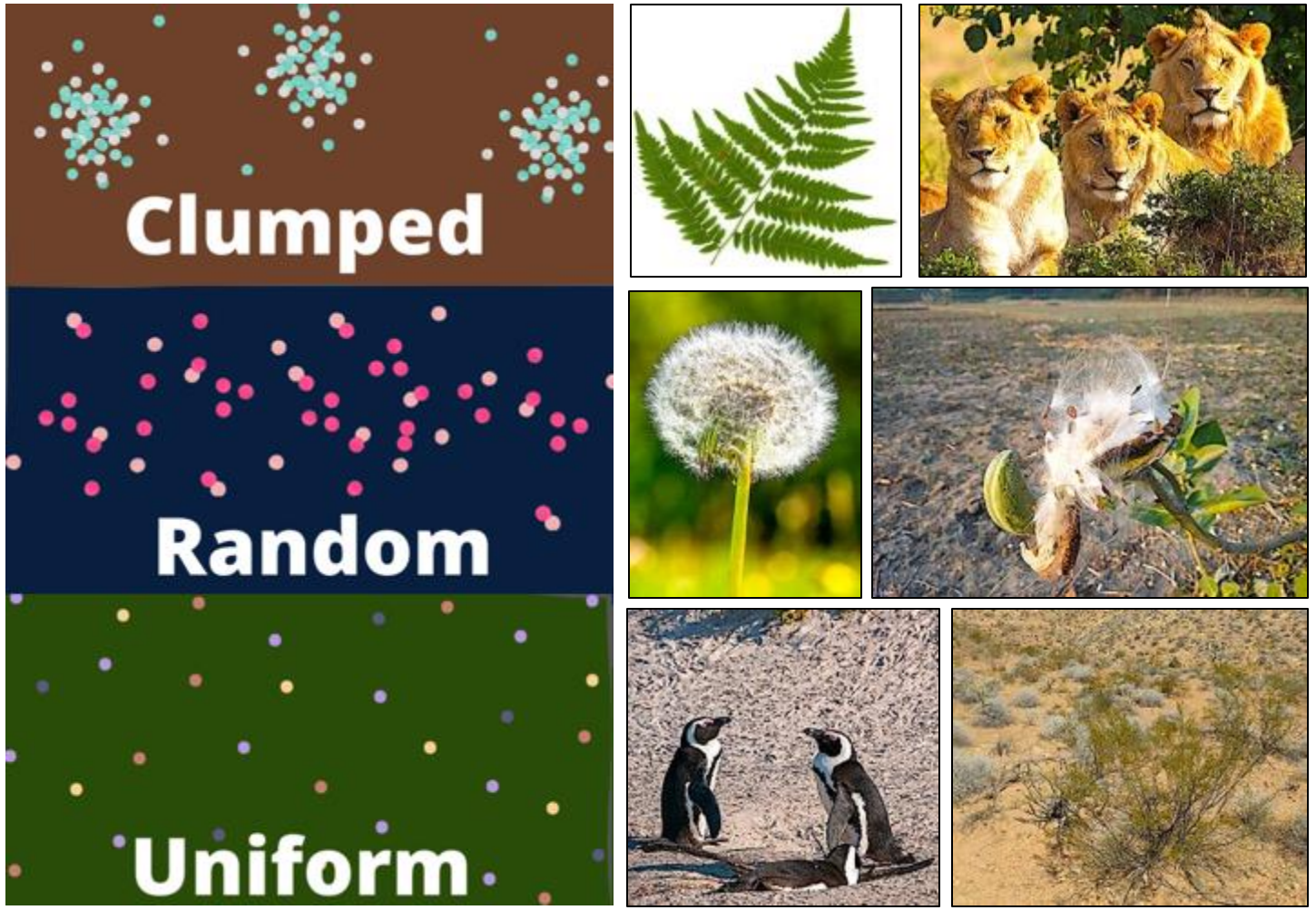
# Population Ecology

A **population** is the number of individuals of the same species in a given area.

