About 3.8 billion years ago, the first life forms on Earth did not have eyes. However, some mutated bacteria that could sense sunlight were an exception. During the day, bacteria stayed underwater to hide from ultraviolet rays. At night, they came up to the surface to get more light.

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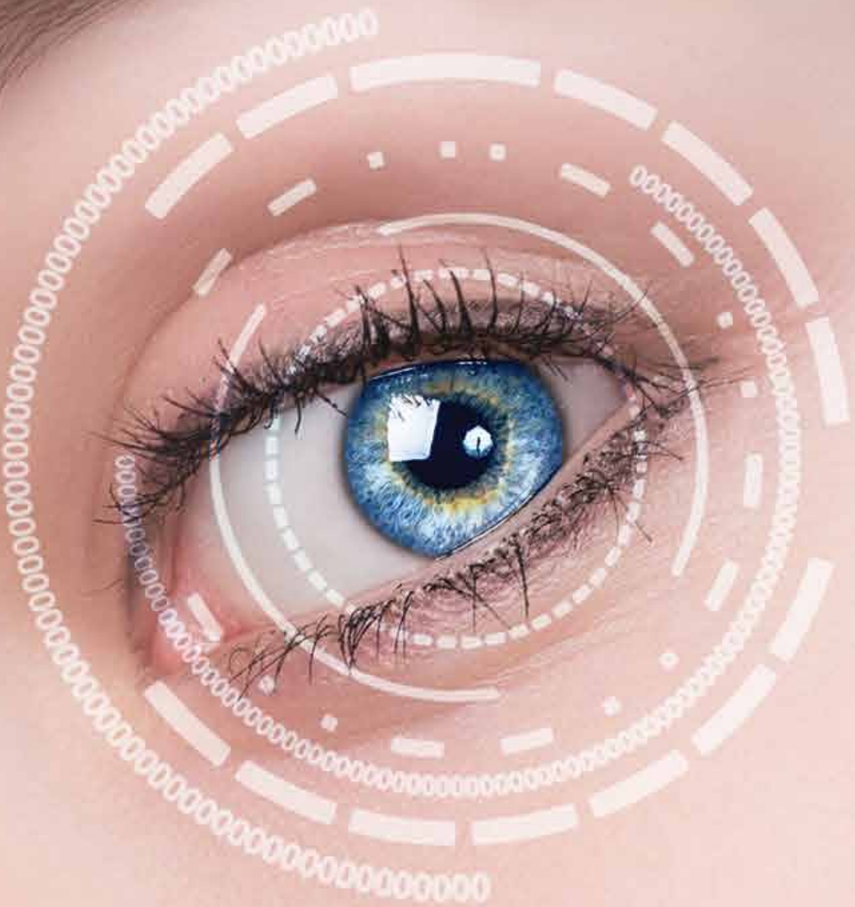

The Secret of Eyes

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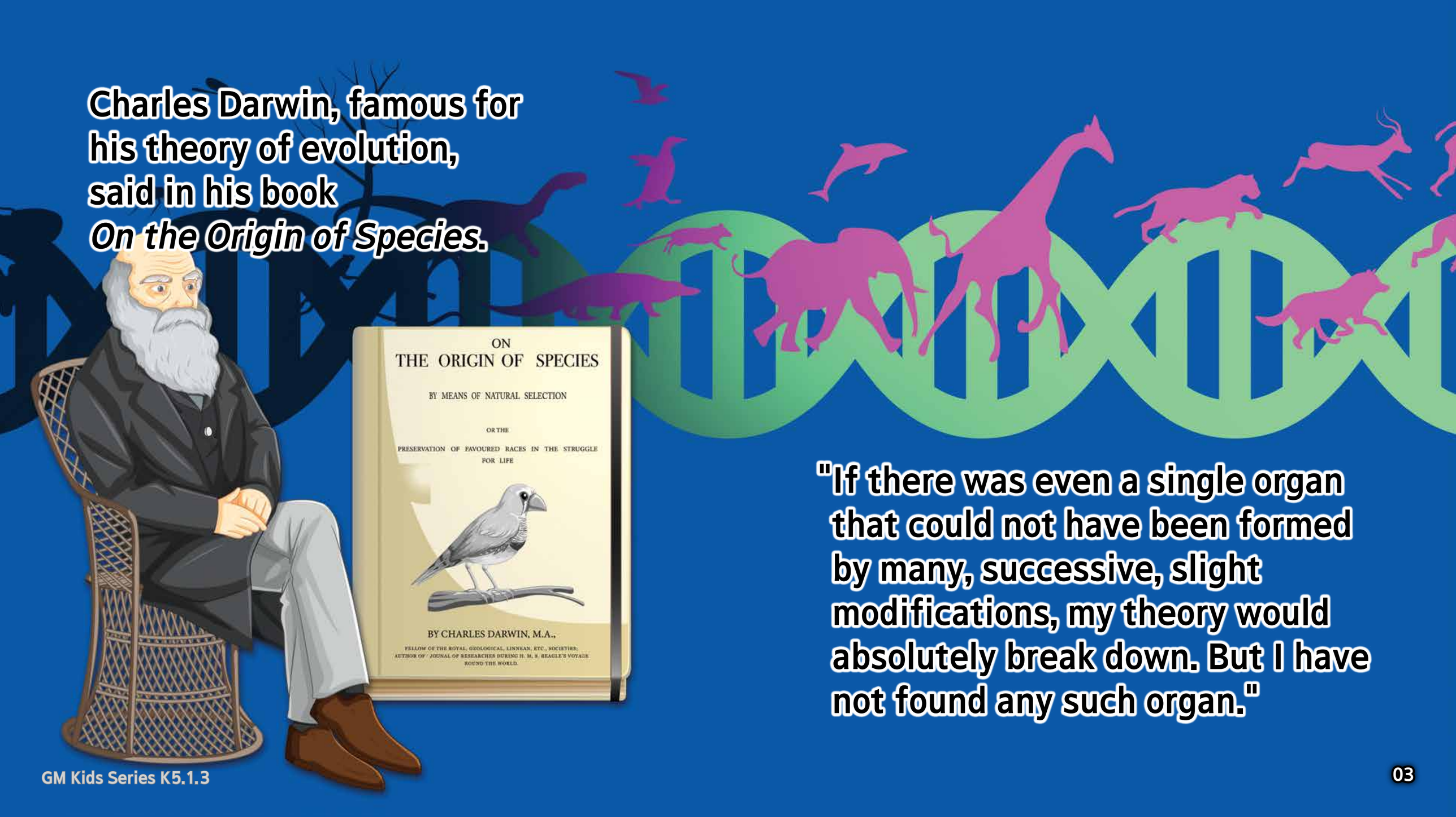
Charles Darwin, famous for his theory of evolution, said in his book *On the Origin of Species*.



