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Cyanobacteria Coexisted with Bacteria

About 2.4 billion years ago, the Earth's atmosphere had very little oxygen. Cyanobacteria began photosynthesis, releasing oxygen into the air. This oxygen helped clean the Earth's air. With more oxygen available, many different life forms were able to live and grow. This release of oxygen by cyanobacteria is known as the "Great Oxidation Event."

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GM Kids Series



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A microscopic image showing a cross-section of a plant stem. The vascular bundles are clearly visible, with a central pith and outer cortex. A prominent vascular bundle is shown in detail, revealing the xylem and phloem. Small, blue-green, rod-shaped organisms, identified as cyanobacteria, are scattered throughout the tissue, particularly near the vascular bundles.

Blue-green algae are tiny organisms that have a bluish-green color.

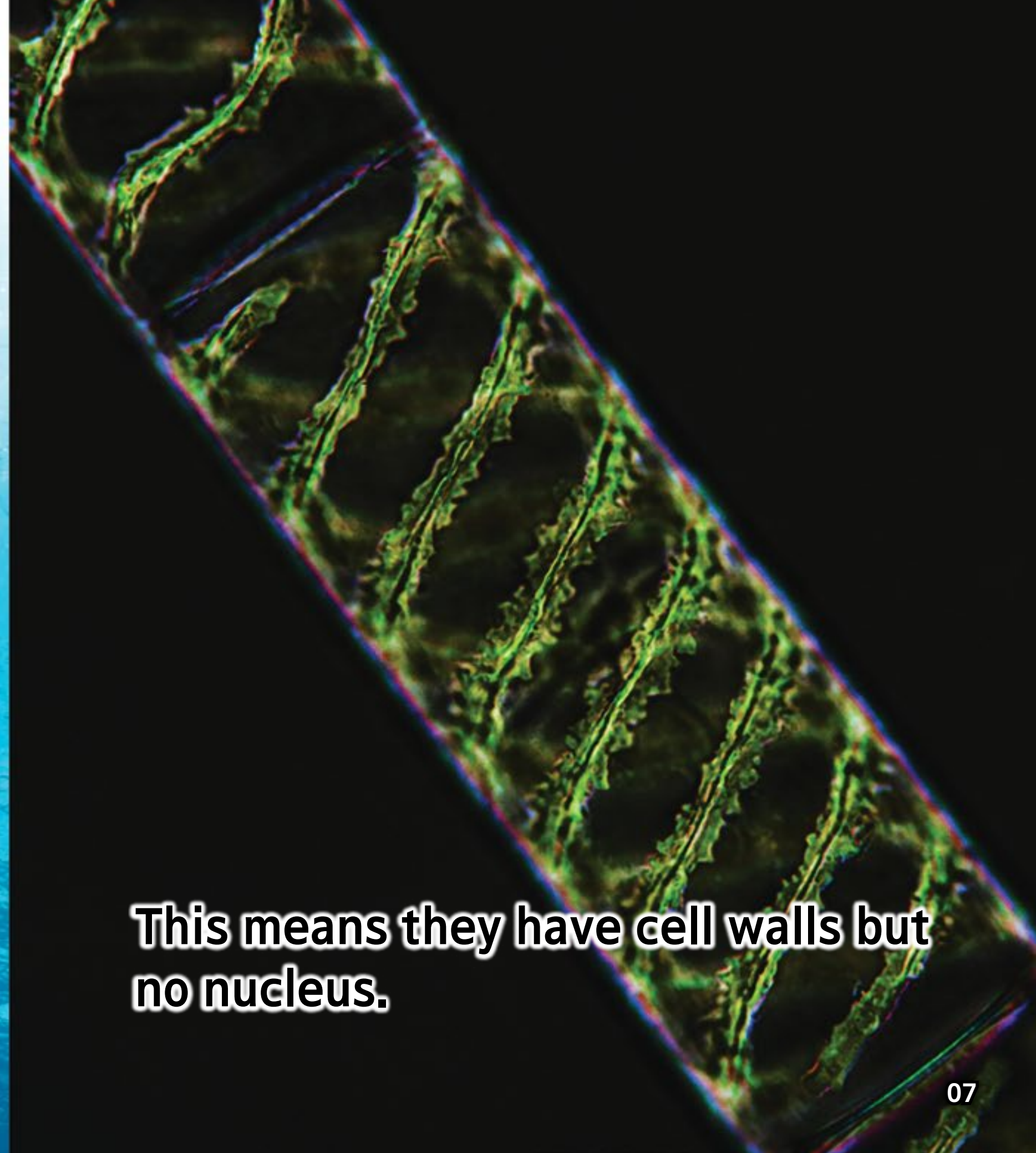
Blue-green algae are also called “cyanobacteria.”