Populations are distributed in three distinct patterns:

- **Clumped** distribution prevails in social animals and in plants with no mechanism for seed dispersal over long distances.
- **Random** distribution prevails in plants where the offspring are scattered by variable weather patterns like wind.
- **Uniform** distribution prevails in animals or plants that employ physical or chemical means to maintain their space requirements.

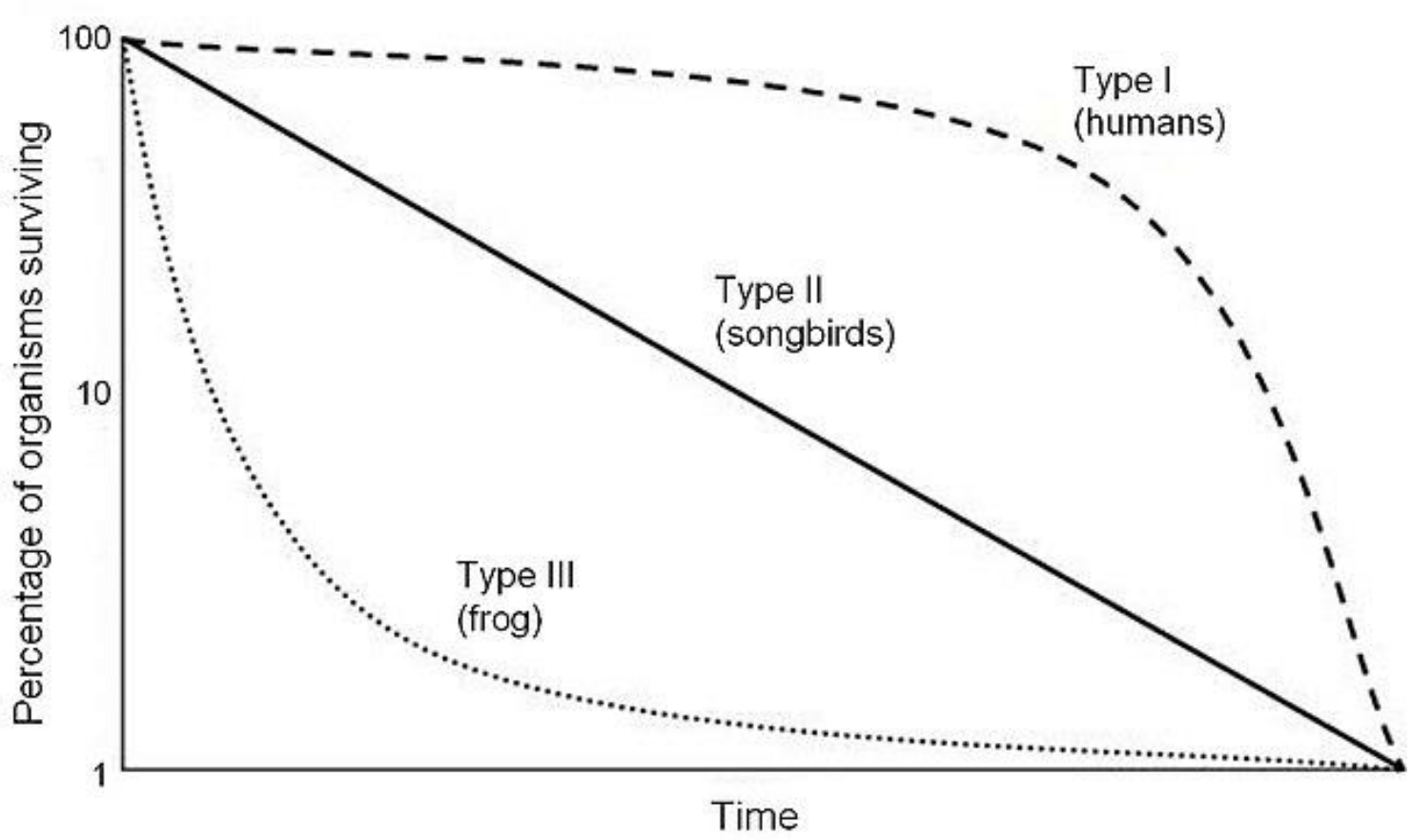


The age distribution of a given population depends in on where the species lands on the **survivorship curve**.