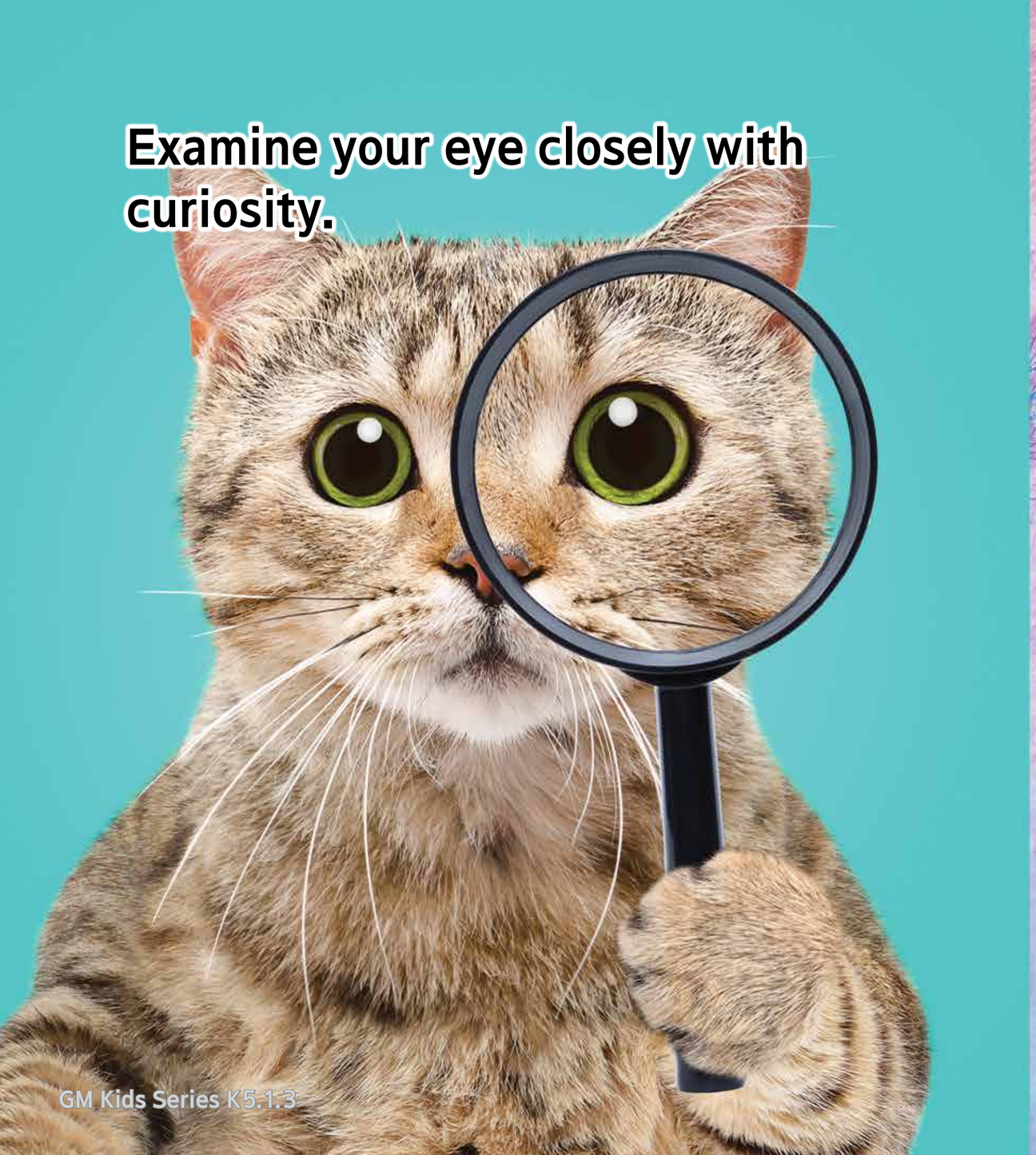
"If there was even a single organ that could not have been formed by many, successive, slight modifications, my theory would absolutely break down. But I have not found any such organ."


The eye is a mysterious and amazing organ.

Even with all the advanced knowledge of modern science, we still cannot design a device as delicate and wondrous as the human eye.

Then how did life forms come to have eyes that see the world?

Examine your eye closely with curiosity.



We will quickly realize just how great evolution is.