Cyanobacteria have been living Earth for about 3.5 billion years. They are close friends with other bacteria.

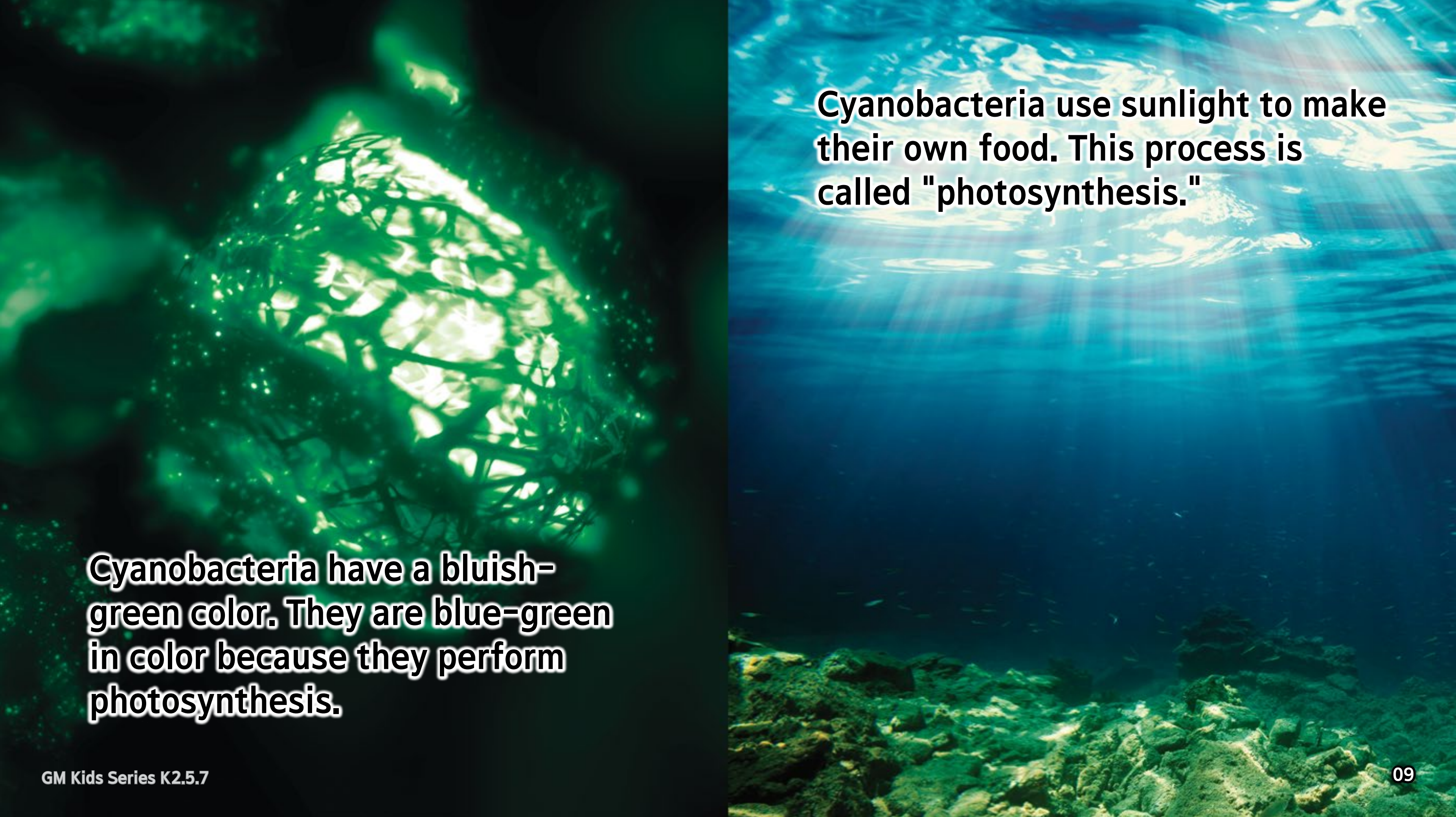
A magnifying glass is positioned over a beach scene, focusing on a collection of diverse, colorful bacteria. The bacteria include various shapes and sizes, such as rod-shaped, spherical, and filamentous forms, some with flagella. The background shows a blue sky with clouds, a blue ocean, and a sandy beach.

