

A photograph of a rainbow arching over a misty, mountainous landscape. The mountains are dark and silhouetted against a bright sky where the rainbow's colors are vividly displayed. The foreground is a dark, shadowed area.

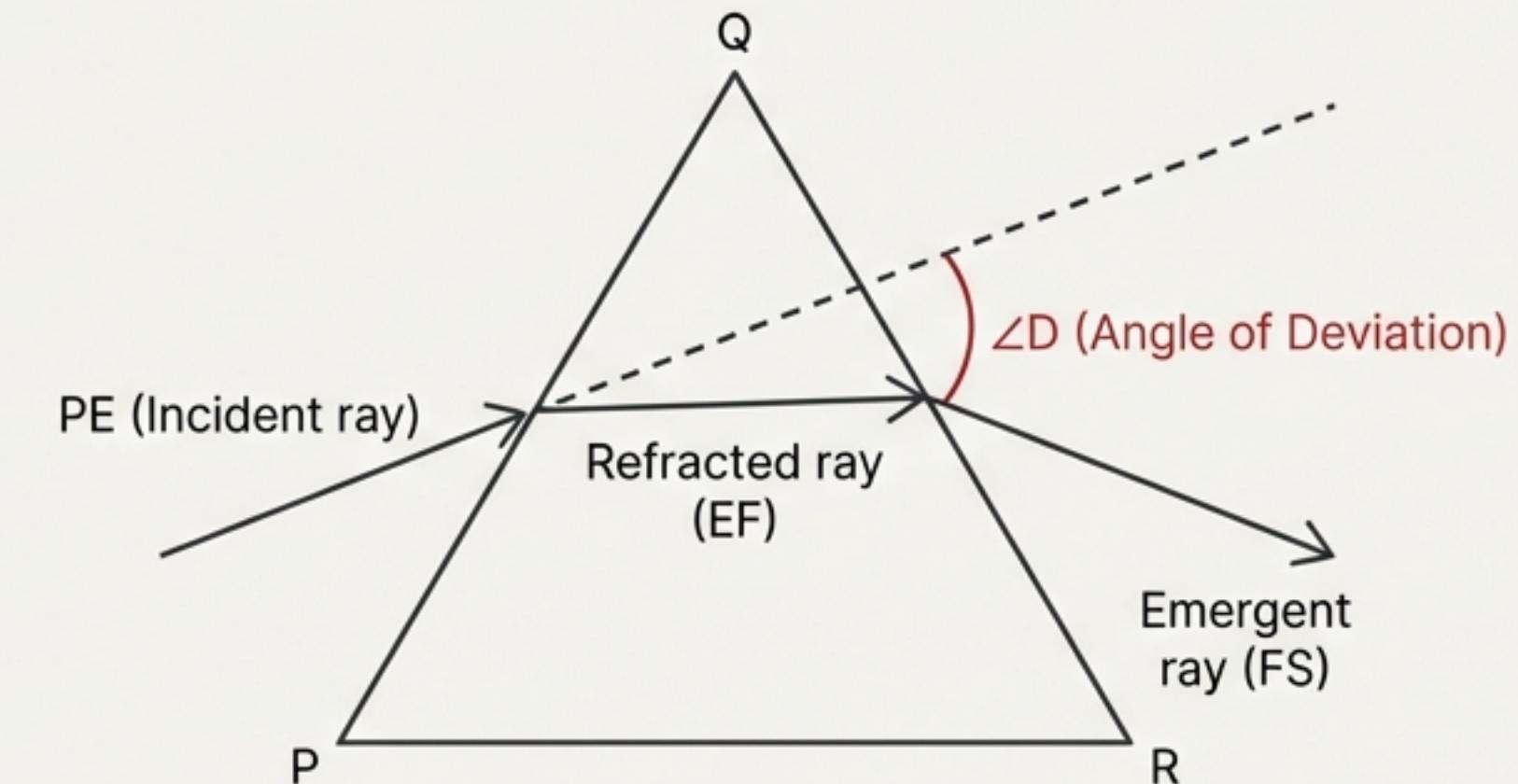
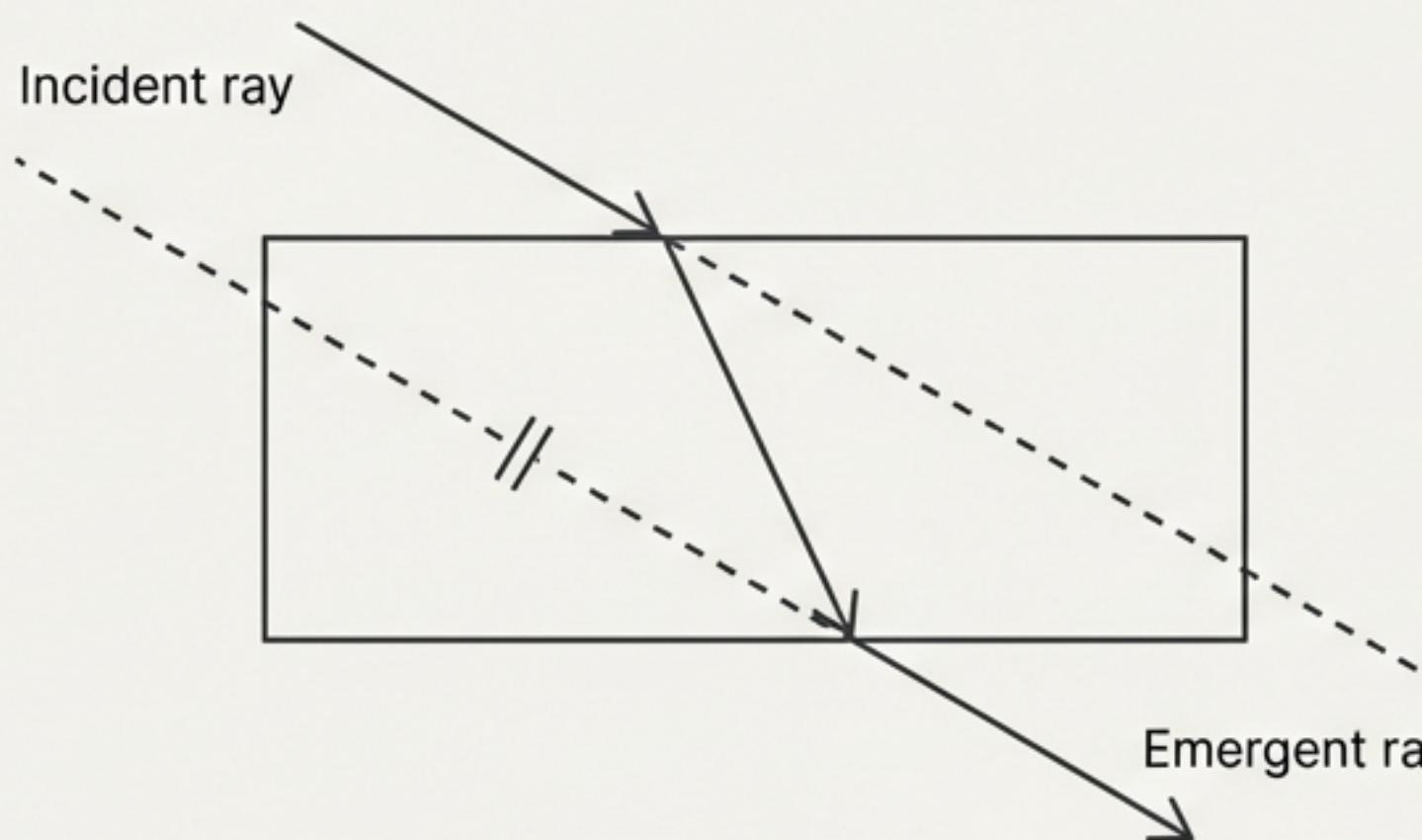
The Science Behind Nature's Spectrum

How does the white light of the sun create the spectacular colors of a rainbow? The answer lies within a simple piece of glass.

