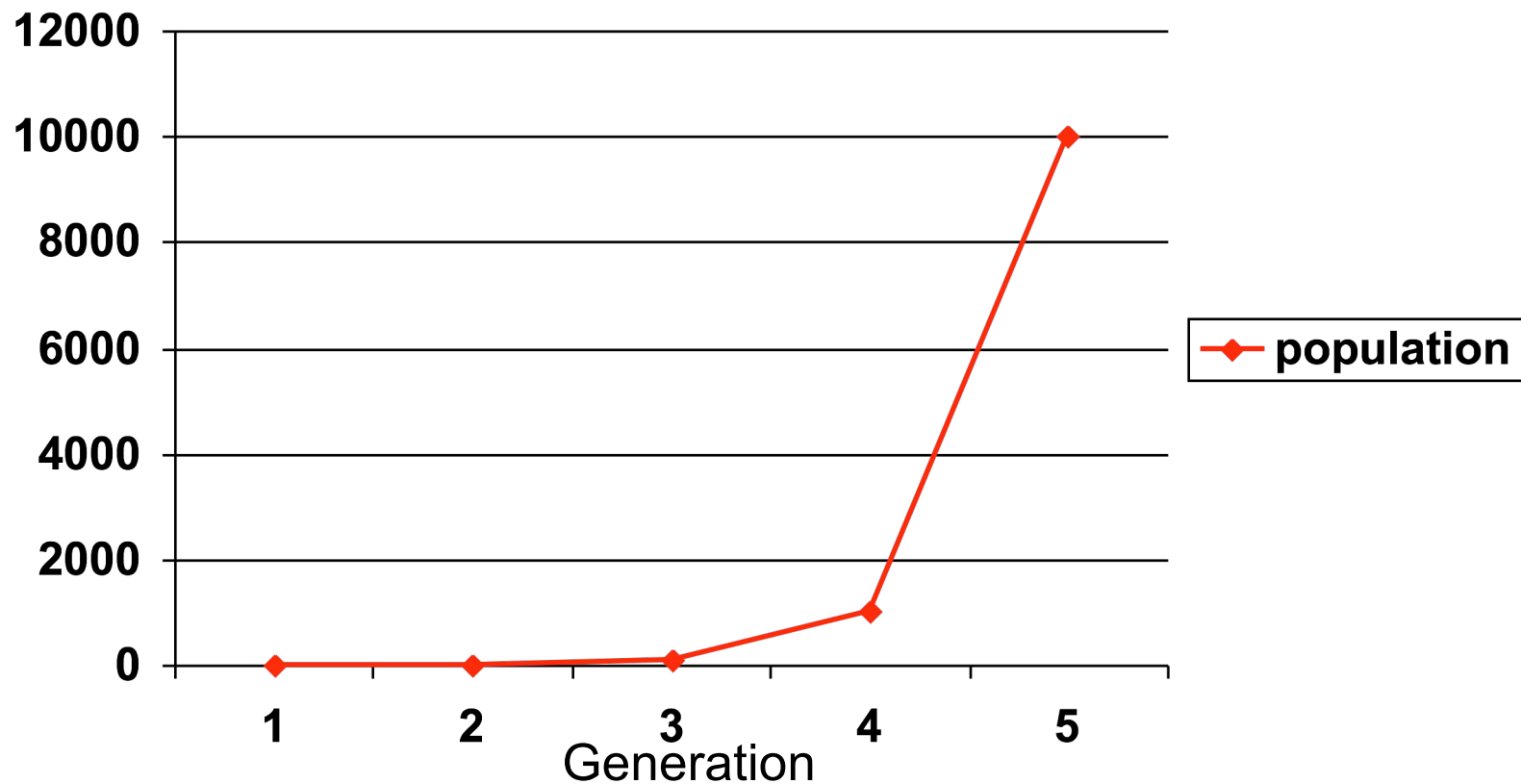




# Artificial selection

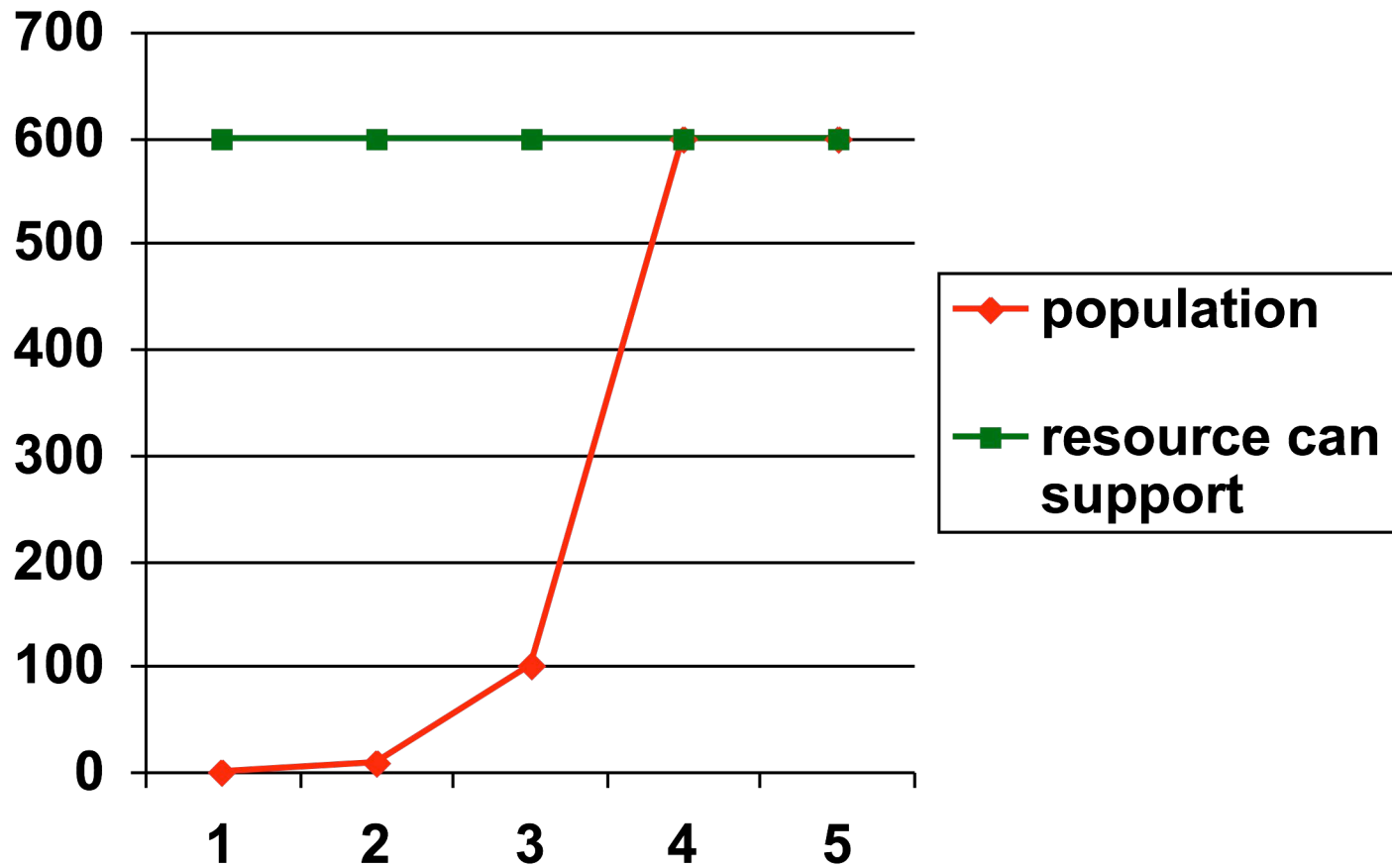


# Species are capable of exponential growth



Thomas Malthus, 1798

- While species may be capable of exponential growth, resources are not!
- Population growth is limited- death rates are high





So...

If there are not enough resources for all  
that are born,

THEN

Not all individuals can survive to reproduce

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# Who gets to survive?

- What factors determine which individuals can survive and reproduce?
- What must be true?



# Some variation is heritable

- All populations exhibit variation
- Selective breeding



# Deduction 1

Since there is variation in a population

**AND**

Since not all that are born can survive to  
reproduce

**THEN**

Those individuals that are best suited to  
the environment will survive to  
reproduce

# Natural Selection

- In other words:
  - “Non-random differential survival or reproduction of classes of phenotypically different entities”
    - (Futuyma, 1986)
- Popular, but misguided statement
  - “only the strong survive”
  - Not accurate

## Deduction 2

Since some variation is heritable

**AND**

Only those that survive to reproduce will  
pass their traits on to the future

**THEN**

**Population** characteristics will change  
over time



# Evolution

1. Any change in the characteristics of organisms in a population over many generations
2. Any change in the trait frequencies of a population over time

Natural Selection is one of the mechanisms that drives the process of evolution

# How to study evolution

- Back to the Galapagos
  - Peter and Rosemary Grant
  - Studied these two species of finch on several islands since 1970
  - Captured birds and measured them