Bacteria are tiny unicellular organisms. Bacteria can live almost anywhere.

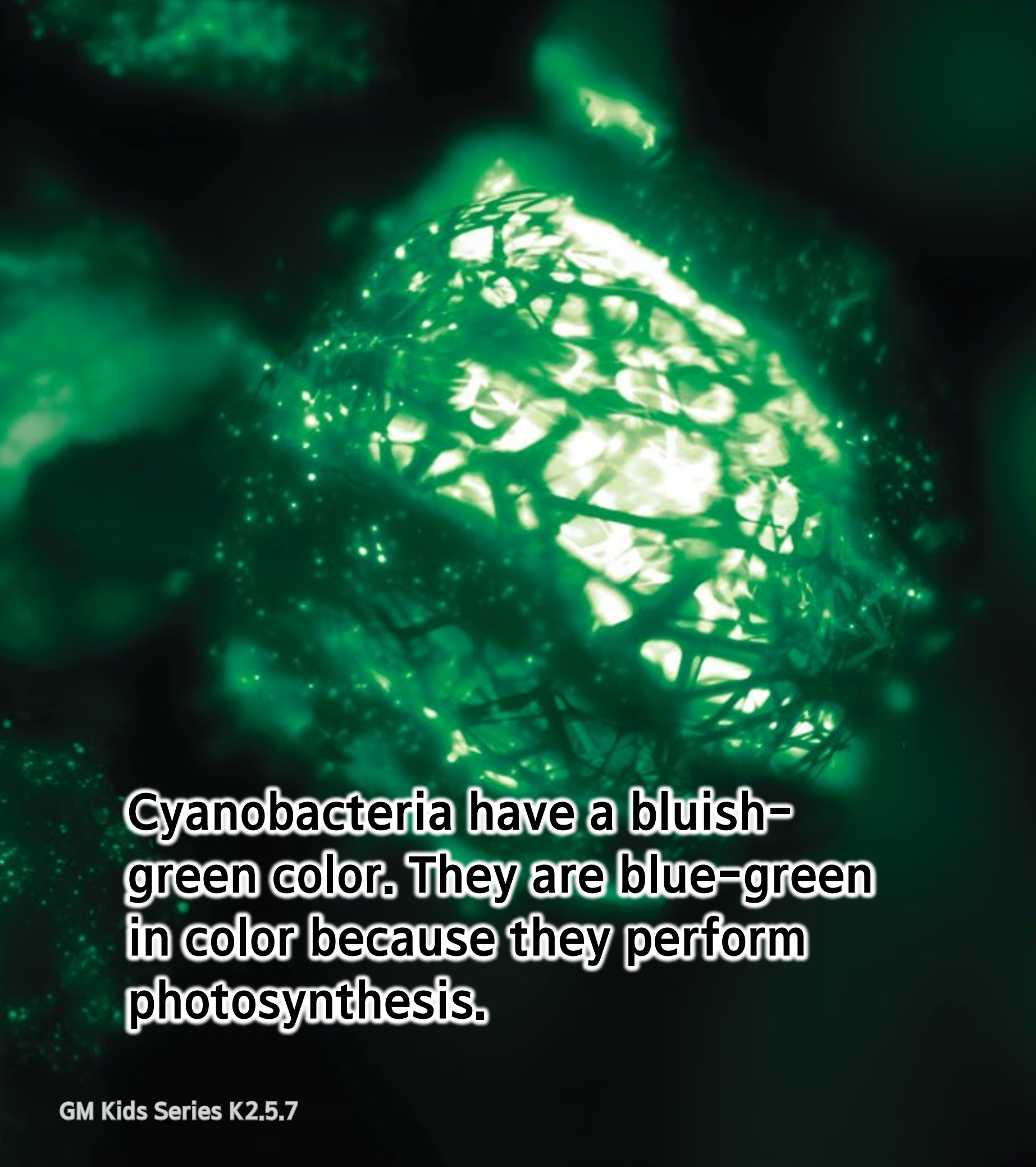
Cyanobacteria live inside water or mud. They are prokaryotic organisms.



This means they have cell walls but no nucleus.

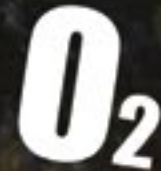
An underwater scene showing sunlight rays filtering through the water surface, creating a shimmering effect. The water is a deep blue-green color, and the bottom is covered in dark, rocky terrain with some greenish growth.

