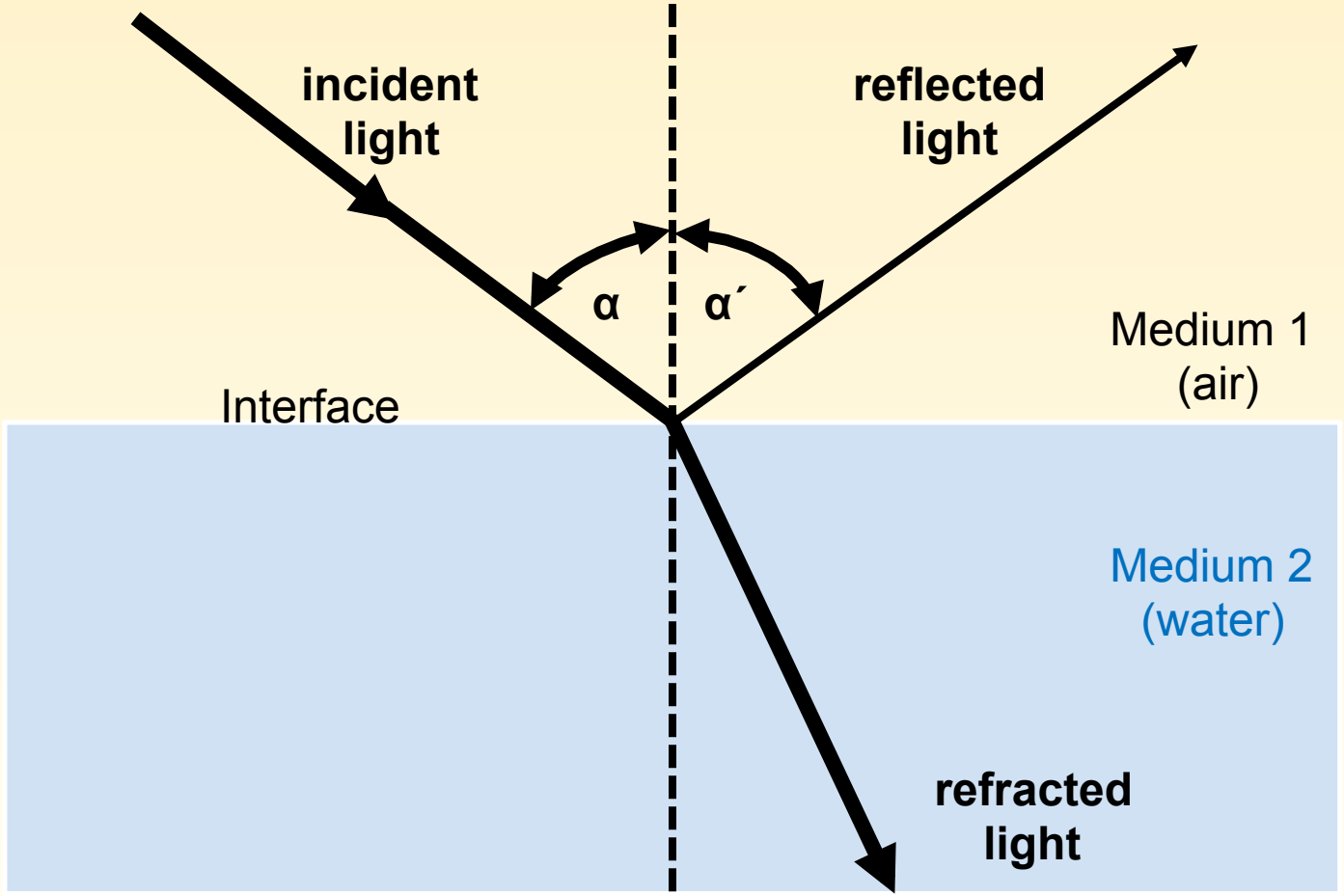
1.1. Properties of light - Refraction



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Speed of light

The speed of light in a vacuum is constant.

Its value is 300 000 km/ sec

But light is slowed down when it passes through a transparent medium.

