GENETIC VARIATION

with Miss Ainur

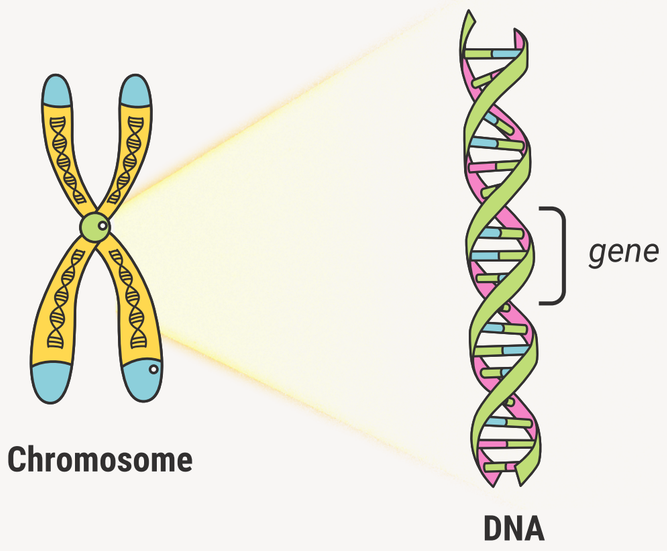
QUICK RECALL:

Can you identify which of the following refers to chromosome, DNA (Deoxyribonucleic acid) or gene?

DNA (Deoxyribonucleic Acid)	Gene	Chromosome
It is the unit of heredity that dictates the traits and functions in an organism.	It stores and transmits genetic information essential for an organism's growth, development and reproduction.	It is responsible for the replication and distribution of genetic materials during cell division.

QUICK RECALL: ANSWER

Note that: Gene refers to a small section of the DNA, and the DNA makes up the chromosomes in our body.



Gene	DNA (Deoxyribonucleic Acid)	Chromosome
It determines the traits and functions of making proteins in the body.	It stores and transmits genetic information **(genes)** essential for an organism's growth, development and reproduction.	It is responsible for the replication and distribution of genetic materials **(DNA)** during cell division.

LEARNING OUTCOMES

At the end of this lesson, you will learn to:

1. explain the relationship between genetic variation and evolution

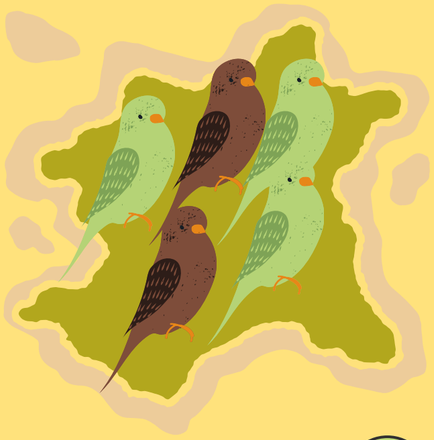
QUESTION

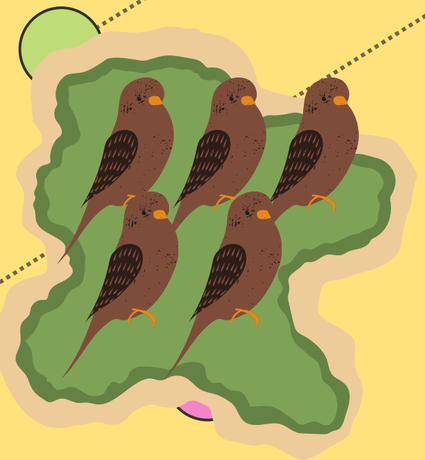
Think about this ...

1. Imagine a world where all individuals of a species are exactly the same, with no differences. What do you think would happen if a new disease emerged? How would the species survive?

Түрдің барлық даралары бірдей, айырмашылығы жоқ әлемді елестетіңіз. Жаңа ауру пайда болса не болар еді деп ойлайсыз? Түр қалай тірі қалады?

QUESTION





Think about this ...