A Prism Bends Light in a Unique Way

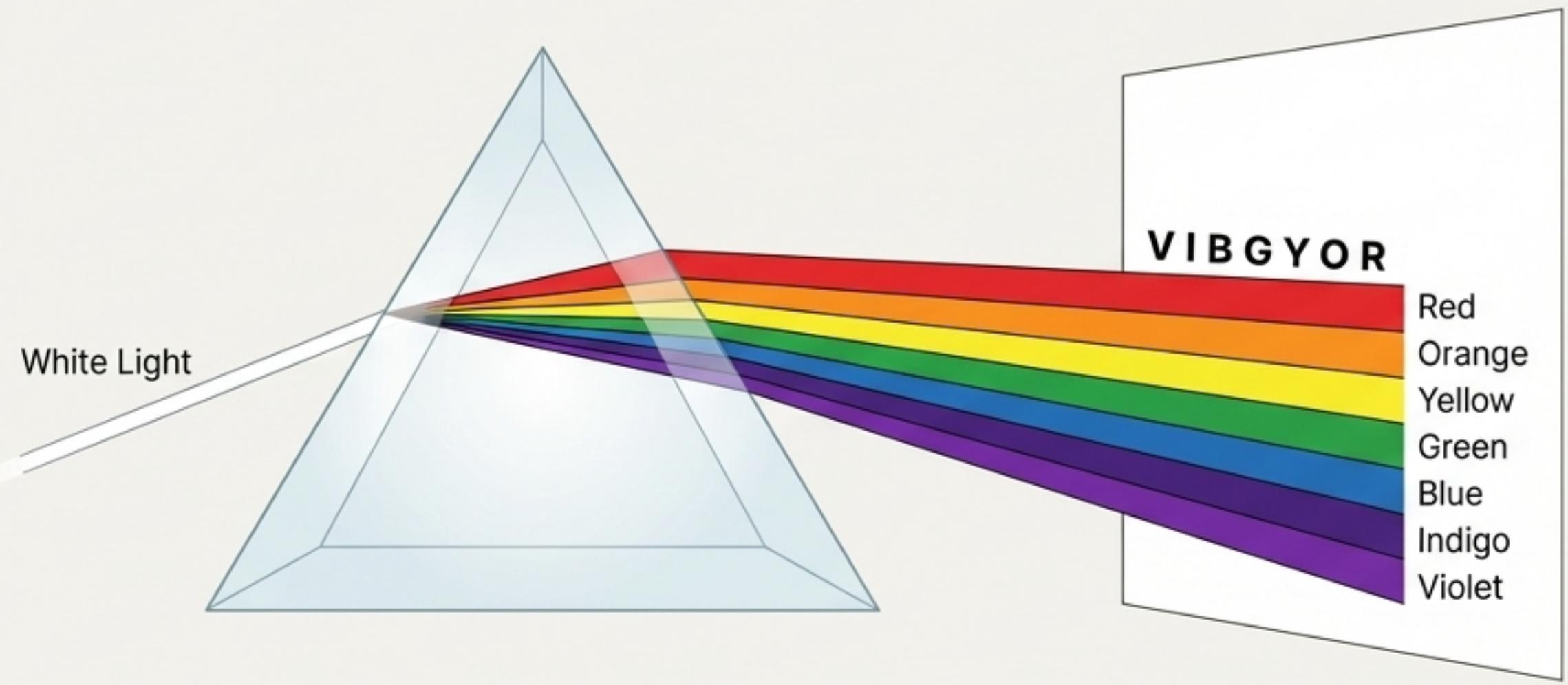
While light passing through a flat glass slab emerges parallel to its original path, a prism's angled surfaces force it to bend. This 'peculiar shape' is the key.

The angle between the incident ray's original path and the final emergent ray is called the **Angle of Deviation ($\angle D$)**.



