K6.1.2 K6.1.2 K6.1.2

Where Do We Use Structural Colors?

Where Do We Use Structural Colors?

Thanks to its unique structure, the Morpho butterfly has very beautiful blue wings.
Many other living things also have structural colors.
For example, the beetle's shell has a shiny blue color, which is a structural color.

We are setting the global standard of mathematics education.
We are always making our best efforts to realize learner-centered education.
Please feel free to reach out to us with the contact information provided below if you are interested in our education.

This edition is published by GOS EDUCATION INC.
Suite 457, 5201 Great America Pkway, Santa Clara, CA 95054
Website : www.gosedusoft.com
E-Mail : davidann819@gmail.com

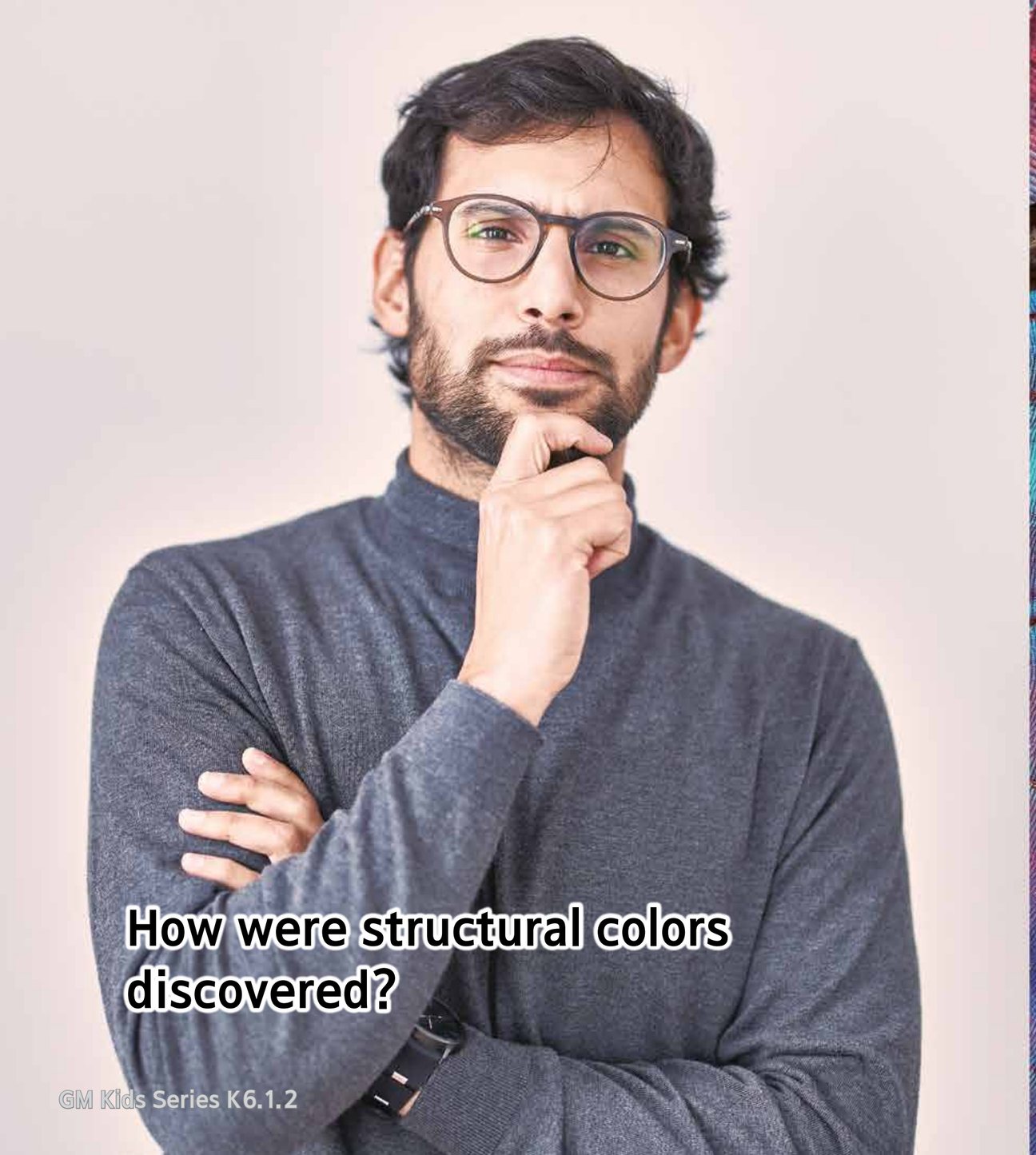
Written by David Ann

Printed in the United States of America
ISBN : 979-8-89533-033-3

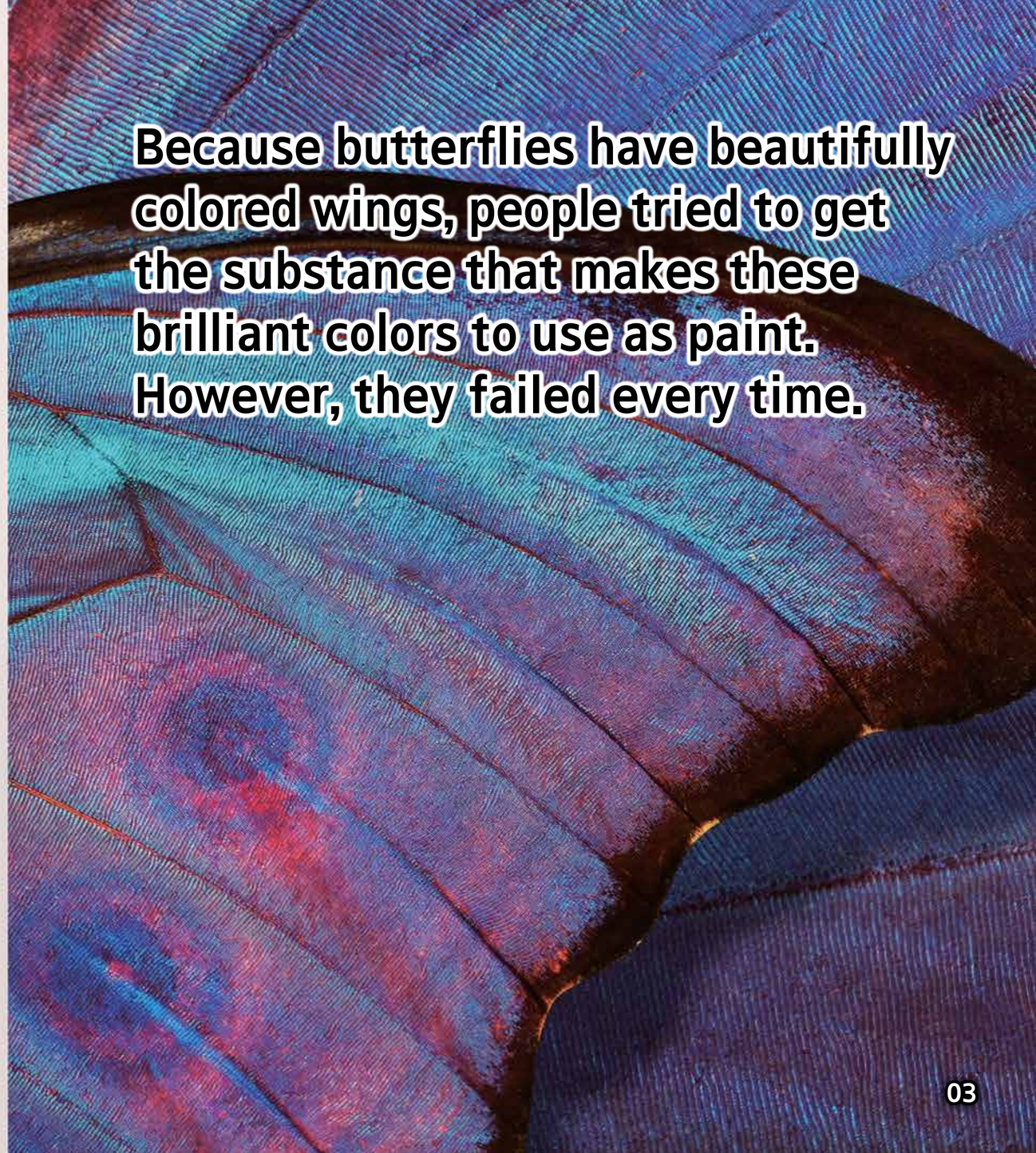
$13.00
ISBN 979-8-89533-033-3
51300>
9 798895 330333