2

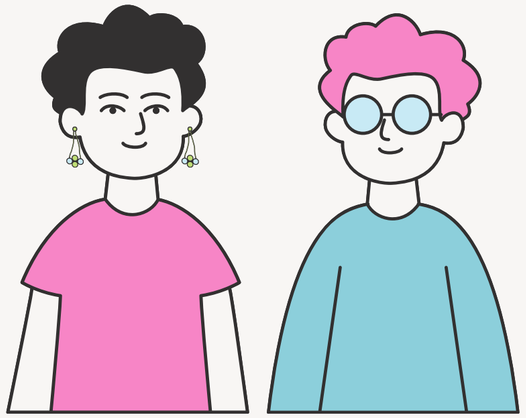
Consider a species of birds living on two different islands. The birds on one island are all brown, while the birds on the other island are a mix of brown and green. Suddenly, a predator that can easily spot brown birds arrives on both islands. Which population of birds do you think would be more likely to survive? Why?

Екі түрлі аралда тұратын құстардың бір түрін қарастырайық. Бір аралдағы құстардың барлығы қоңыр түсті, ал екінші аралдағы құстар қоңыр және жасыл түсті аралас. Кенеттен екі аралға да қоңыр құстарды оңай байқайтын жыртқыш келеді. Сіздің ойыңызша, құстардың қай популяциясы тірі қалуы мүмкін? Неліктен?

GENETIC VARIATION

the difference or diversity in gene alleles in a population

99.9% identical



This tiny fraction of genetic variation is what makes each of us unique!

GENETIC VARIATION

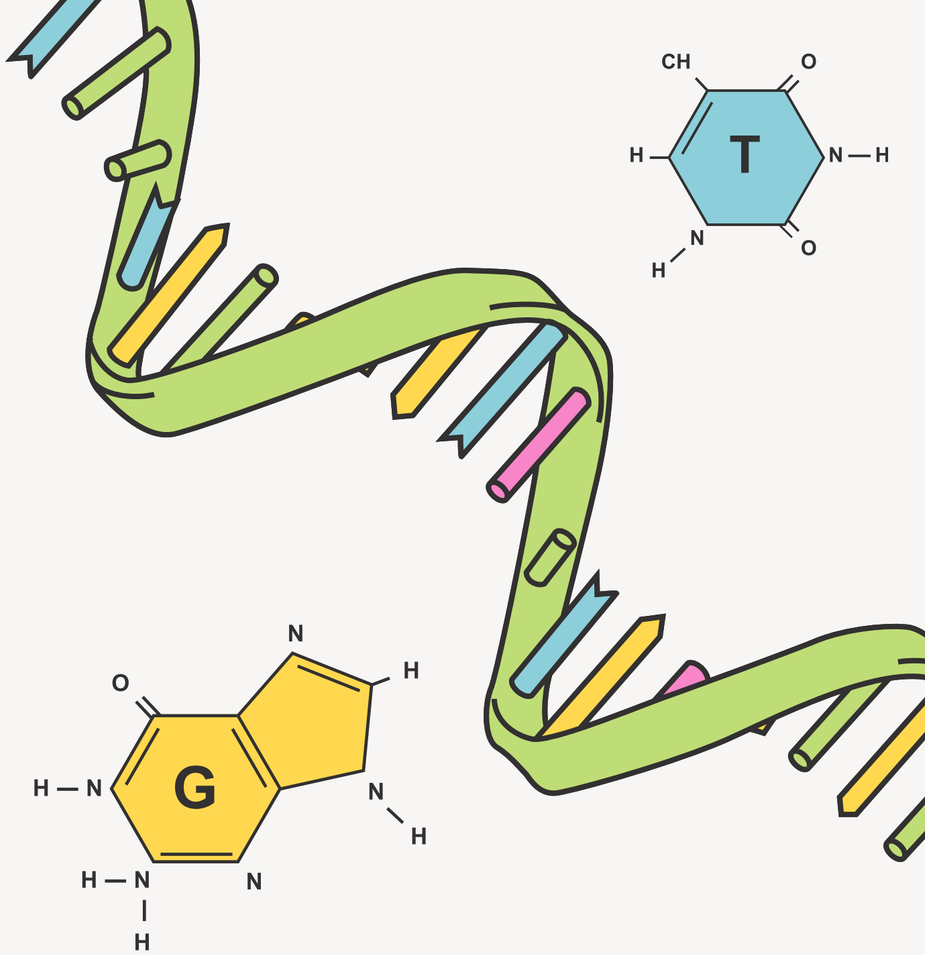
In some species, such as the African elephant, genetic variation is extremely low. This means that if a disease were to wipe out a significant portion of the population, they would have a hard time recovering because they lack the genetic diversity to adapt and evolve

In 1979 population was in the range of around 1.1 to 1.8 million
In 2024 estimated population number - 415, 000
Ritchie, H. (2024, September 10). The state of the world's elephant populations. Our World in Data. https://ourworldindata.org/elephant-populations

GENETIC MUTATION

One way that genetic variation can occur is via genetic mutation. This is when a genetic code on a gene can either become damaged or the faulty gene is inherited.