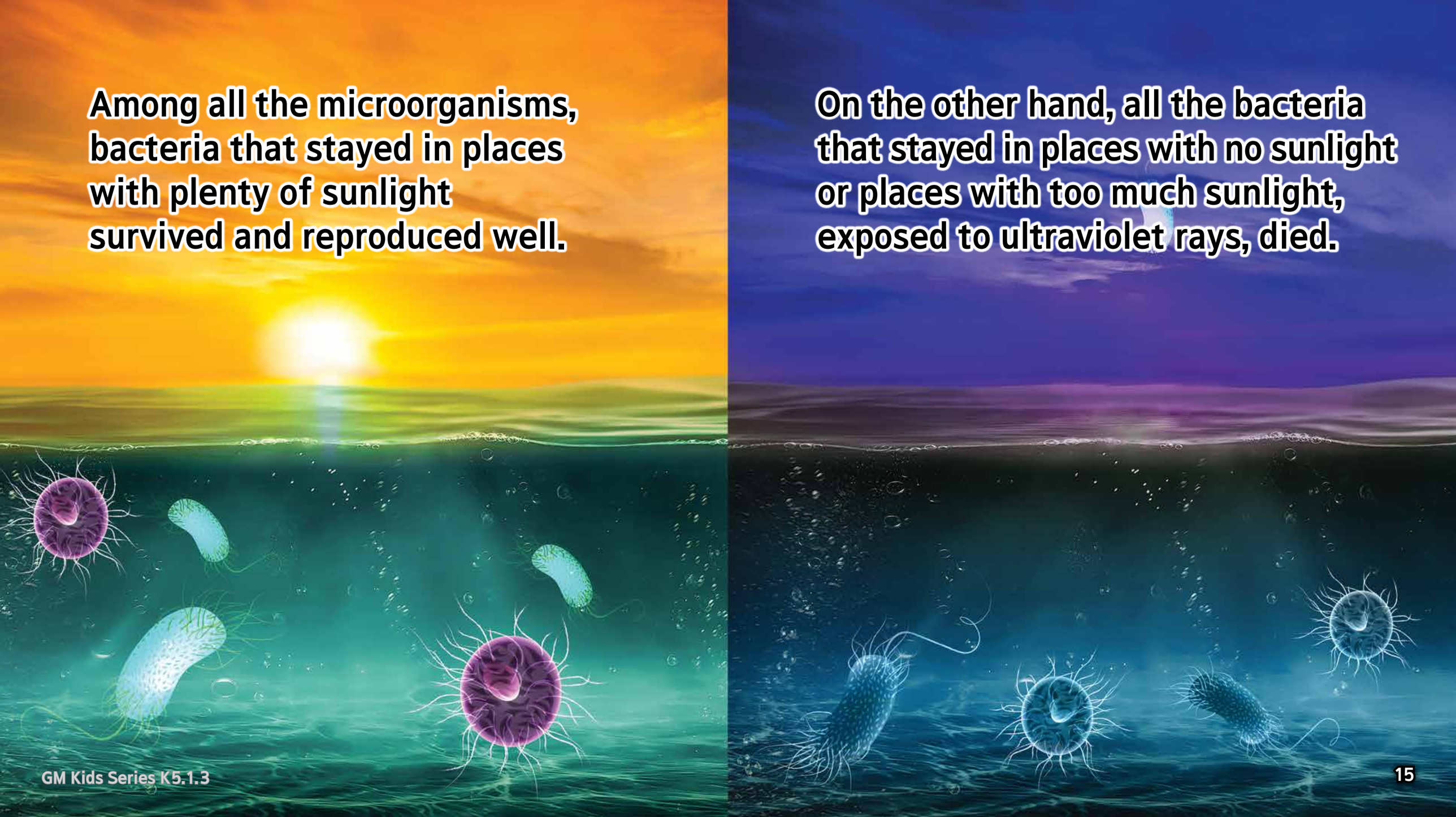
About 3.8 billion years ago, the first life forms on Earth did not have eyes.

At that time, all life forms on Earth were microorganisms drifting aimlessly in the ocean. However, they still needed energy to survive.

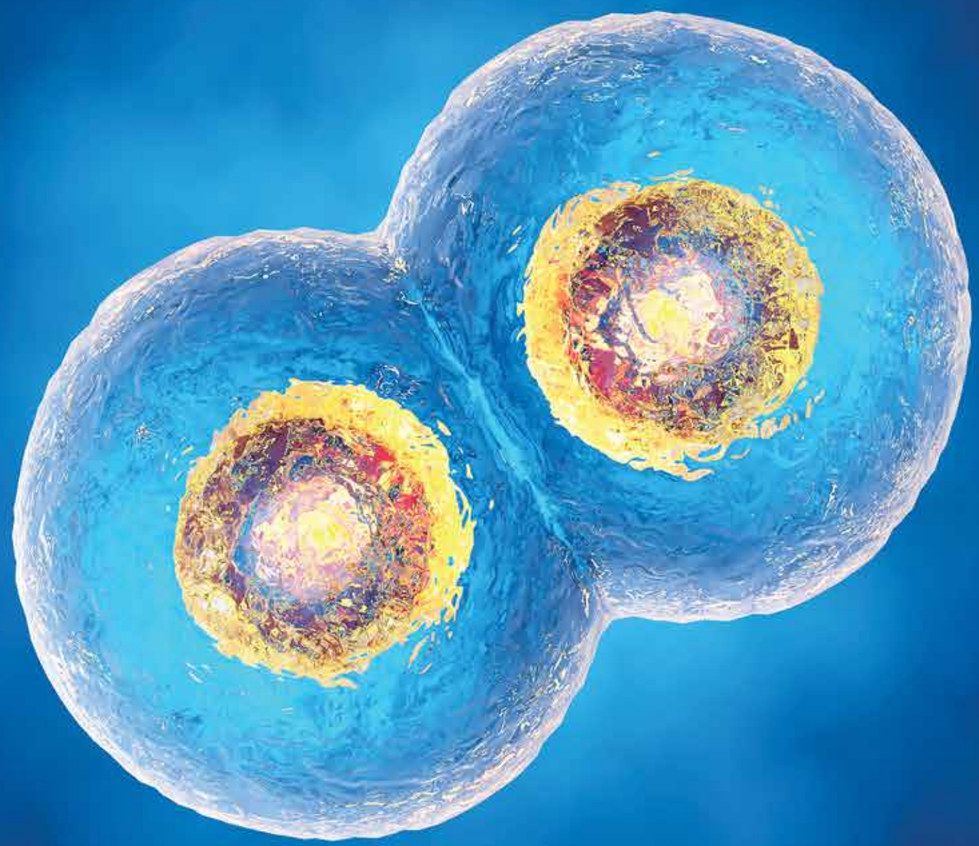

Their energy came from
the sunlight shining from the Sun.

Among all the microorganisms, bacteria that stayed in places with plenty of sunlight survived and reproduced well.