**Type I** have few offspring and mostly die later in life.

**Type II** die at the same rate at any point in life.

**Type III** have large numbers of offspring to compensate for the small number that survive to breed.



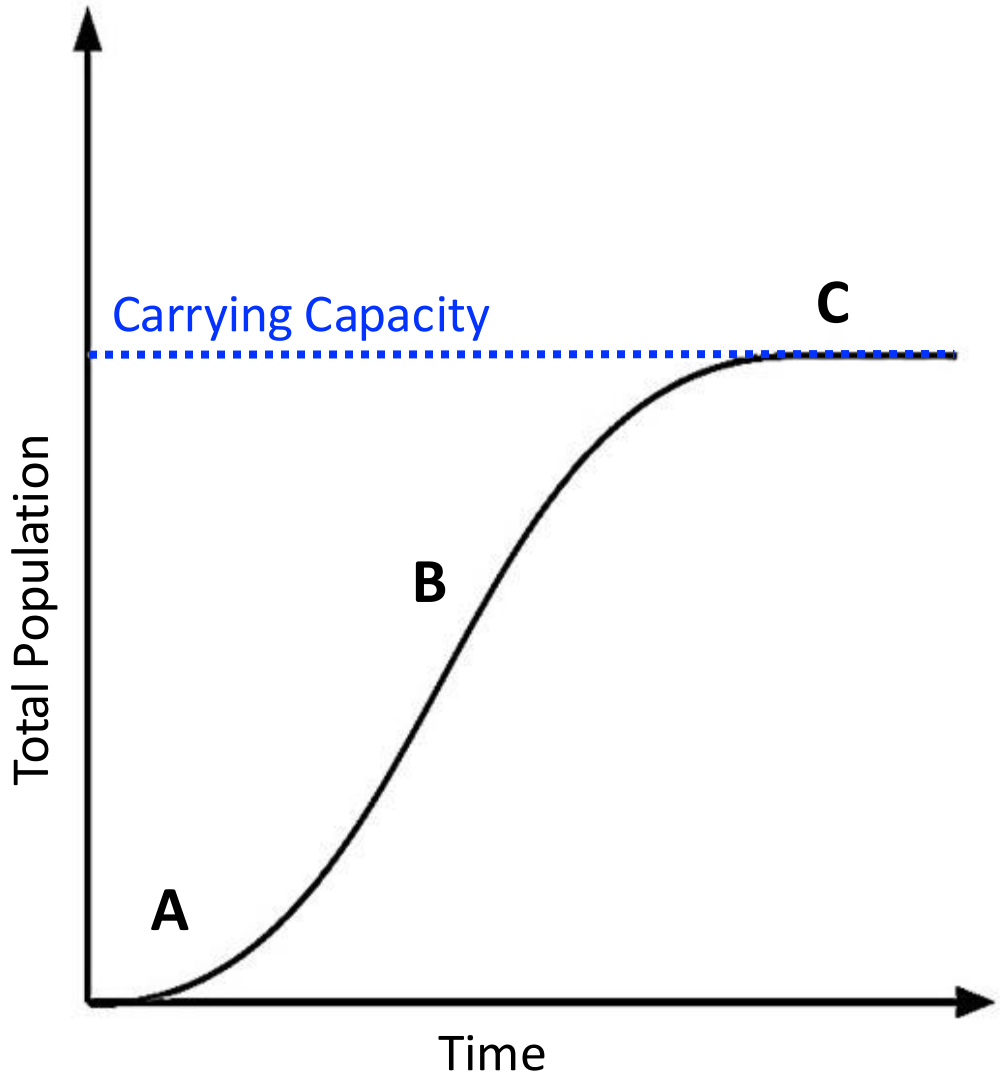
The growth of a population entering a new habitat conducive to its survival undergoes three distinct phases:

a) During **lag phase**, reproduction is slow because the population is still adjusting to the new surroundings.

b) During **exponential growth**, the rate of growth occurs at its fastest rate because the resources needed to thrive are still abundant. This rate approximates the **biotic potential**.

c) During **logistic growth**, the rate of growth stabilizes as individuals start to compete over limited resources.