General Onologic Soft

GM Kids Series GM Kids Series



How were structural colors discovered?



Because butterflies have beautifully colored wings, people tried to get the substance that makes these brilliant colors to use as paint. However, they failed every time.

This was because there were no pigments in the butterfly's wings that produced the color.

The color of the butterfly comes from the very small structures that make up its wings.

When we look at the structure of a butterfly's wing under an electron microscope, we can see that it is very detailed.

When light hits this detailed structure, certain colors are strongly reflected.

The color is not created by pigments but by the structure of the wing.

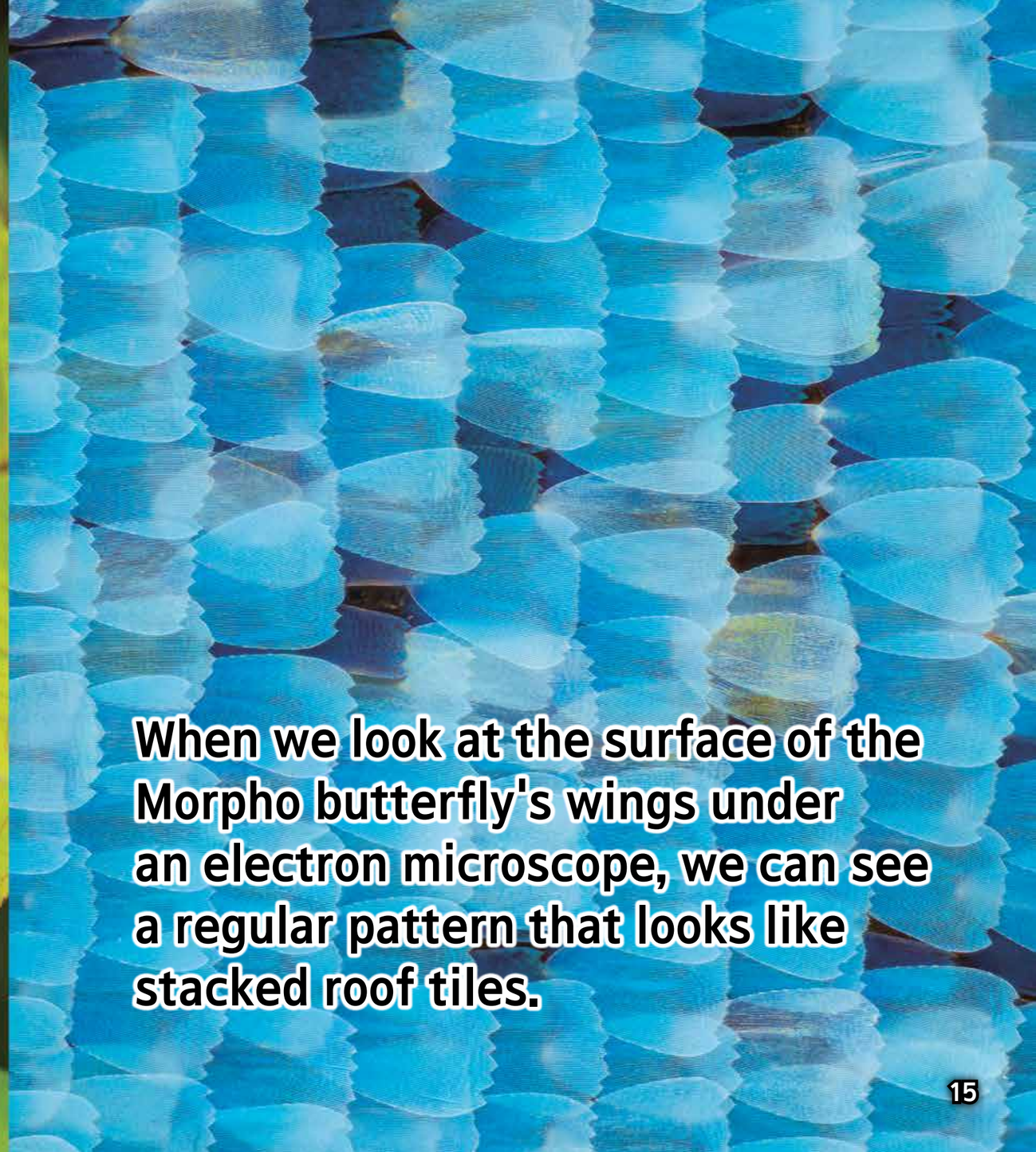
Many other living things also have structural colors, not just butterflies.