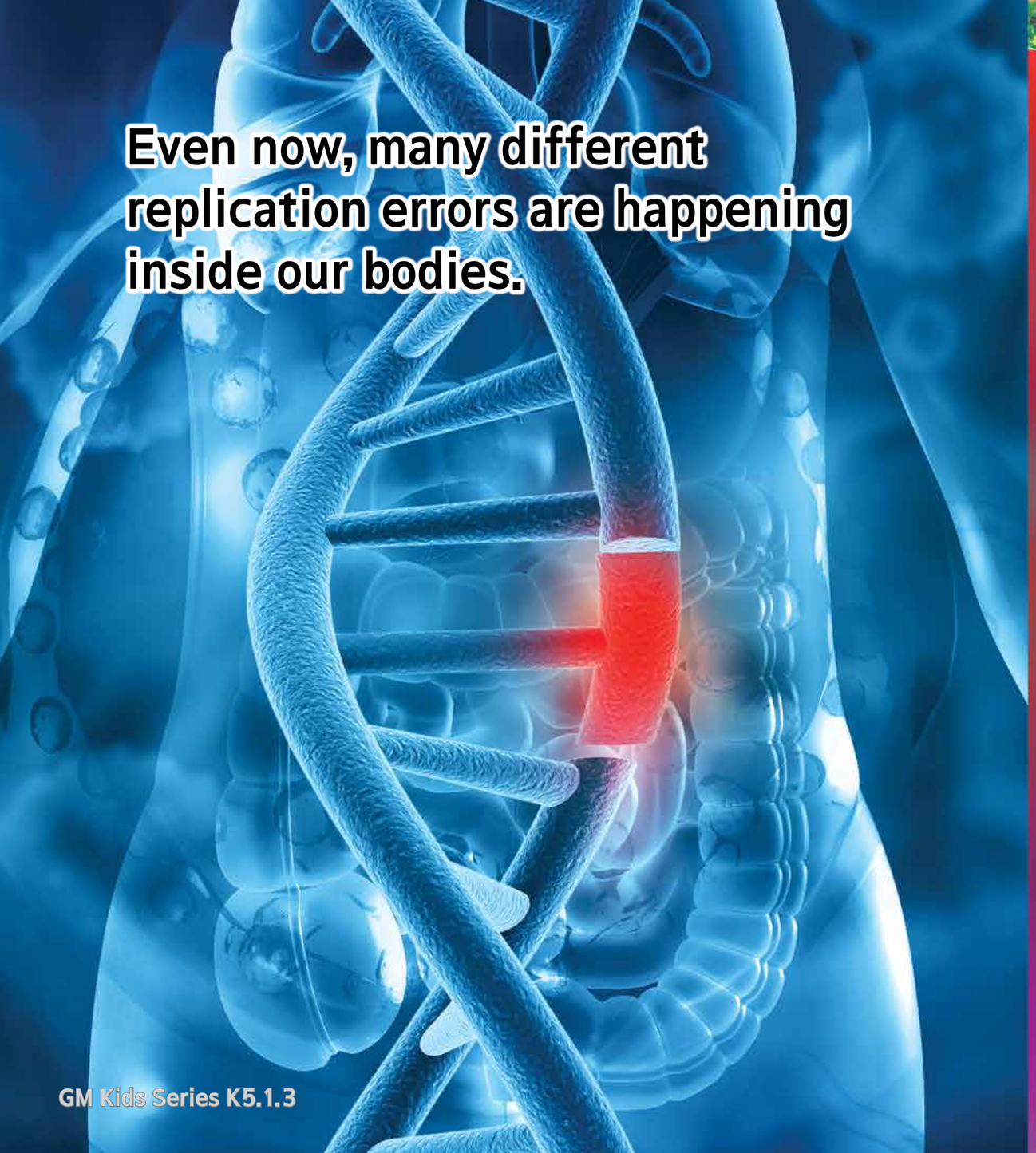
On the other hand, all the bacteria that stayed in places with no sunlight or places with too much sunlight, exposed to ultraviolet rays, died.



However, a DNA replication error occurred in the reproduction process of bacteria that were lucky enough to get sunlight.



DNA replication errors are common mistakes that happen during the reproduction process of life forms.