Cyanobacteria use sunlight to make their own food. This process is called "photosynthesis."

A close-up view of a cyanobacteria colony, showing a dense, tangled mass of greenish-brown filaments. The colony is illuminated from above, creating a bright, glowing effect.

Cyanobacteria have a bluish-green color. They are blue-green in color because they perform photosynthesis.

About 2.4 billion years ago,
the Earth's atmosphere had very
little oxygen.



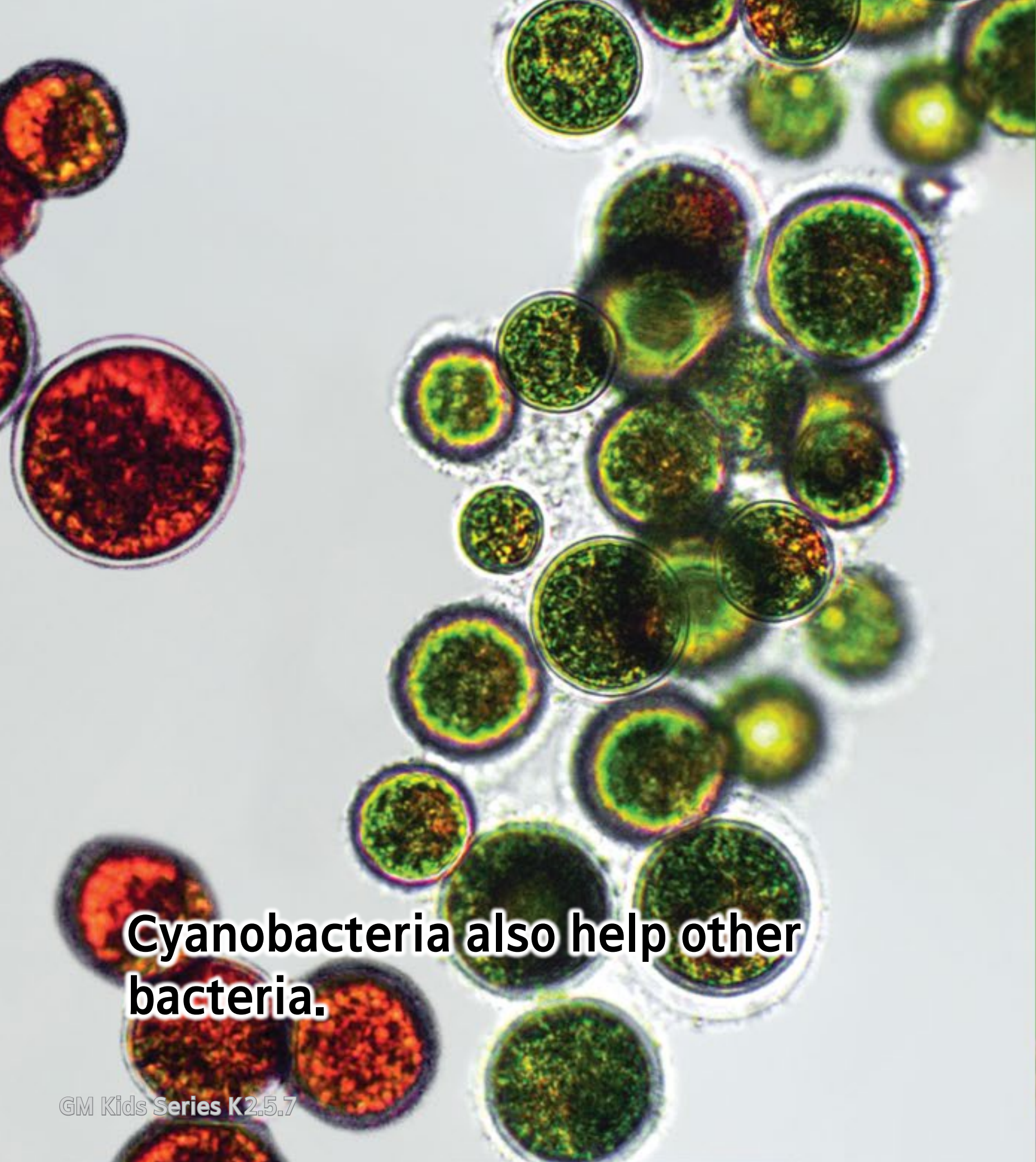
Cyanobacteria began
photosynthesis, releasing oxygen
into the air.



With more oxygen available, many different life forms were able to live and grow. This release of oxygen by cyanobacteria is known as the "Great Oxidation Event."