New phenotypes can rarely occur from genetic mutations, but when this happens, it can cause continuous changes in the species.

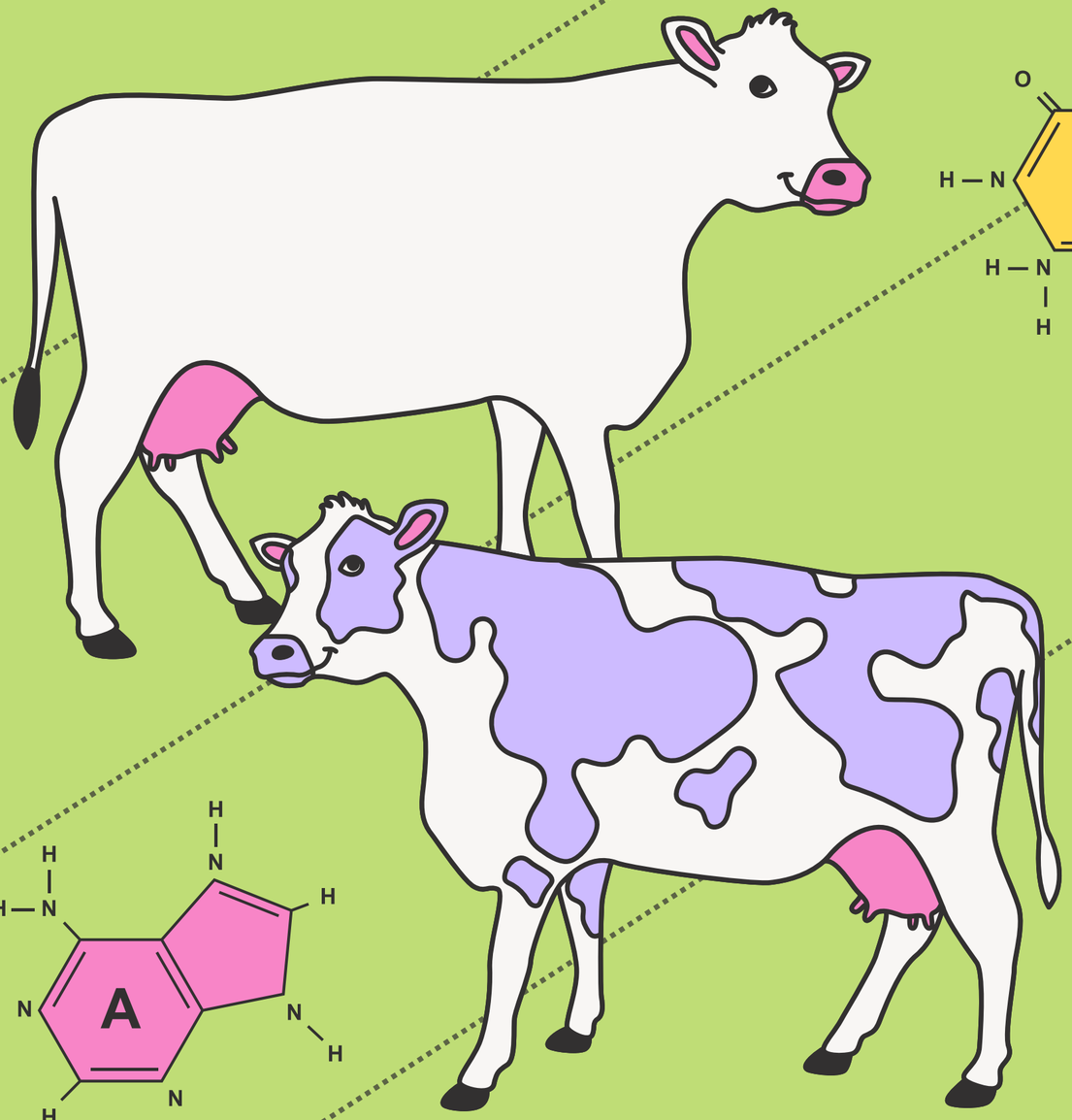


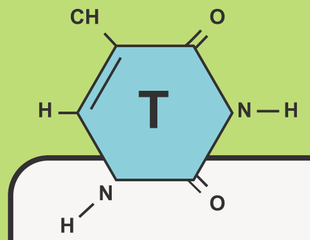
Recall that phenotype refers to the physical characteristic of an organism as influenced by the genome and environmental factors.

