

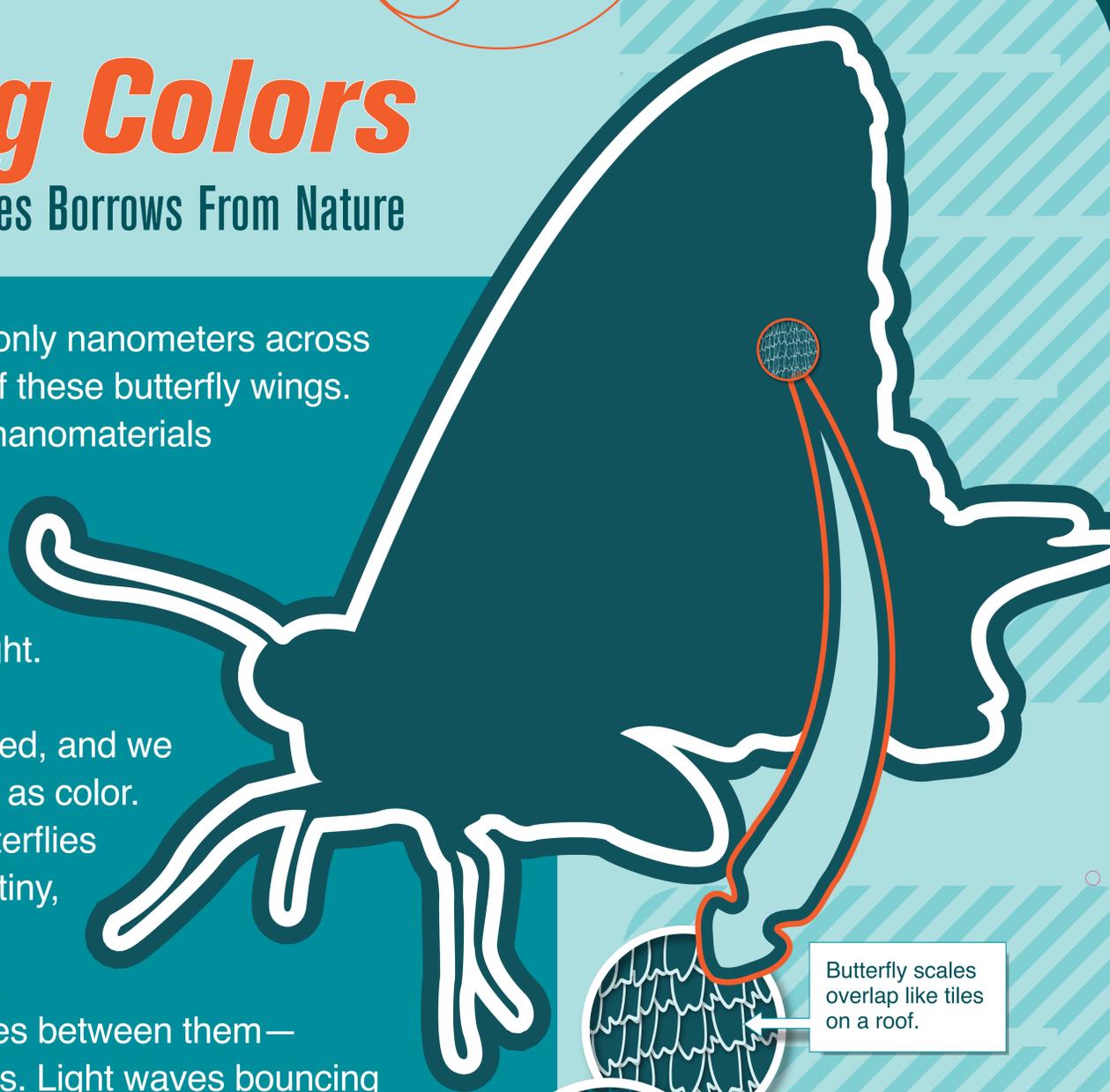
Changing Colors

Nanotechnology Sometimes Borrows From Nature

Light-reflecting structures only nanometers across create the shifting colors of these butterfly wings. Scientists are developing nanomaterials with similar properties.

Most butterflies have chemicals called *pigments* in their cells that absorb light. The wavelengths that aren't absorbed are reflected, and we perceive the reflected light as color. But the wings of these butterflies are covered with layers of tiny, transparent scales—each just nanometers thick, with nanometers-thick air spaces between them—that create iridescent colors. Light waves bouncing off the top and bottom surfaces of neighboring scales interfere with each other. Most light waves are cancelled and only certain wavelengths—or colors—bounce back to your eyes. Multiple layers create purer colors.

Scientists are developing products that, like the butterfly wings, use super-thin layers of transparent materials to manipulate light and produce color. They include flexible films that reflect more light than glass mirrors, low-energy computer and cell phone displays, and fabrics and paints that change color.



Butterfly scales overlap like tiles on a roof.



Zooming in closer, you can see the individual scales.



Layers of nanoscale structures are the reason for the butterfly's brilliant colors.



NISE and all related activities are supported by the National Science Foundation's Informal Science Education program (ESI - 0532536).