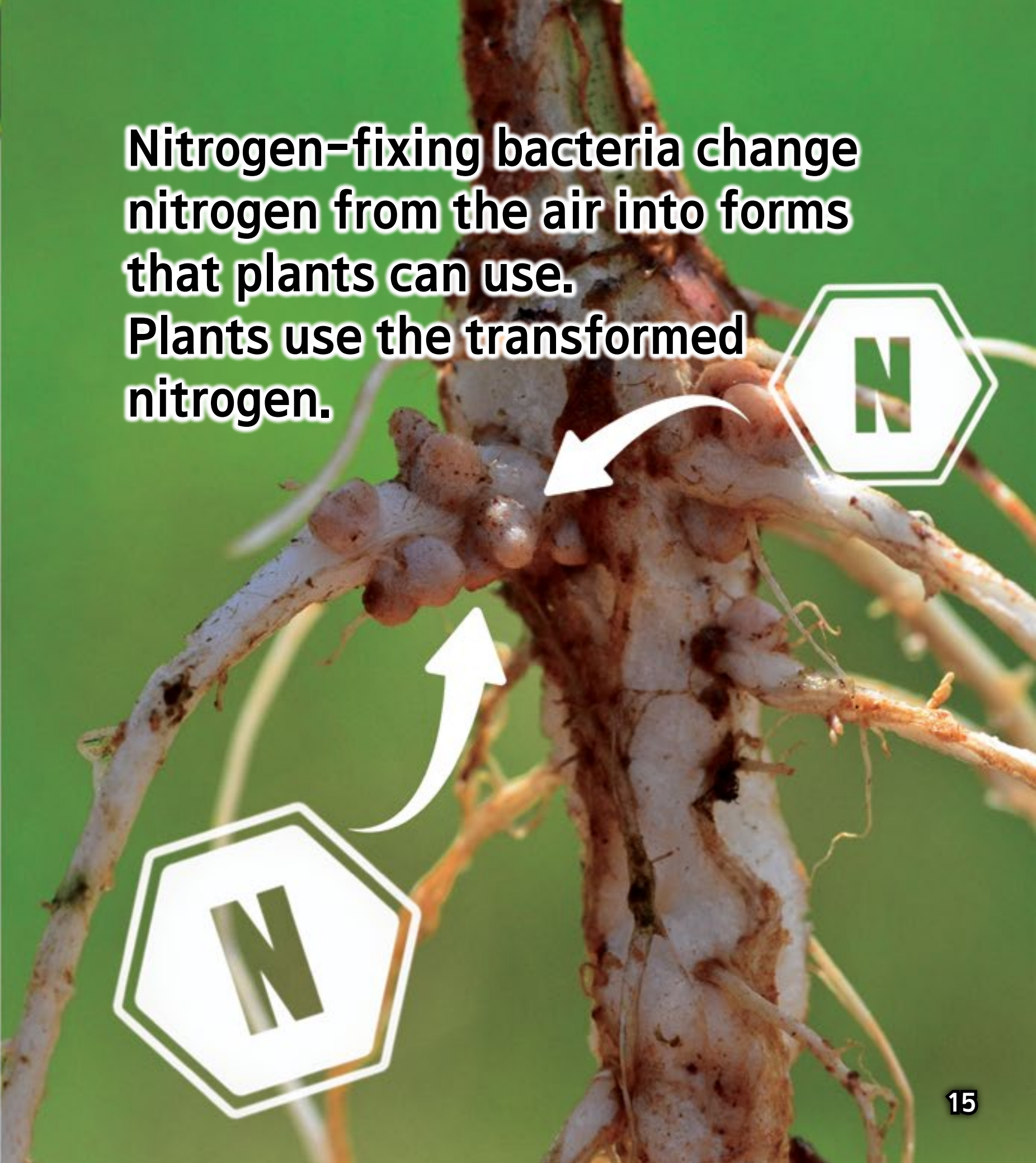
This oxygen helped clean the Earth's air.