The Prism Reveals White Light's Hidden Components

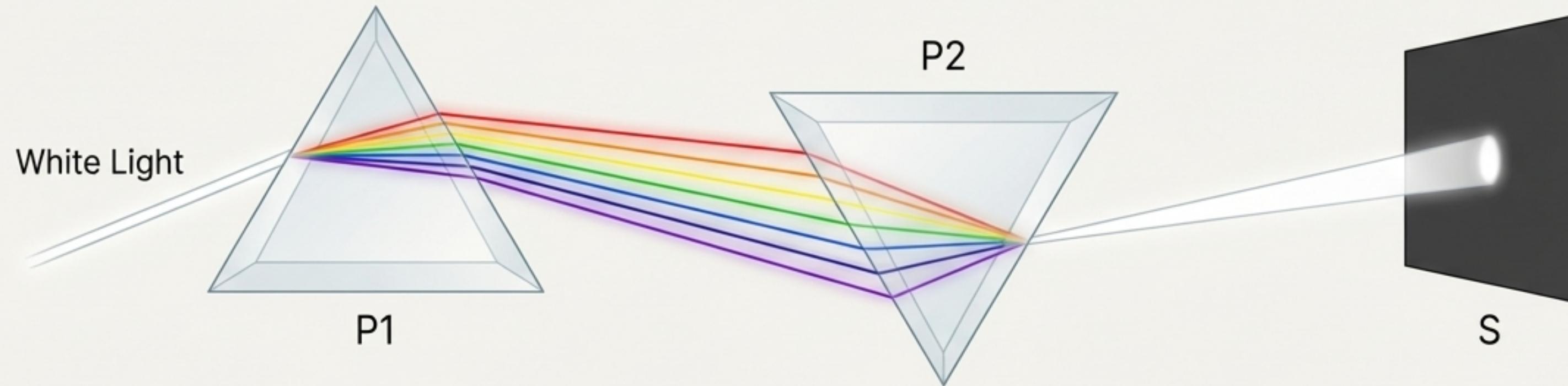
When a beam of white light passes through a prism, it splits into a band of its constituent colors. This phenomenon is called **dispersion**. The resulting band of colors is called the **spectrum**.



Key Insight: The different colors of light bend through different angles. **Red light bends the least**, while **violet light bends the most**. This is why they separate.

Newton's Proof: Light is a Composite

To prove the prism wasn't simply coloring the light, Isaac Newton used a second, inverted prism. When the dispersed spectrum passed through this second prism, the colors recombined into a single beam of white light.



This elegantly proved that sunlight is not a single entity, but is made up of the seven colors of the spectrum. Any light that gives a similar spectrum is referred to as “white light”.

A Raindrop is Nature's Prism



A rainbow is a natural spectrum caused by the dispersion of sunlight by millions of tiny water droplets suspended in the atmosphere after a rain shower. Each individual droplet acts like a small prism.