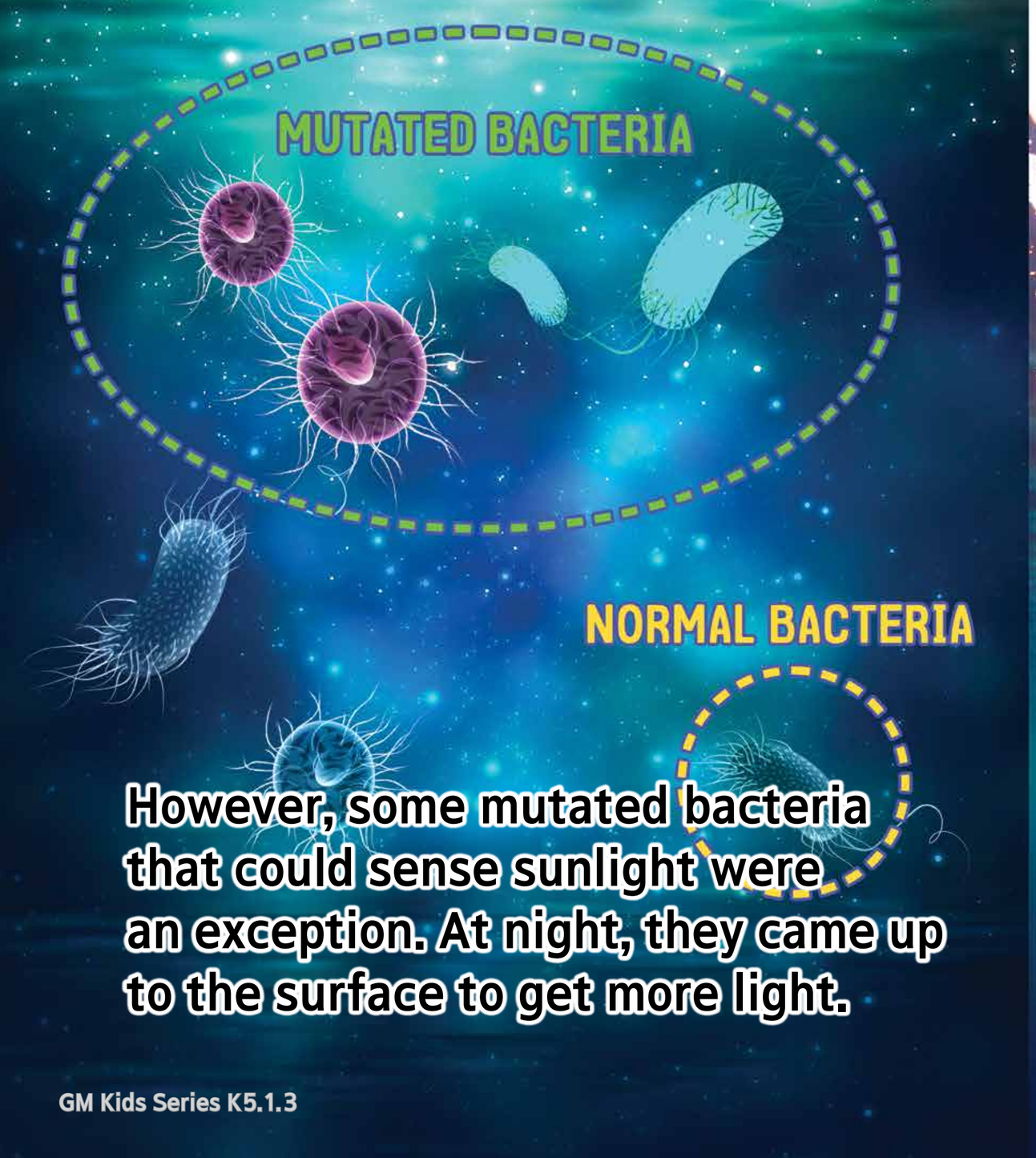


Even now, many different replication errors are happening inside our bodies.

Errors in bacterial DNA replication at that time led to new genetic changes. A new part that could sense sunlight was created.

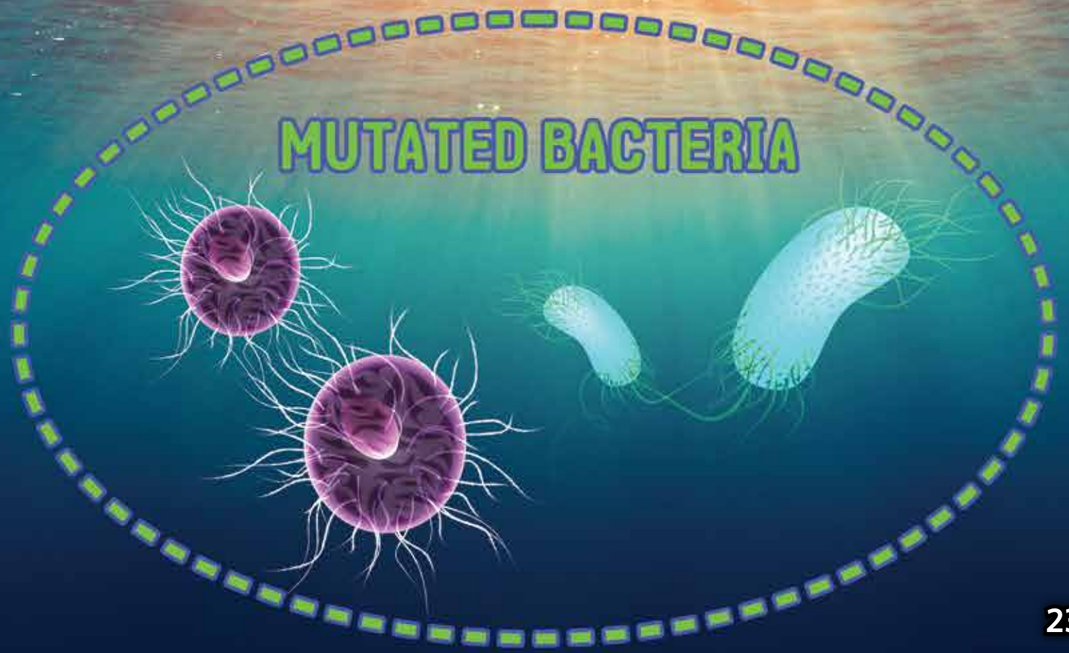
This process is called a mutation in nature.

Mutations are not always good for survival and reproduction.
Mutated genes might not be passed down to future generations and can disappear quickly.



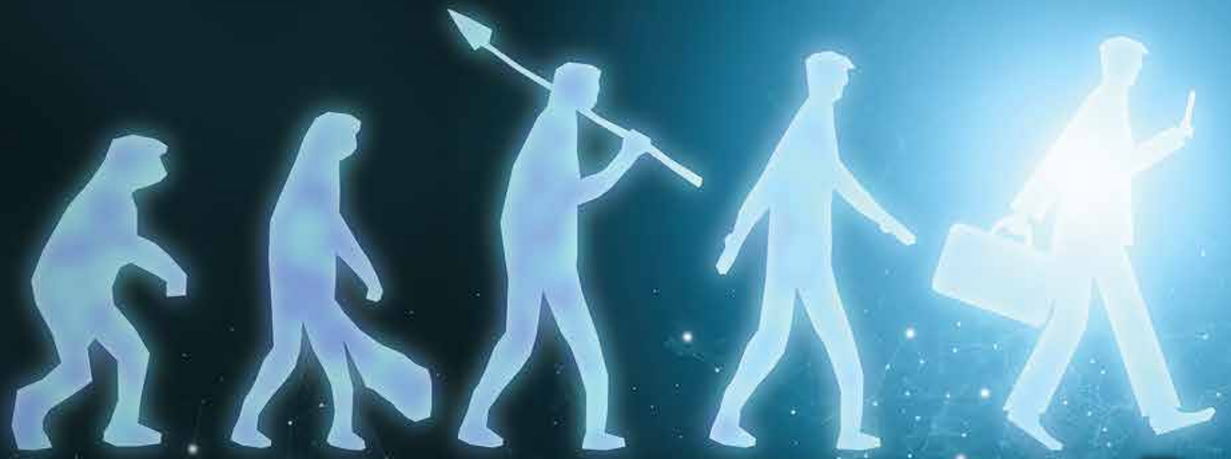
However, some mutated bacteria that could sense sunlight were an exception. At night, they came up to the surface to get more light.

During the day, they went below the surface to avoid harmful ultraviolet rays, safely absorbing sunlight to survive and reproduce. Eventually, the number of these smart mutated bacteria grew rapidly.



Meanwhile, the bacteria that could not sense sunlight barely survived and slowly decreased in number.