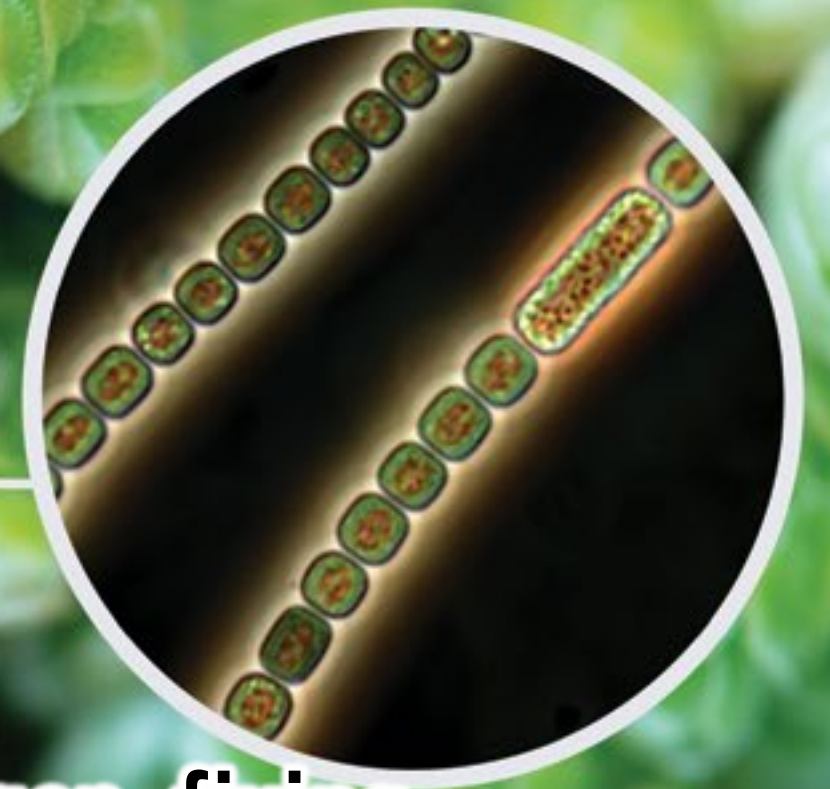


Cyanobacteria also help other bacteria.

Nitrogen-fixing bacteria change nitrogen from the air into forms that plants can use. Plants use the transformed nitrogen.



Cyanobacteria share the nutrients they make through photosynthesis to nitrogen-fixing bacteria.



In return, nitrogen-fixing bacteria provide the nitrogen that cyanobacteria need.

When organisms live together and help each other like this, it is called "symbiosis."



However, if too many cyanobacteria grow in the water, it can cause problems.

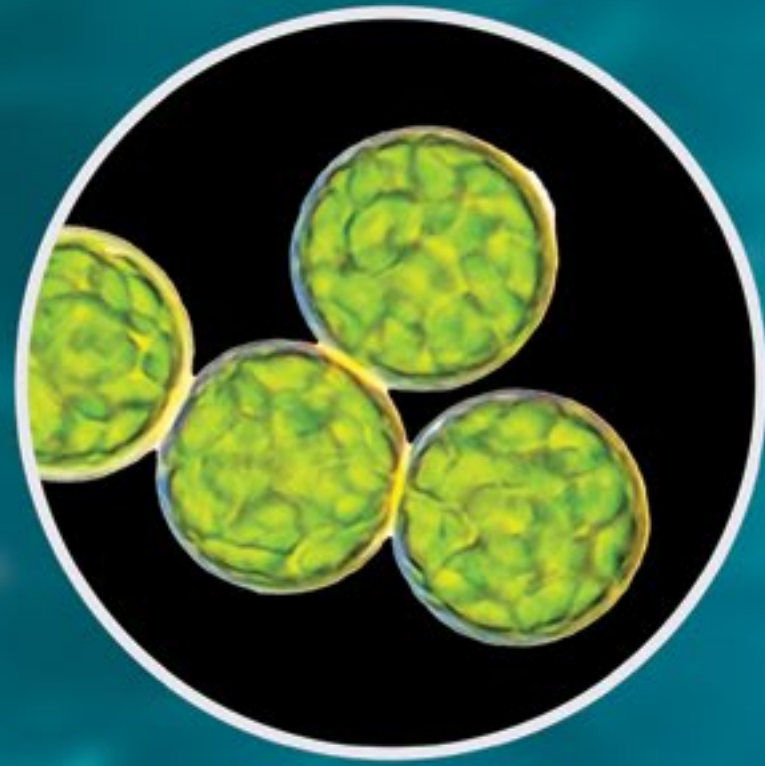


When cyanobacteria multiply too much, it creates a "red tide." Red tide is when the water turns red.



Red tide lowers the oxygen levels in the water, which can harm other living organisms.

Cyanobacteria form the base of the ocean's food chain.