For example, the beetle's shell has a shiny blue color, which is a structural color.

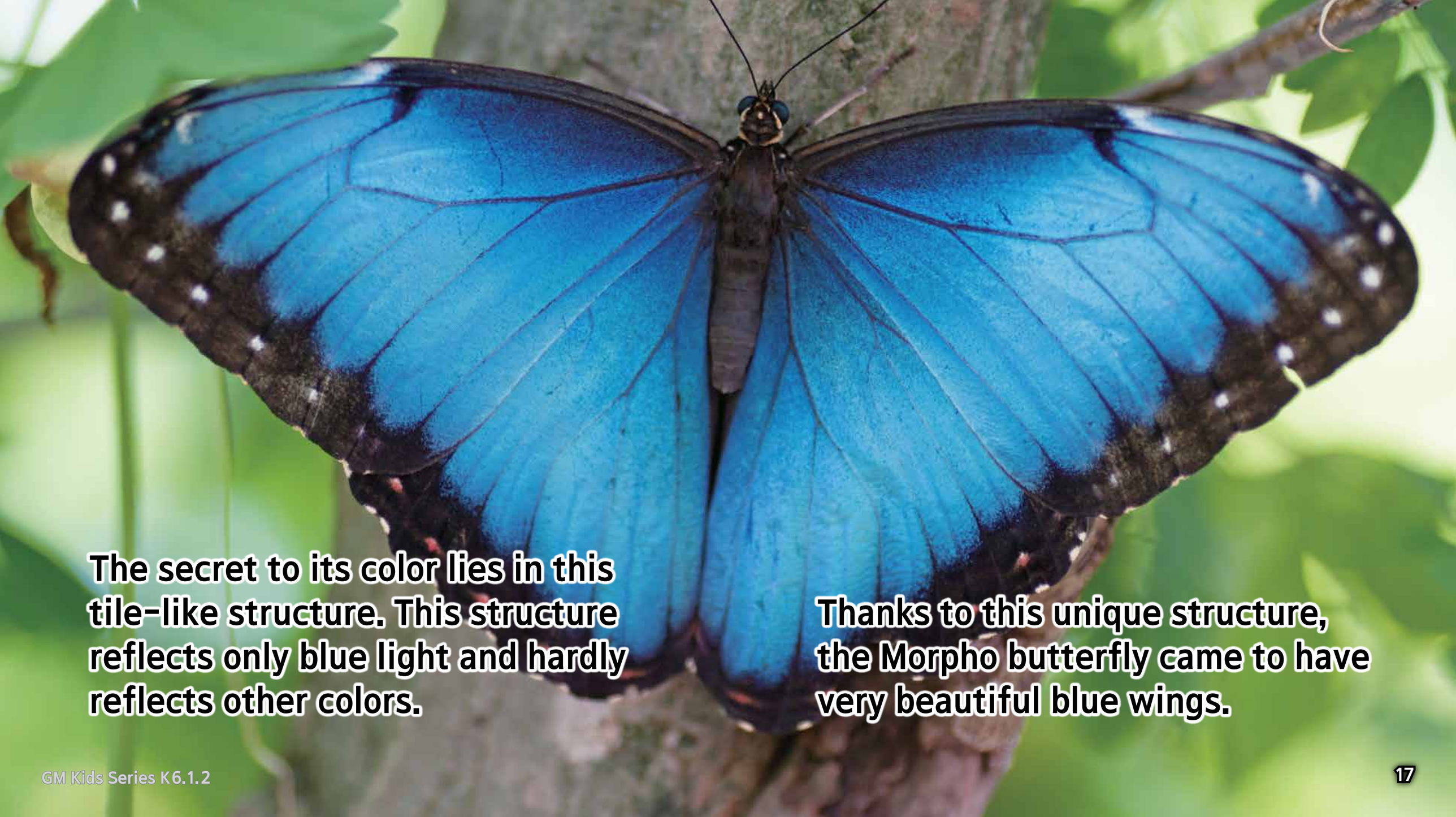
The bright colors seen on a male peacock's feathers are also structural colors.