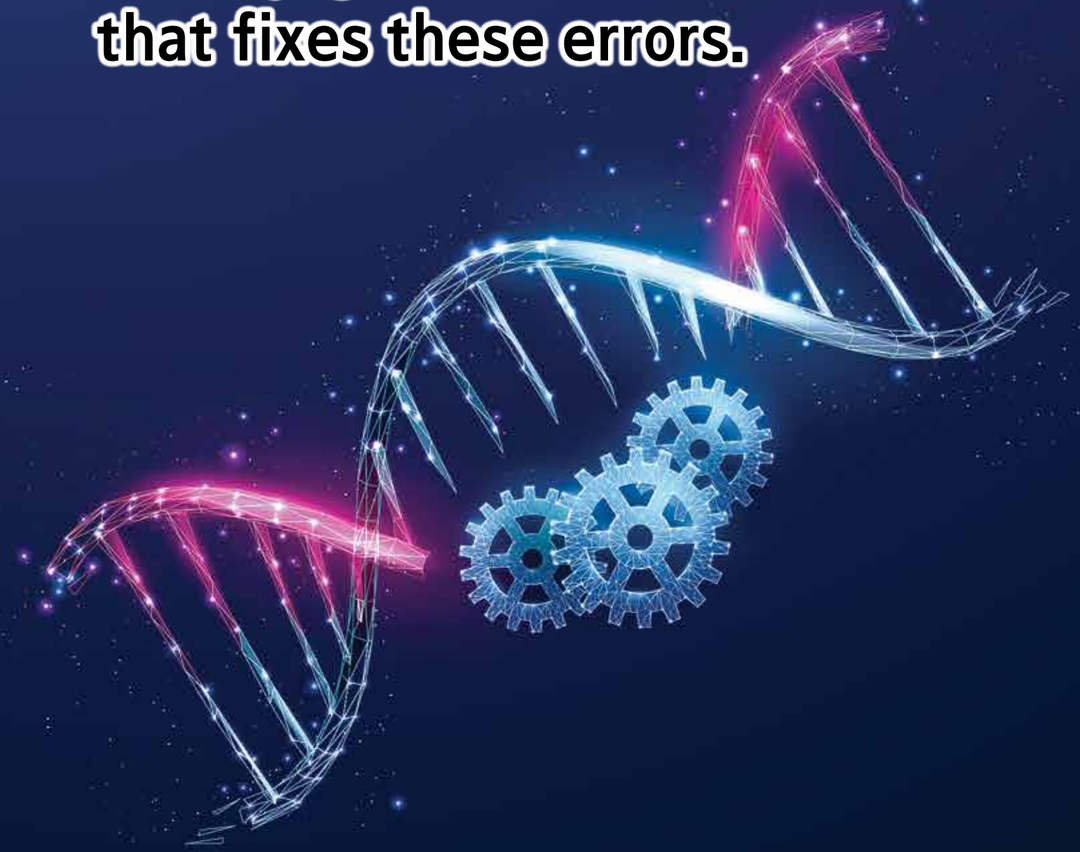
Over generations, the mutated bacteria were naturally selected. In nature, it is not the strongest genes that survive, but the genes that survive are considered strong.



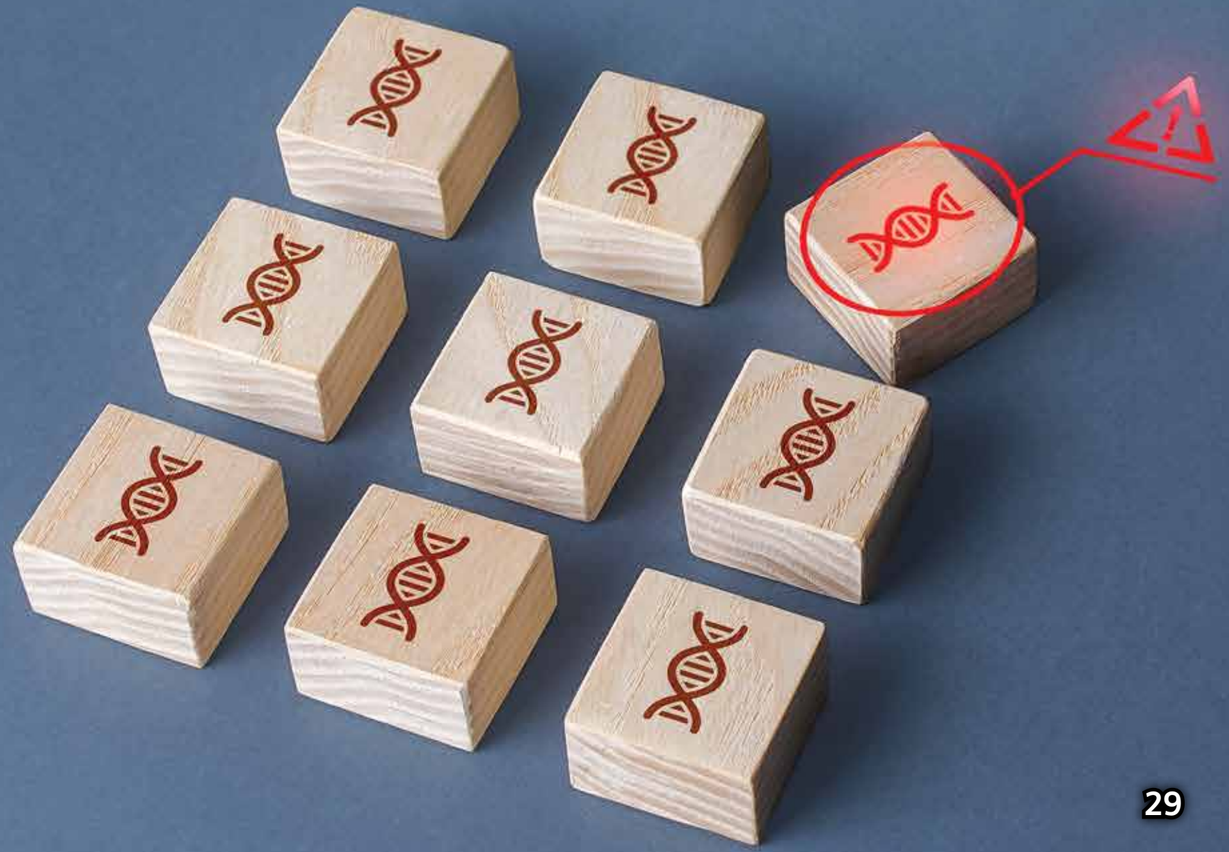
A life form's body is made up of many genes.
These genetic differences create variations between people and between humans and other life forms.