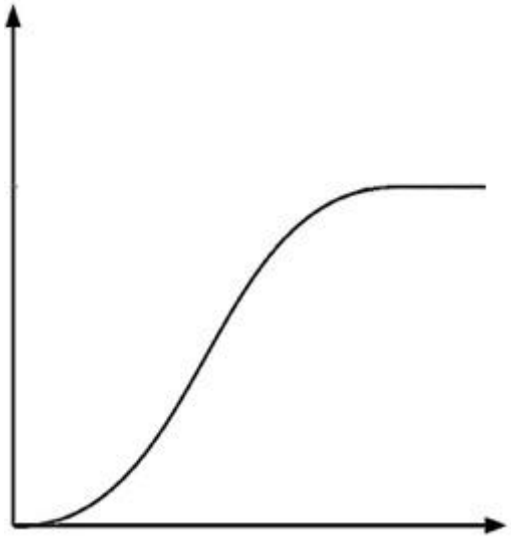
The point where logistic growth occurs approximates the **carrying capacity** of the habitat.



**Limiting factors** for population growth can be either density-dependent or density-independent.

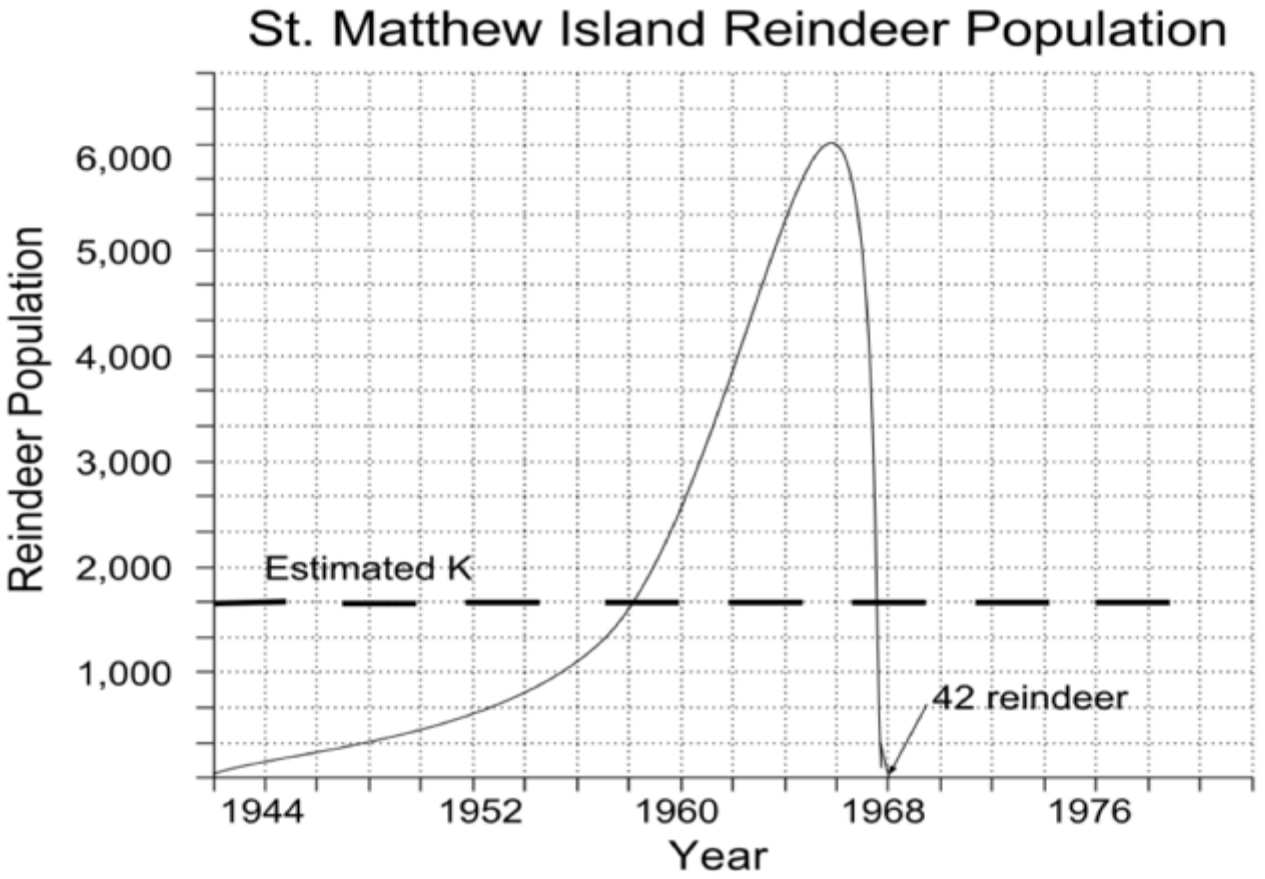
**Density-dependent** limits on population growth include competition for resources like food, water, and oxygen, living space, sunlight, spread of diseases, and predation.

