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

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

Rainbows

1. Draw one big quadrilateral across the scene
2. Anywhere that \(.7400 \leq \cos(\Theta) \leq .7700\), paint a color
3. Otherwise, discard.

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

Rainbow Strategy
float Pulse( float min, float max, float tol, float t )
{
    float a = min - tol;
    float b = min + tol;
    float c = max - tol;
    float d = max + tol;
    return smoothstep(a,b,t) - smoothstep(c,d,t);
}

vec3 SunDirection = vec3( 0., SunY, 10. );
vec3 PtToSun = normalize( SunDirection );
vec3 PtToEye = normalize( vec3(0.,0.,0.) - ECposition );
costheta = dot( PtToEye, PtToSun );
R = Pulse( .7400, .7490, Tol, costheta );
G = Pulse( .7490, .7605, Tol, costheta );
B = Pulse( .7605, .7700, Tol, costheta );

float t = ( λ – 400. ) / ( 600. – 400. );
vec3 rgb = Rainbow( t );

Oil Slicks

Reinforces when 2d = λn · (m+½)
Cancels when 2d = λn · (m)

λn = λ/η

For a CD, d = 1600 nm
For a DVD, d = 740 nm

Diffraction Gratings

On the way in, A travels dcos(φi) less than B. On the way out, A travels dcos(φr) more than B.

So, wavelengths reinforce when

abs[ dcos(φi) - dcos(φr) ] is a multiple of the wavelength = mλ

λ* = d x | cos(φi) - cos(φr) | / m
Then, \( \cos(\Phi_i) \) is \( \frac{\text{ToLight} \cdot \text{Tangent}}{d} \) and \( \cos(\Phi_r) \) is \( \frac{\text{ToEye} \cdot (-\text{Tangent})}{d} \). So that \( \cos(\Phi_i) - \cos(\Phi_r) \) is:

\[
\frac{\text{Tangent} \cdot (\text{ToLight} + \text{ToEye})}{d}
\]

Diffraction Gratings

Call the unit vector from the point to the light \( \text{Tolight} \).
Call the unit vector from the point to the eye \( \text{ToEye} \).
Call the transformed tangential unit vector \( \text{Tangent} \).

Then, \( \cos(\Phi_i) \) is \( \text{Tolight} \cdot \text{Tangent} \)
And, \( \cos(\Phi_r) \) is \( \text{ToEye} \cdot (-\text{Tangent}) \)
So that \( \cos(\Phi_i) - \cos(\Phi_r) \) is: \( \text{Tangent} \cdot (\text{ToLight} + \text{ToEye}) \)

\[
\lambda^* = d \times |\cos(\Phi_i) - \cos(\Phi_r)| / m
\]