What does it mean when a mutation, or a change in genes, occurs?

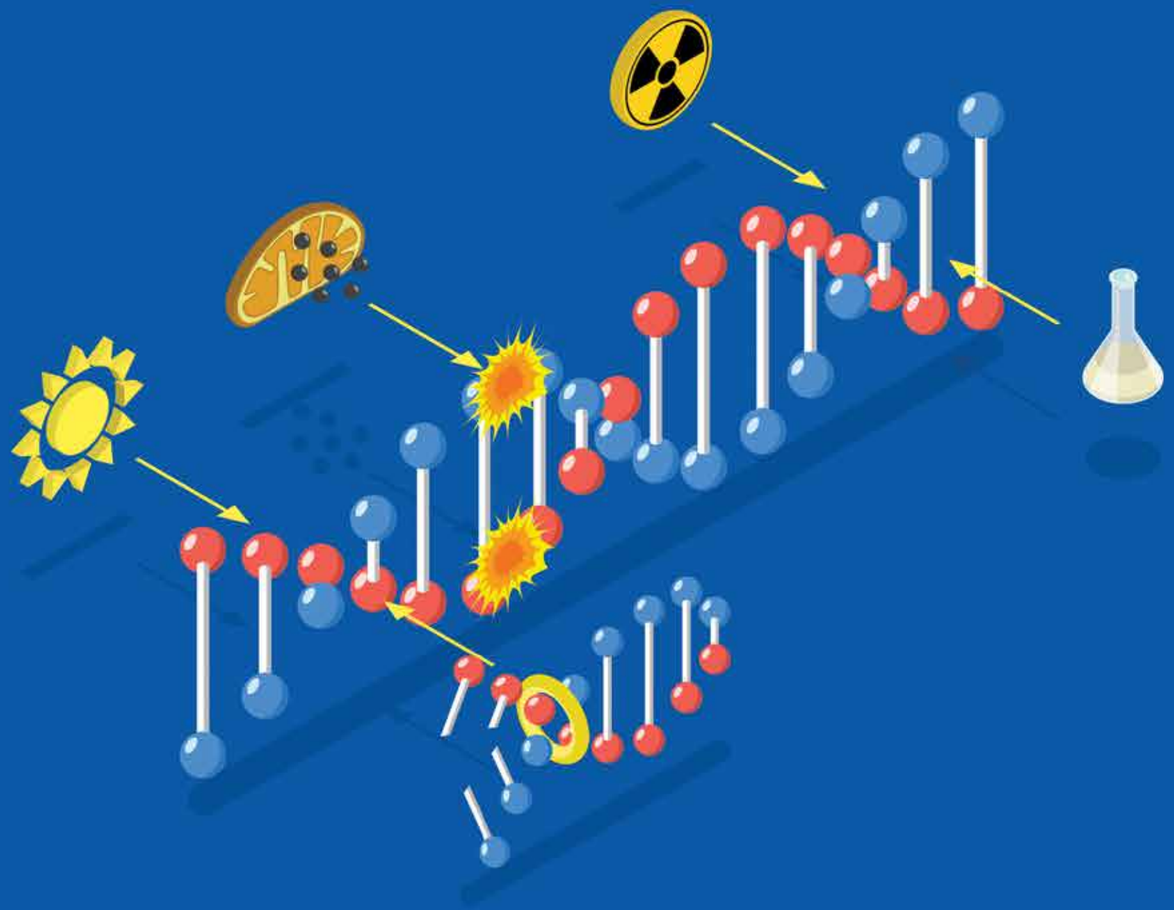
When genes are copied,
errors happen once in every
100,000 times.
Luckily, genes have a function
that fixes these errors.



However, this function is not perfect,
and it misses an error once in
every 100,000 times. As a result,
mutations happen.