**Density-independent** limits on population growth include overall climate, water chemistry, and frequency of natural disasters.

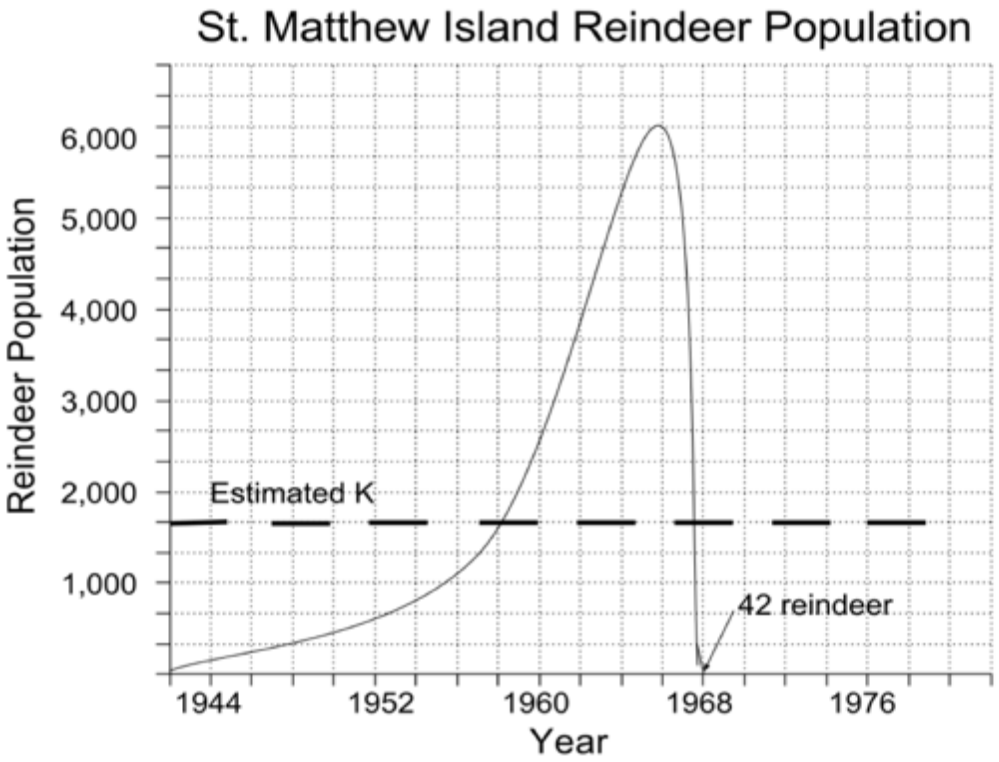


# Review Question

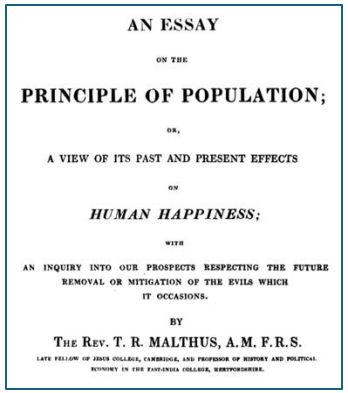
What happened to the reindeer population in St. Matthew Island? (K = carrying capacity)




# Review Question




The population grew exponentially, but after far exceeding the carrying capacity many reindeer died of starvation.