GENETIC MUTATION

An example of genetic mutation is the pigmentation on cows.

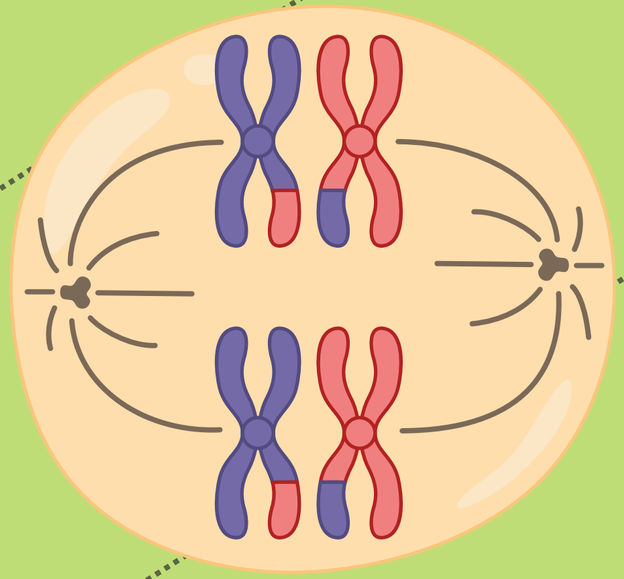
The spots on the cow helps them deter flies.

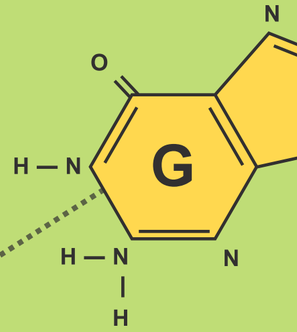


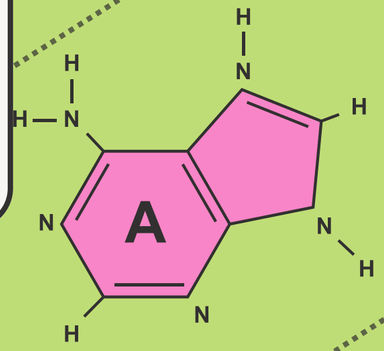


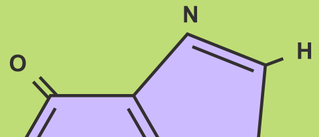
RECOMBINATION

1) Crossing-over
2) Independent assortment
3) Fertilization









EVOLUTION

Genetic variation is raw material of evolution. Higher the genetic variation is, higher is the chance of evolution.

Factors of evolution

1) Natural selection
2) Genetic drift (Founder effect, Bottleneck effect)
3) Gene flow