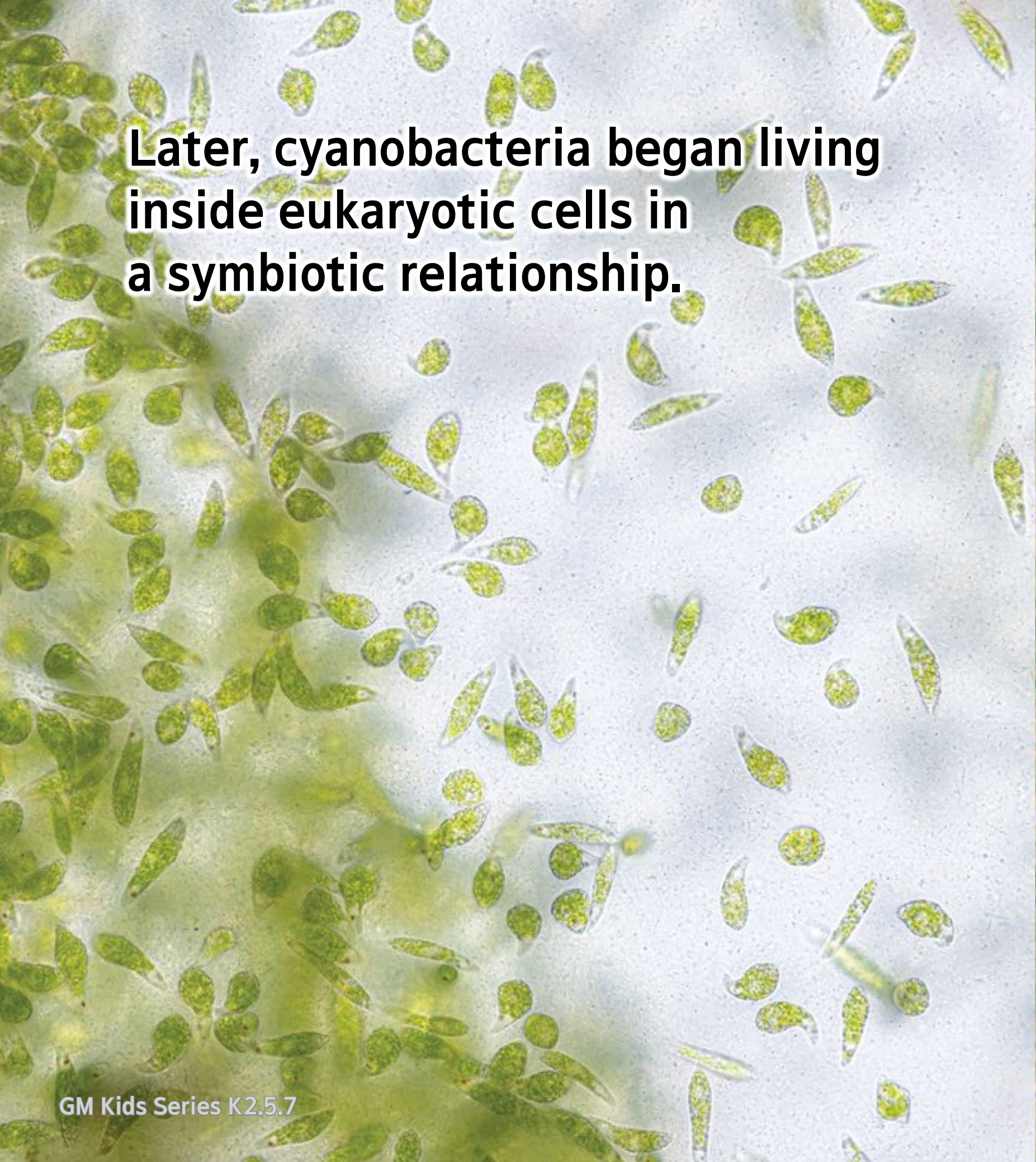


Cyanobacteria absorb nutrients in the water.