AN ESSAY

ON THE

PRINCIPLE OF POPULATION;

OR,

A VIEW OF ITS PAST AND PRESENT EFFECTS

ON

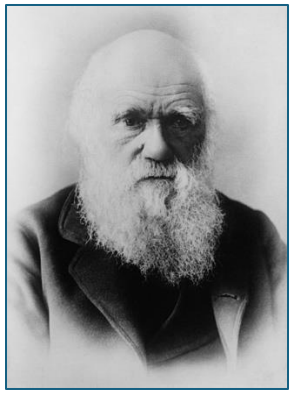
*HUMAN HAPPINESS;*

WITH

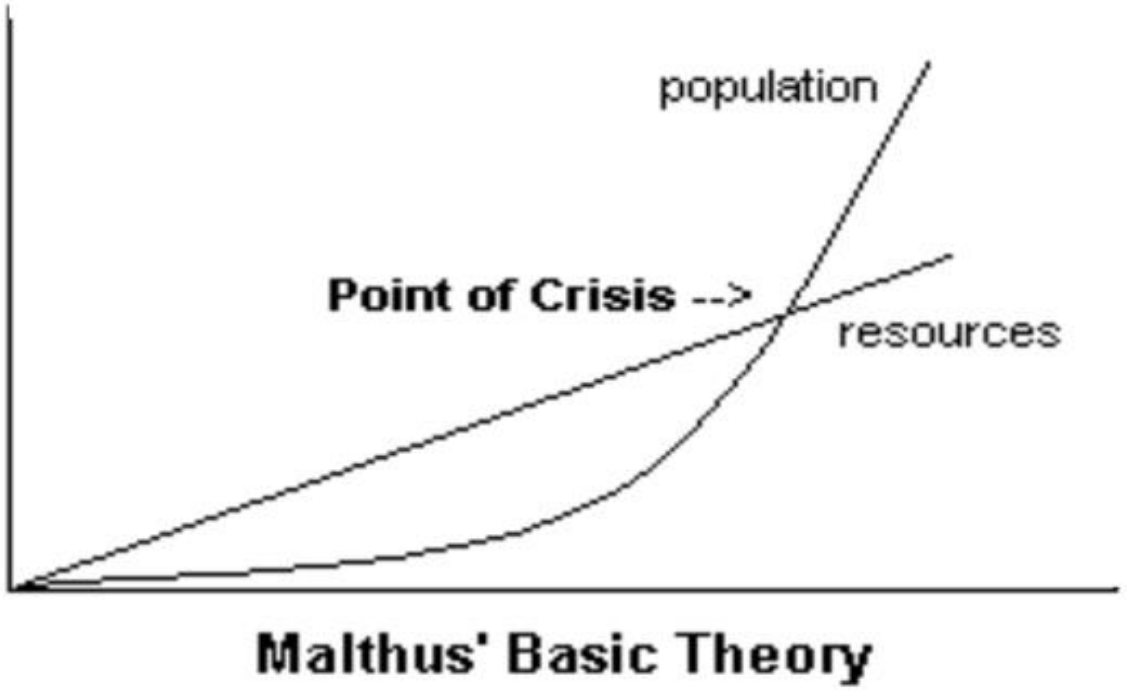
AN INQUIRY INTO OUR PROSPECTS RESPECTING THE FUTURE REMOVAL OR MITIGATION OF THE EVILS WHICH IT OCCASIONS.