The amount by which it is slowed down is called the

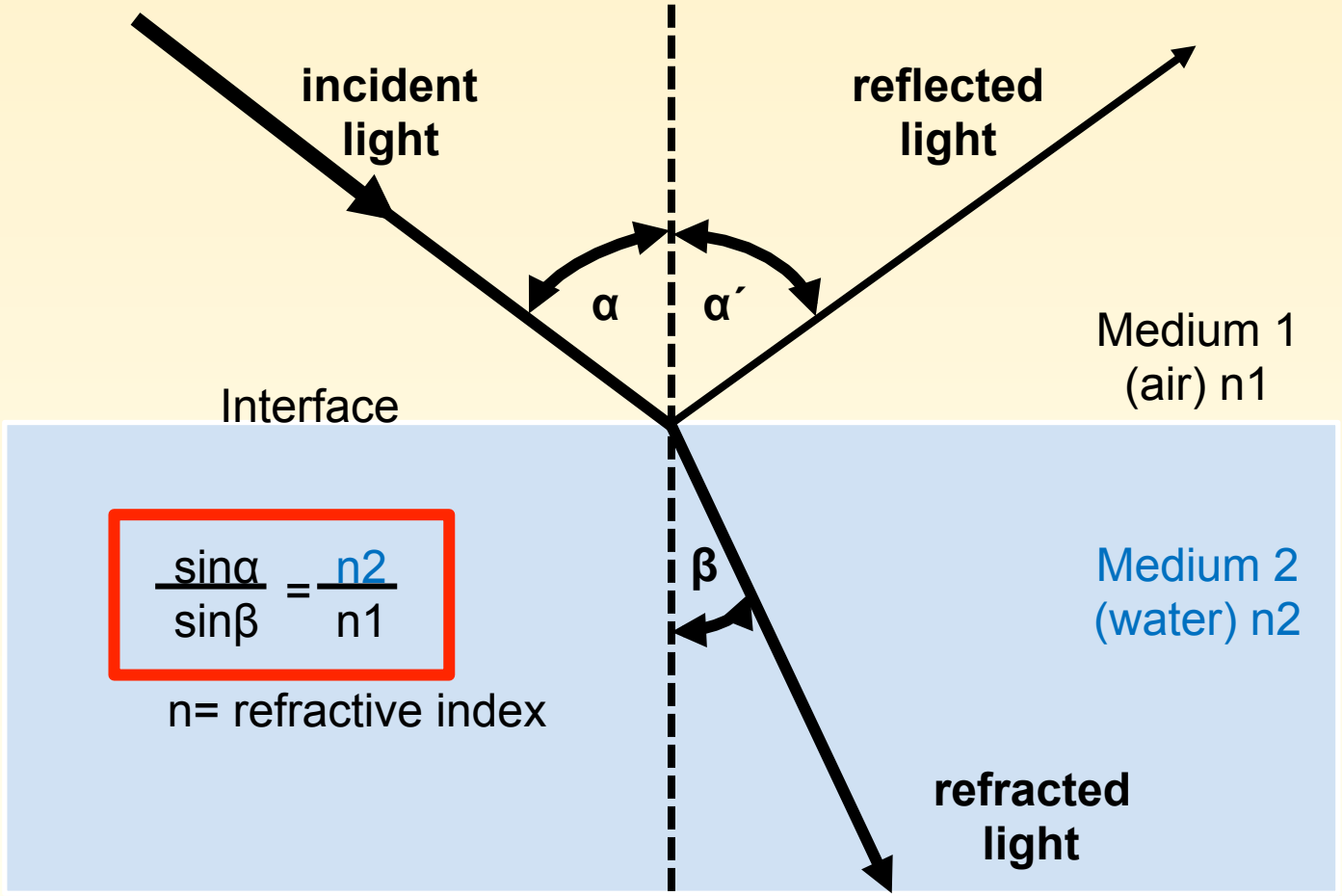
Refractive index n

$$n = \frac{\text{speed of light in vacuum}}{\text{speed of light in medium}} = \frac{c}{c_n}$$

