Spectral Effects: Chromatic Refraction and Wavelength Interference

All You Pink Floyd Fans Already Understand Spectral Behavior...

Certain processes result in a different light color being seen in a different place.

Rainbows

Primary Rainbow

Secondary Rainbow

Rainbow Strategy

1. Draw one big quadrilateral across the scene
2. Anywhere that \(0.7400 \leq \cos(\Theta) \leq 0.7490\), paint a color
3. Otherwise, discard.

Rainbow Strategy

Or anything else, really. You just need a large "fragment-generator".

Spectral Colors

Primary Rainbow

Secondary Rainbow

Spectral Colors

Primary Rainbow

Secondary Rainbow
Oil Slicks

\[ \lambda_n = \frac{\lambda}{\eta} \]

Reinforces when \( 2d = \lambda_n \cdot (m + \frac{1}{2}) \)

Cancels when \( 2d = \lambda_n \cdot m \)

\[ \eta \approx 1.4 \]

For a CD, \( d = 1600 \text{ nm} \)
For a DVD, \( d = 740 \text{ nm} \)

Diffraction Gratings

On the way in, \( A \) travels \( dcos(\phi_i) \) less than \( B \). On the way out, \( A \) travels \( dcos(\phi_r) \) more than \( B \).

So, wavelengths reinforce when \( abs[dcos(\phi_i) - dcos(\phi_r)] \) is a multiple of the wavelength = \( m\lambda \)

\[ \lambda^* = \frac{d \cdot |cos(\phi_i) - cos(\phi_r)|}{m} \]