BY

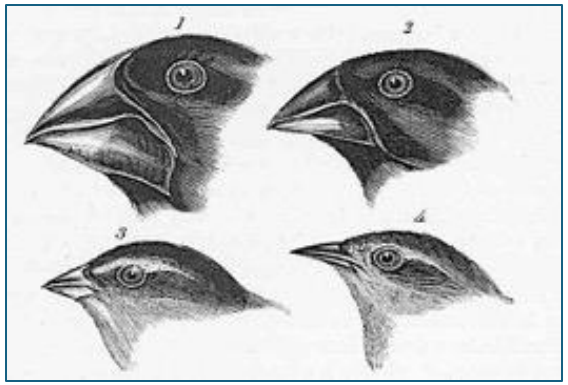
THE REV. T. R. MALTHUS, A.M. F.R.S.



Near the end of the 18th century, Thomas Malthus predicted that human population growth would eventually exceed the food production.




This "**Malthusian scenario**" has yet to come true, but it did serve as a basis for Charles Darwin's theory on the origin of different species through a **struggle for survival**, accompanied by the **natural selection** of traits that provided a competitive edge.

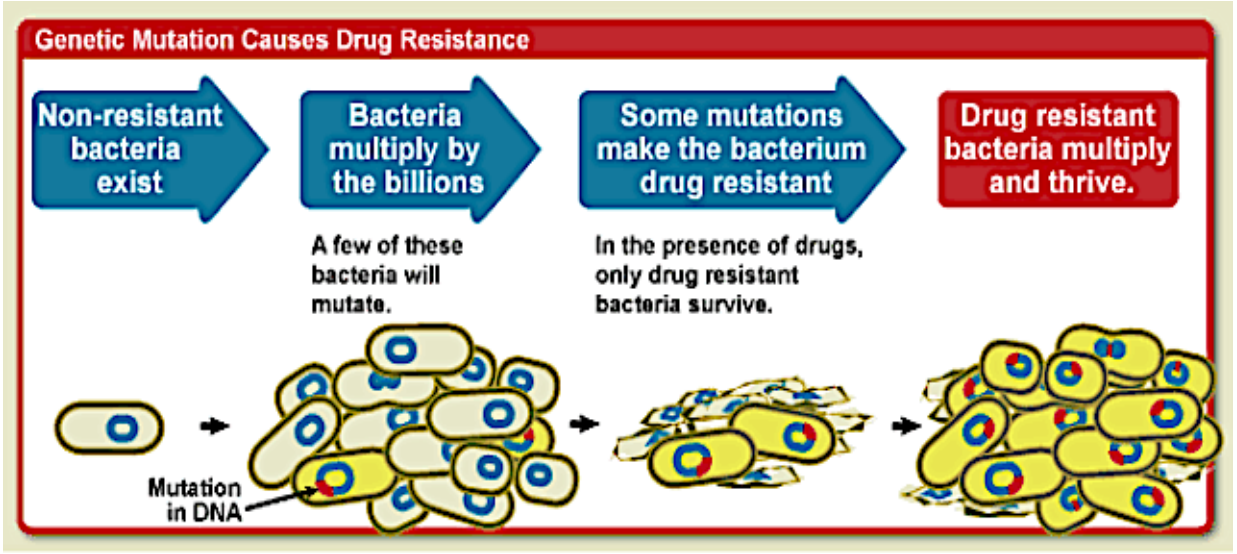


Drawing of Galapagos finches from "The Origin of the Species."

**Natural selection** is responsible for the ongoing ”arms race” between **antibiotic resistant bacteria** and the need for new antibiotics to replace those that are becoming obsolete. This is further exacerbated by the ongoing **misuse of antibiotics** in medical care and agriculture.

The clear areas of the petri dish surrounding the disks indicate where bacteria cells were killed by antibiotics released from each white disk.