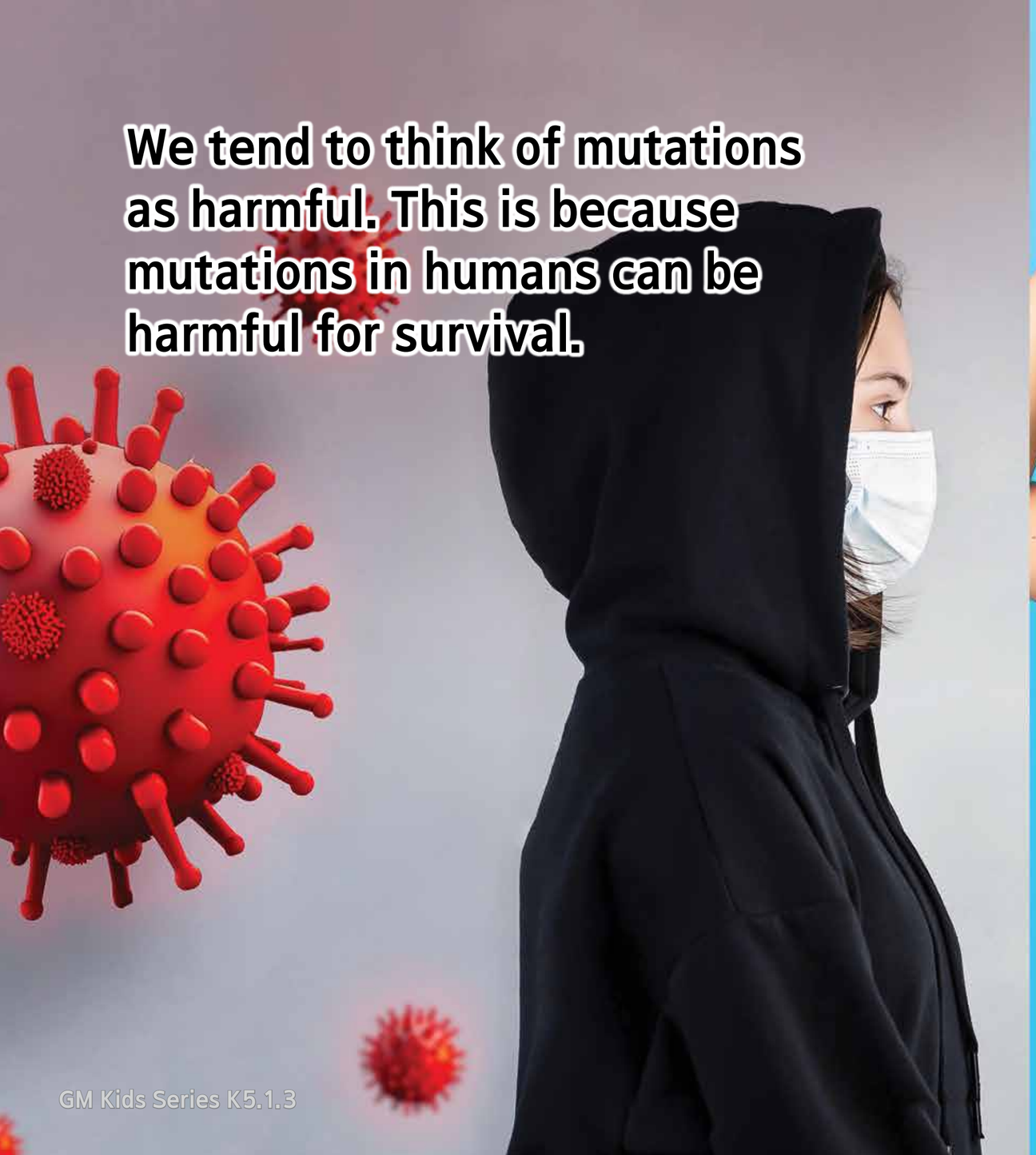


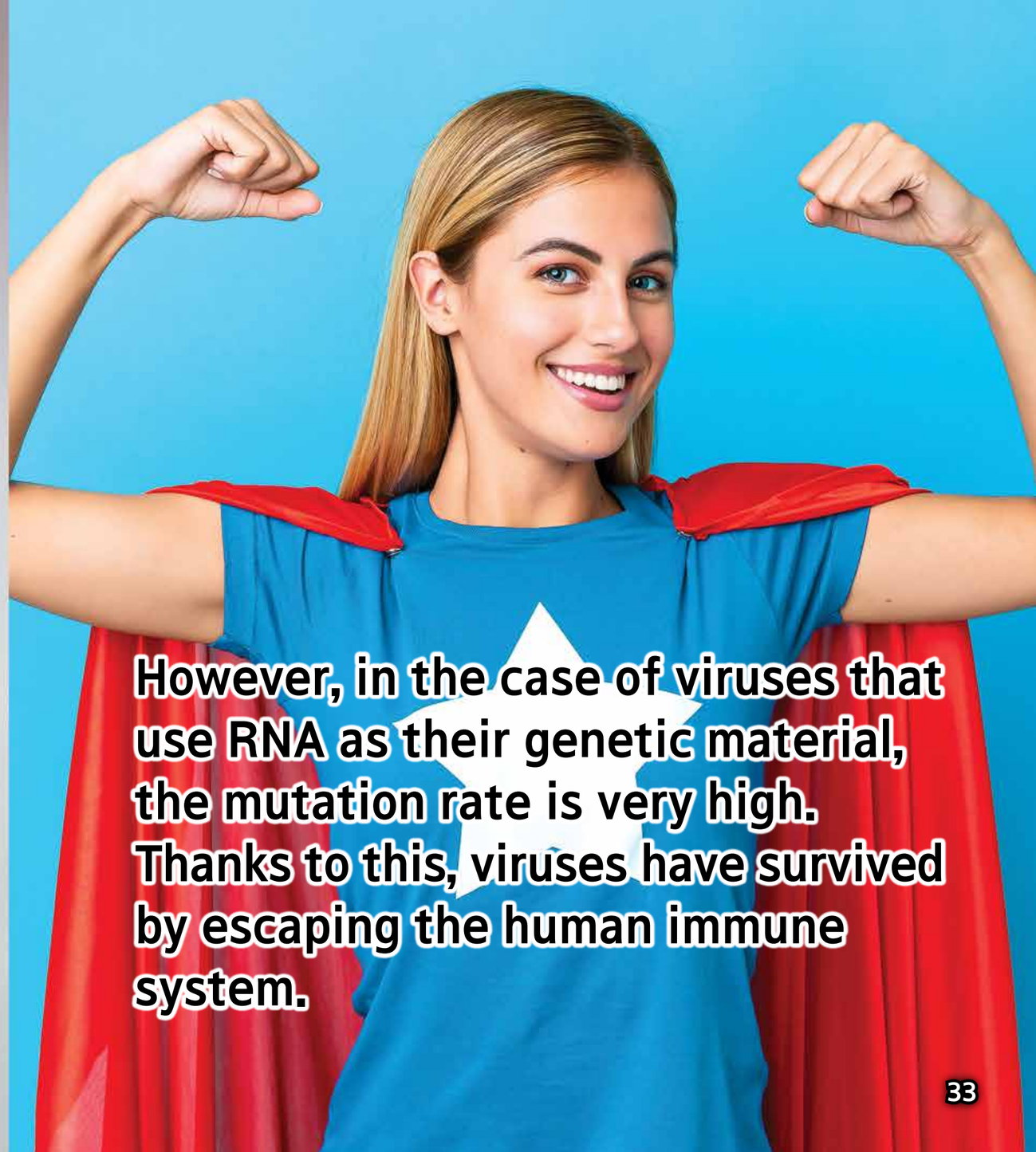
Mutations can also happen because of physical and chemical factors.



Chemical mutations can happen when we are exposed to radiation, ultraviolet rays, or when we eat burnt meat. Of course, these things do not happen often.

We tend to think of mutations as harmful. This is because mutations in humans can be harmful for survival.





However, in the case of viruses that use RNA as their genetic material, the mutation rate is very high. Thanks to this, viruses have survived by escaping the human immune system.