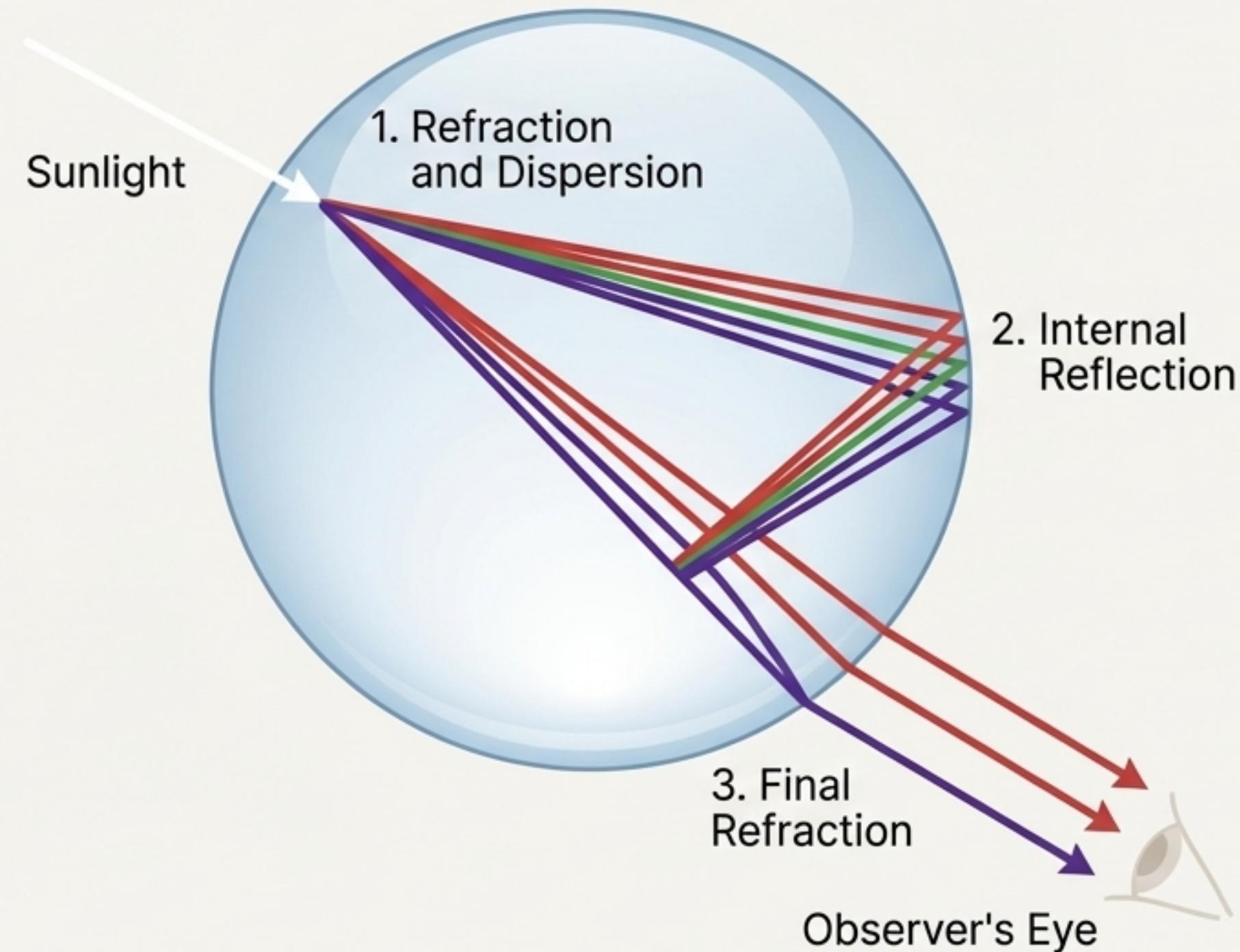
A rainbow is always formed in the direction **opposite** to that of the Sun.



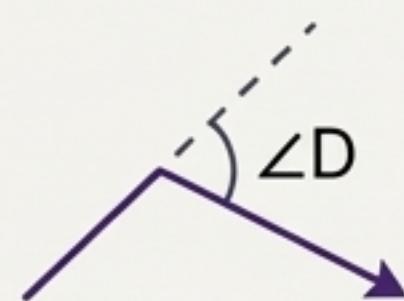
The Journey of Light Inside a Raindrop

The formation of the rainbow involves three key steps within each water droplet:

1. ****Refraction and Dispersion****: Sunlight enters the droplet, bending and splitting into its component colors.
2. ****Internal Reflection****: The dispersed colors then reflect off the inner back surface of the droplet.
3. ****Final Refraction****: The light exits the front of the droplet, refracting again as it travels toward the observer's eye.



The Core Principles of Light's Spectrum



1. Deviation

A prism's angled shape bends light, causing the emergent ray to change direction relative to the incident ray.



2. Dispersion

The splitting of white light into its component colors (the spectrum) because each color bends at a slightly different angle.



3. Recombination

Isaac Newton proved white light is a composite by using a second prism to recombine the spectrum back into white light.



4. Rainbow Formation

A natural spectrum created when water droplets in the atmosphere refract, disperse, and internally reflect sunlight.