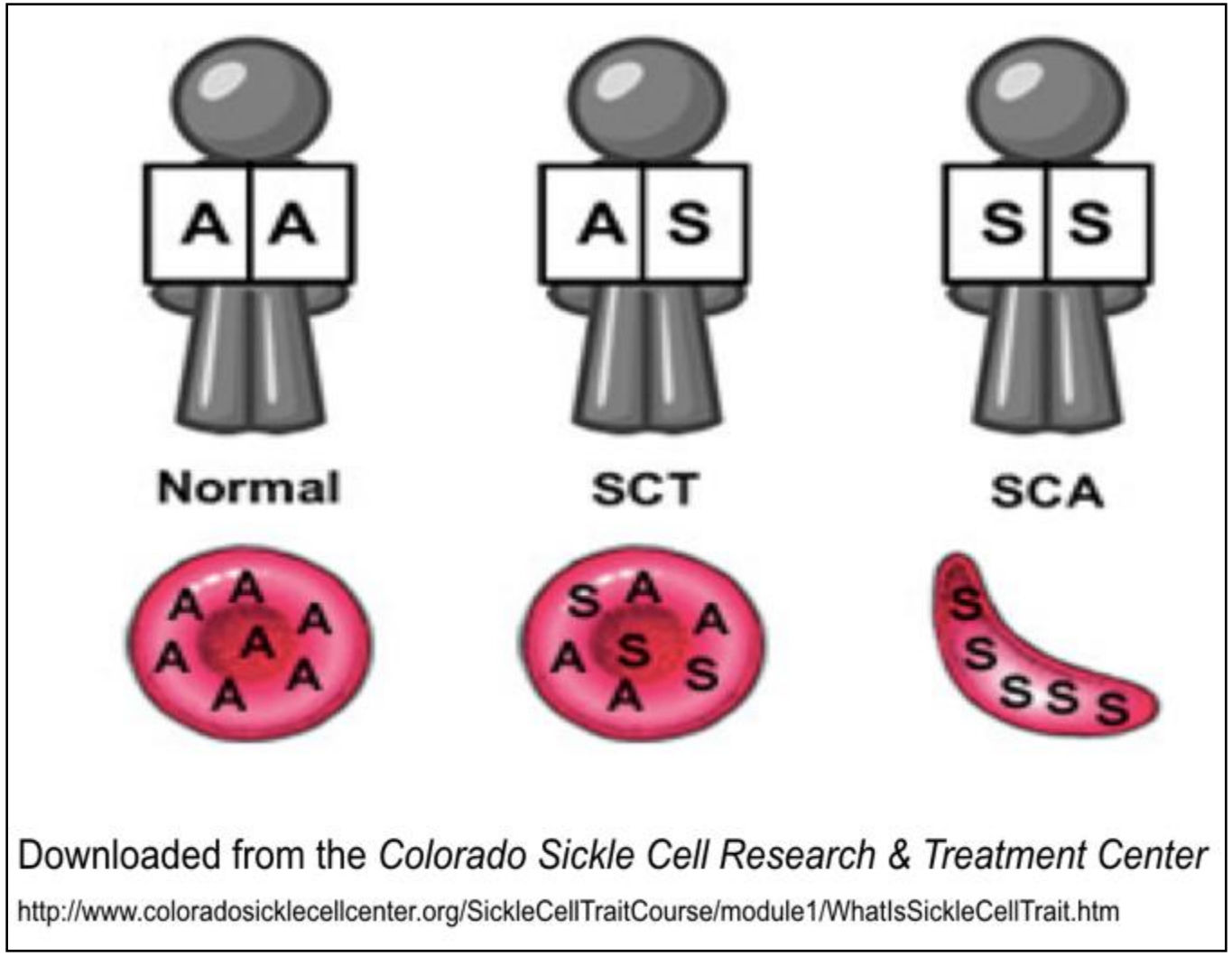
The plate on the far right demonstrates a strain of bacteria that is resistant to four of the seven different antibiotics that were applied.




Natural selection is also responsible for the prevalence of **sickle cell trait** among people of African descent. People possessing one or two copies of this mutation are **immune to malaria**.

Sickle cell trait is a double-edged sword because people with **two copies** of this mutation suffer from impeded circulation due to **sickle cell anemia**.

Normal Sickle Cell Anemia




Downloaded from the *Colorado Sickle Cell Research & Treatment Center*
http://www.coloradosicklecellcenter.org/SickleCellTraitCourse/module1/WhatIsSickleCellTrait.htm

## Acknowledgement: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