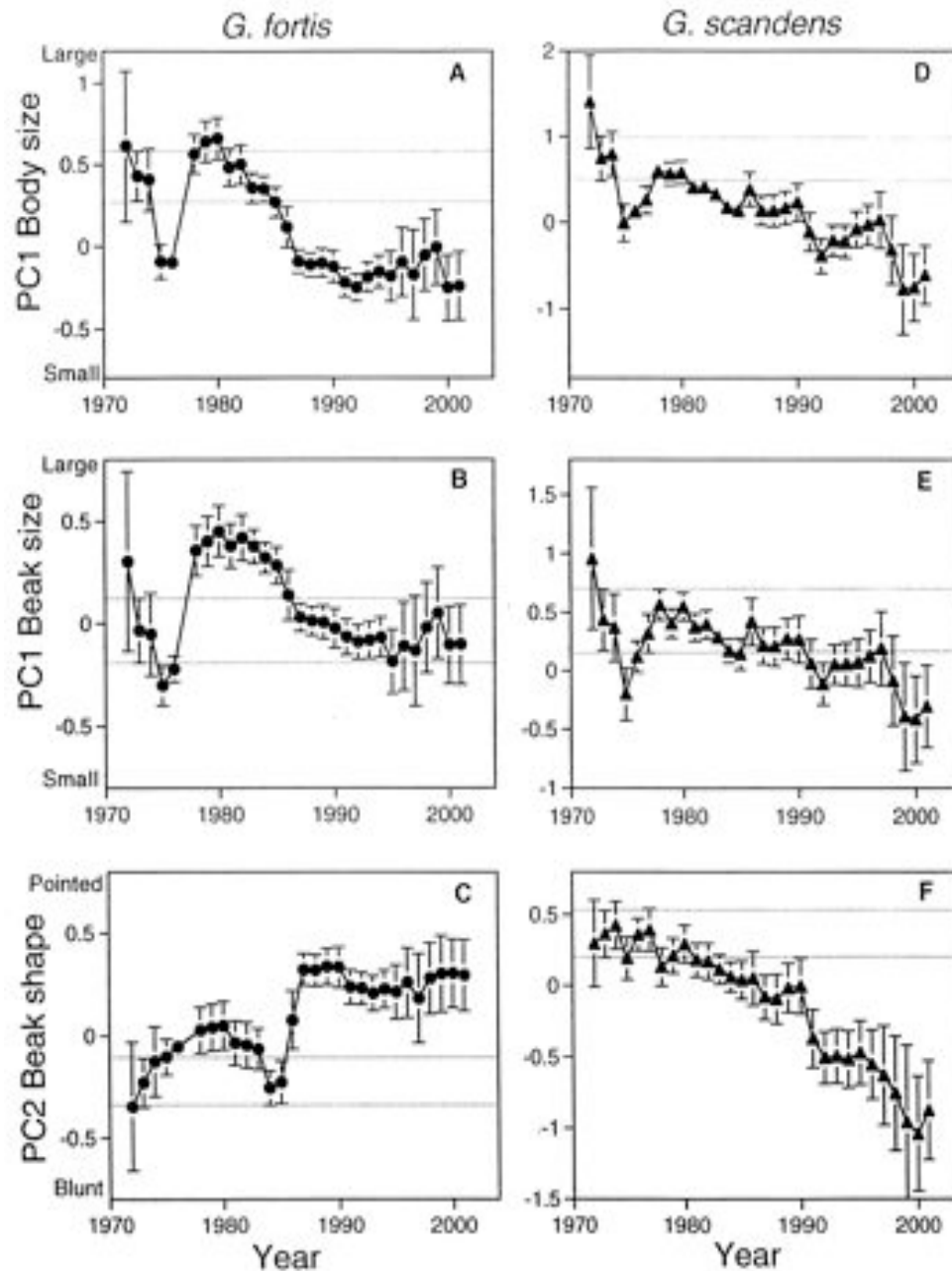


# Research in evolution

- Measured beak sizes over 30 years
- Weather changes and the El Niño



PLATE 8. Daphne Major, in years of contrasting rainfall. Upper: March 1975, a normal year. Lower: January 1996, following two dry years.



- Beak size changed over time
- Could be traced to changes in seed availability
- Seed availability was related to weather

# Adaptation

Process: the changes caused by natural selection leading to a greater fit between the **population** and its environment across generations

Trait: a trait that confers higher **fitness** on individuals that have it than any other alternative trait