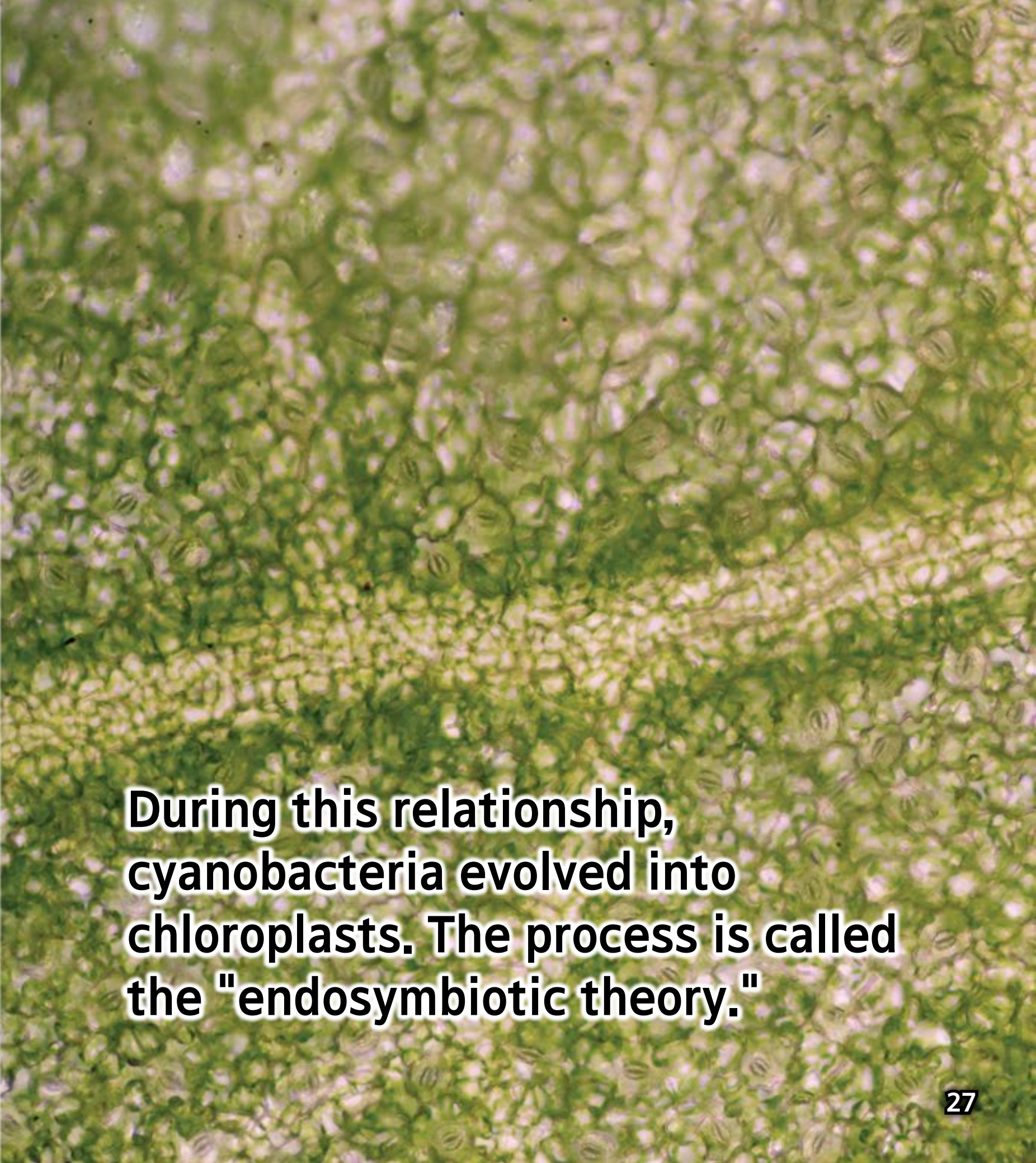
Long ago, cyanobacteria lived on their own.



Chloroplasts in plants are descendants of cyanobacteria.

A microscopic view of numerous cyanobacteria cells. The cells are small, oval-shaped, and green, with some showing internal structures. They are scattered across a light-colored background.

Later, cyanobacteria began living inside eukaryotic cells in a symbiotic relationship.


A microscopic view of a dense population of chloroplasts. The chloroplasts are small, green, and bean-shaped, with visible internal structures. They are packed closely together, filling the frame.

During this relationship, cyanobacteria evolved into chloroplasts. The process is called the "endosymbiotic theory."



Cyanobacteria performed photosynthesis to produce oxygen.

Cyanobacteria also provided energy for many other living organisms.

A microscopic view of cyanobacteria cells, showing various shapes and sizes, some with internal structures visible. The background is a mix of green and yellowish-green.

**Cyanobacteria also formed
symbiotic relationships with other
bacteria.**

**These relationships helped nature
in many ways through their
cooperation.**

Even today, cyanobacteria are important in both the ocean and freshwater environments.



Cyanobacteria also have a significant impact on humans.

Studying cyanobacteria is important for understanding how life has changed and evolved over time.