The beautiful and brilliant colors of many birds' feathers are all structural colors.

Among butterflies, the Morpho butterfly is famous for its beautiful wing color. Its wings are very bright and have an intense blue color.



When we look at the surface of the Morpho butterfly's wings under an electron microscope, we can see a regular pattern that looks like stacked roof tiles.

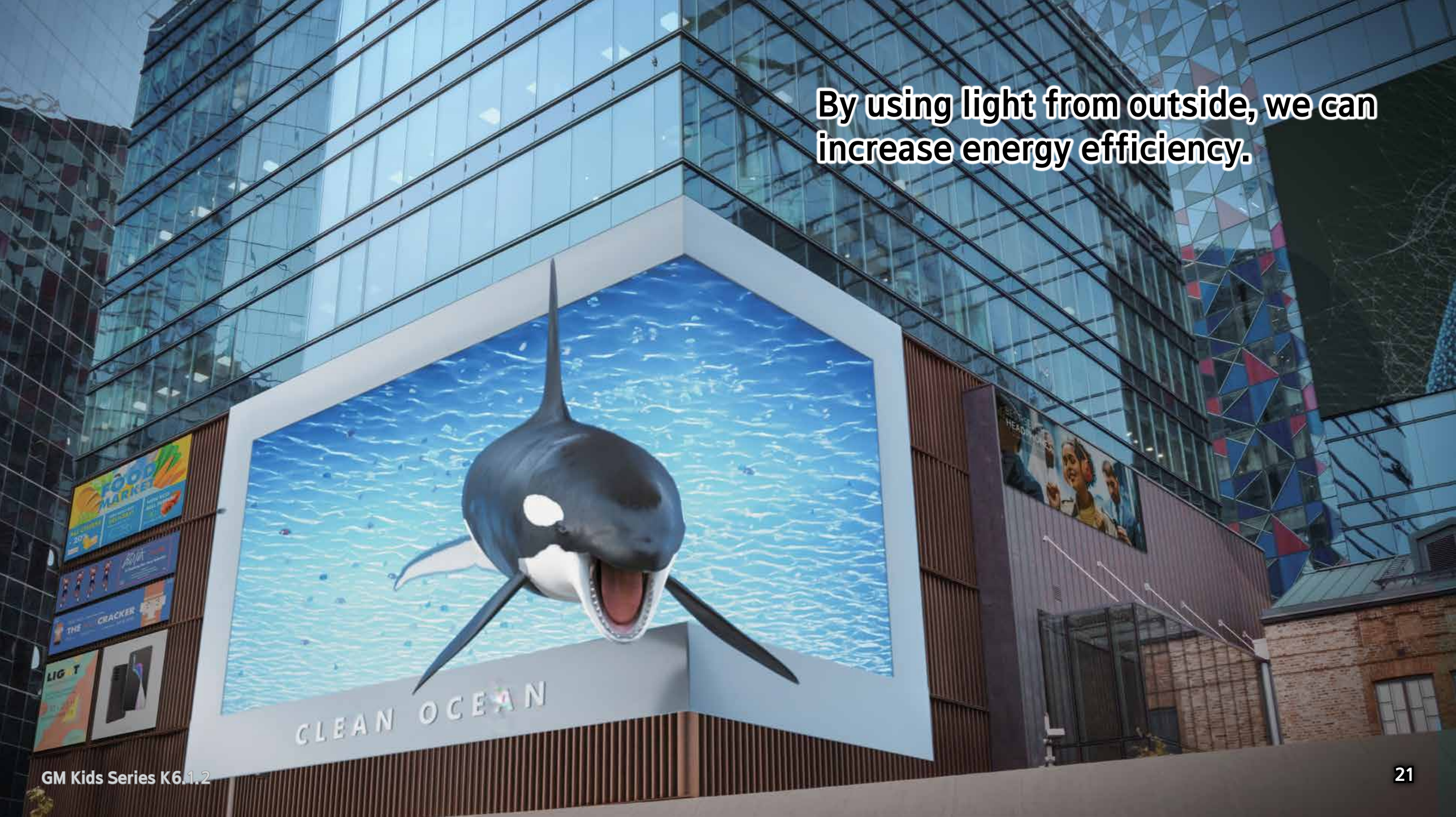


The secret to its color lies in this tile-like structure. This structure reflects only blue light and hardly reflects other colors.

Thanks to this unique structure, the Morpho butterfly came to have very beautiful blue wings.

This involves making reflective displays that use natural light. These displays reflect external light to create vivid colors on the screen.

So, where can structural colors be used? By using the principles of structural color, we can create brighter and clearer TVs.


By using light from outside, we can increase energy efficiency.
CLEAN OCEAN

Displays that use structural colors are very useful because they can make bright light while saving electricity.


That is not all. The principles of structural color are also used in technologies to prevent fake money.
The numbers printed on the back of banknotes can appear red, gold, or green depending on the viewing angle.

This is because color-shifting ink is used to prevent people from making fake money. Color-shifting ink is a security technology that makes the color look different depending on the viewing angle.

This color-shifting ink was inspired by the wings of the Morpho butterfly.

The butterfly's wings have layers of tiny protein structures at a nano level. Light hits these layered structures and reflects off them. The reflected light waves then meet and create various colors.

The ink has special materials that bend light in different ways. When light hits the ink, it reflects off the surface and the materials inside. These reflections mix together and make the colors change when we look at them from different angles.

"Magnetic responsive color-shifting technology" also uses this way to detect fake money.

For banknotes with this technology, bringing a smartphone or magnet close will change the arrangement of tiny particles, causing the color to change. If the color does not change, the banknote is fake.

Holograms can also be used to prevent fake money.
Hologram stickers have 3D images inside them.

When we change the angle we see them from, the image appears to move.

Holograms can be made in two ways, analog and digital, but they both work the same. To make a hologram, we use two laser beams.

One laser beam shines on a mirror, and the other shines on the object. The light from both beams reflects and mixes together to create the hologram.