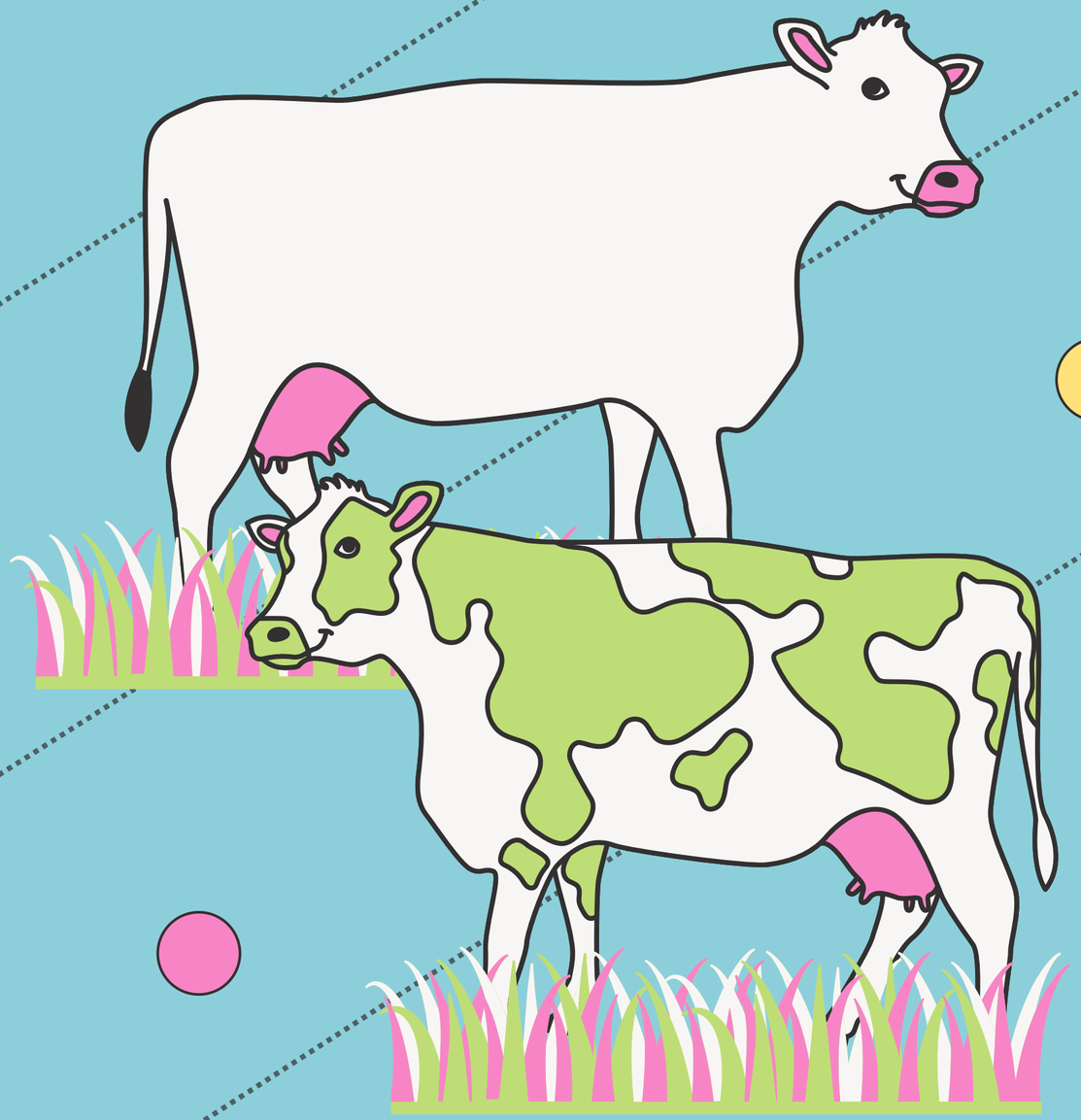
EVOLUTION

Why populations change over time?

NATURAL SELECTION

Natural selection is the mechanism by which organisms that are more suited to their environment survive and reproduce.

Through natural selection, advantageous traits, such as spots on cows, are passed on to future generations, driving evolution.

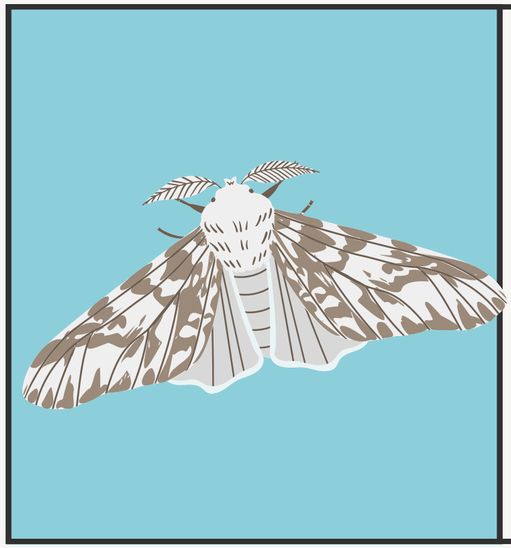


NATURAL SELECTION

Another example is the white peppered moth turning into a black moth.

THE INDUSTRIAL REVOLUTION

During the Industrial Revolution, factories produced large amounts of soot, which turned the bark of trees black.



WHITE PEPPERED MOTH

The peppered moths at that time were usually white with black speckles, but due to the change in their environment, they no longer had natural camouflage.