Examples: air: 1.000, water: 1.333, immersion oil: ~1.515, diamond: 2.417

1.1. Properties of light - Refraction

Snell´s law describes the direction of the refracted light.
Towards the normal from an optical thinner into a more dense medium



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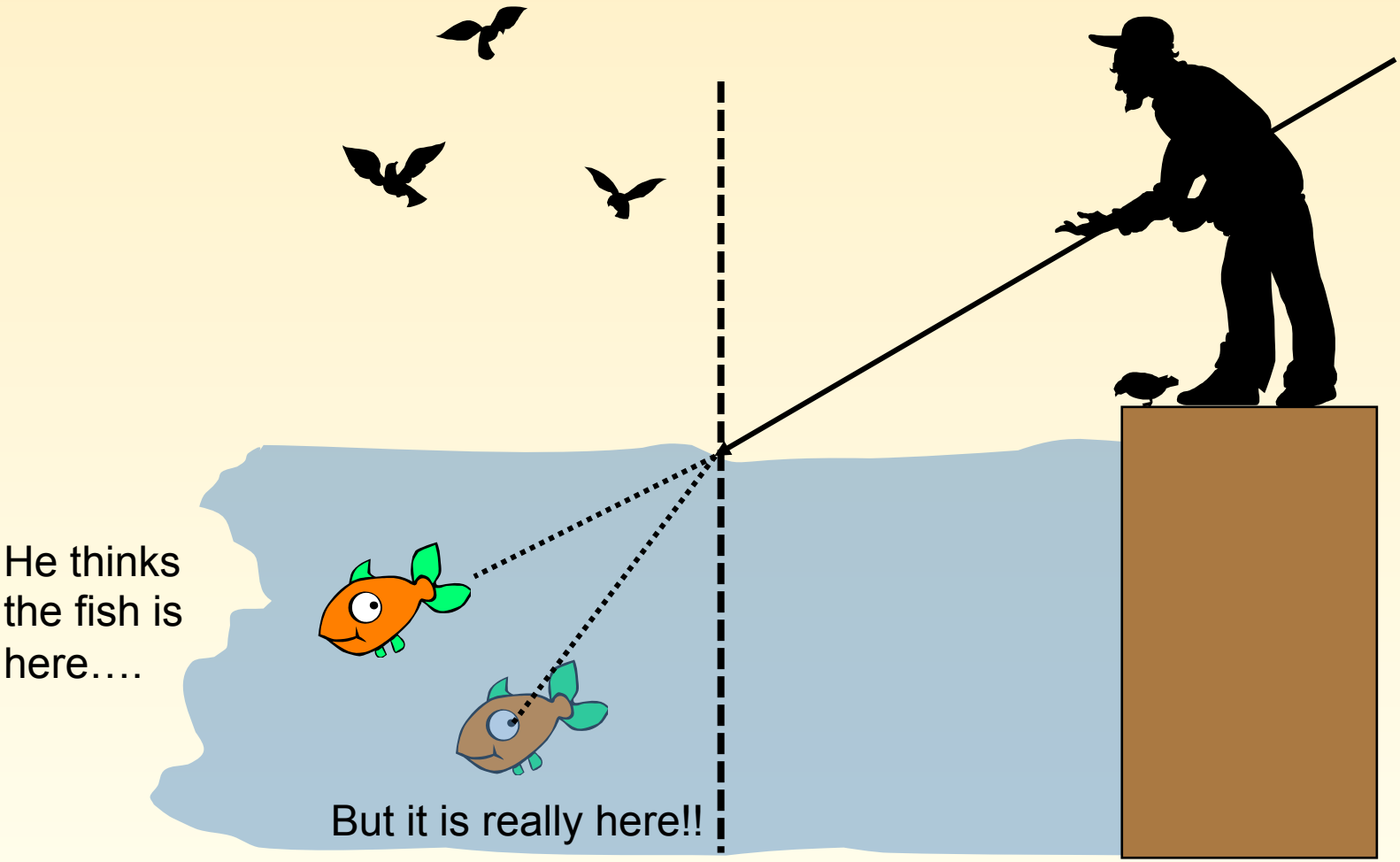
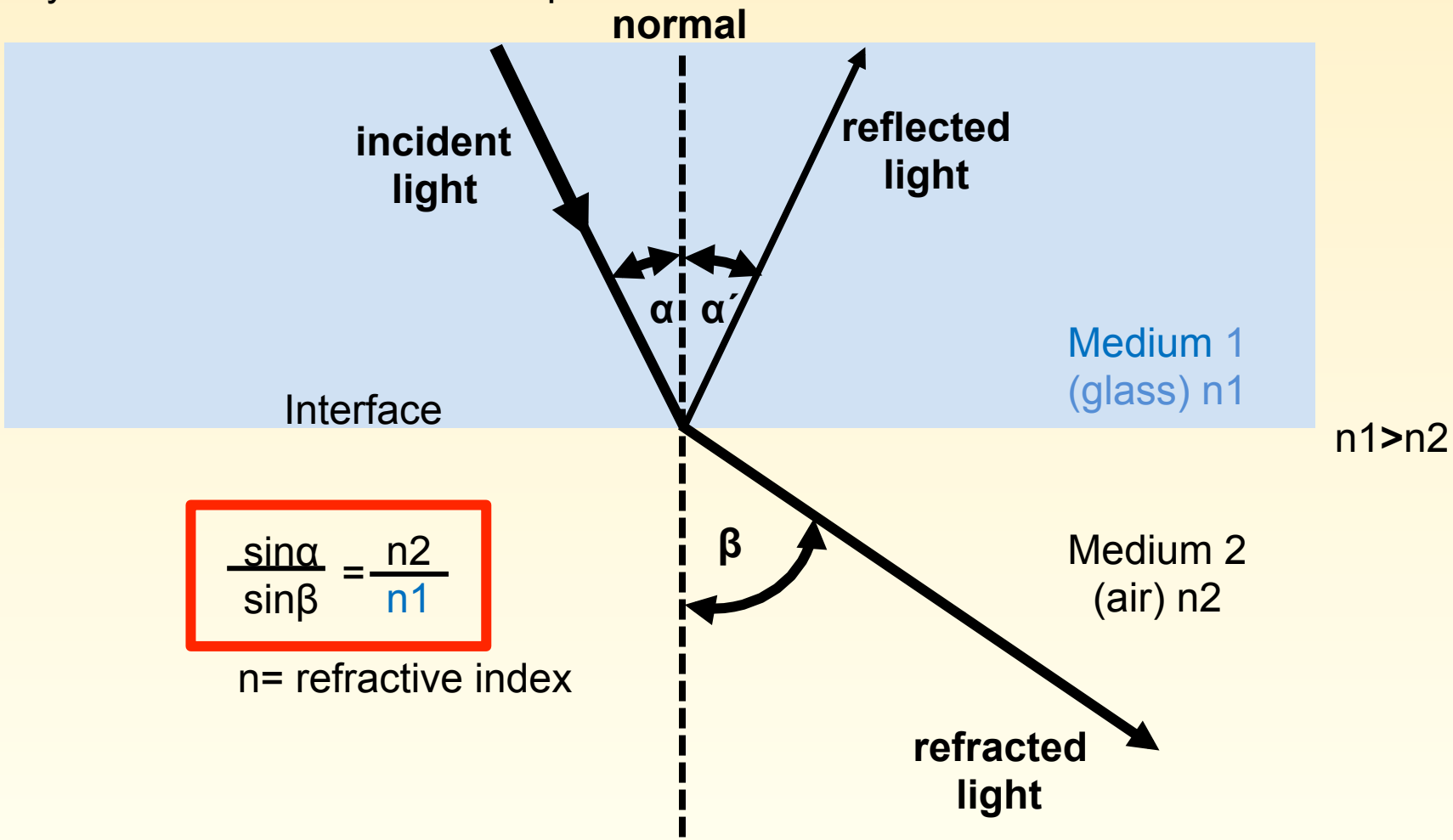


1.1. Properties of light - Refraction

Snell´s law describes the direction of the refracted light.

Away from the normal from an optical thicker into a thinner medium

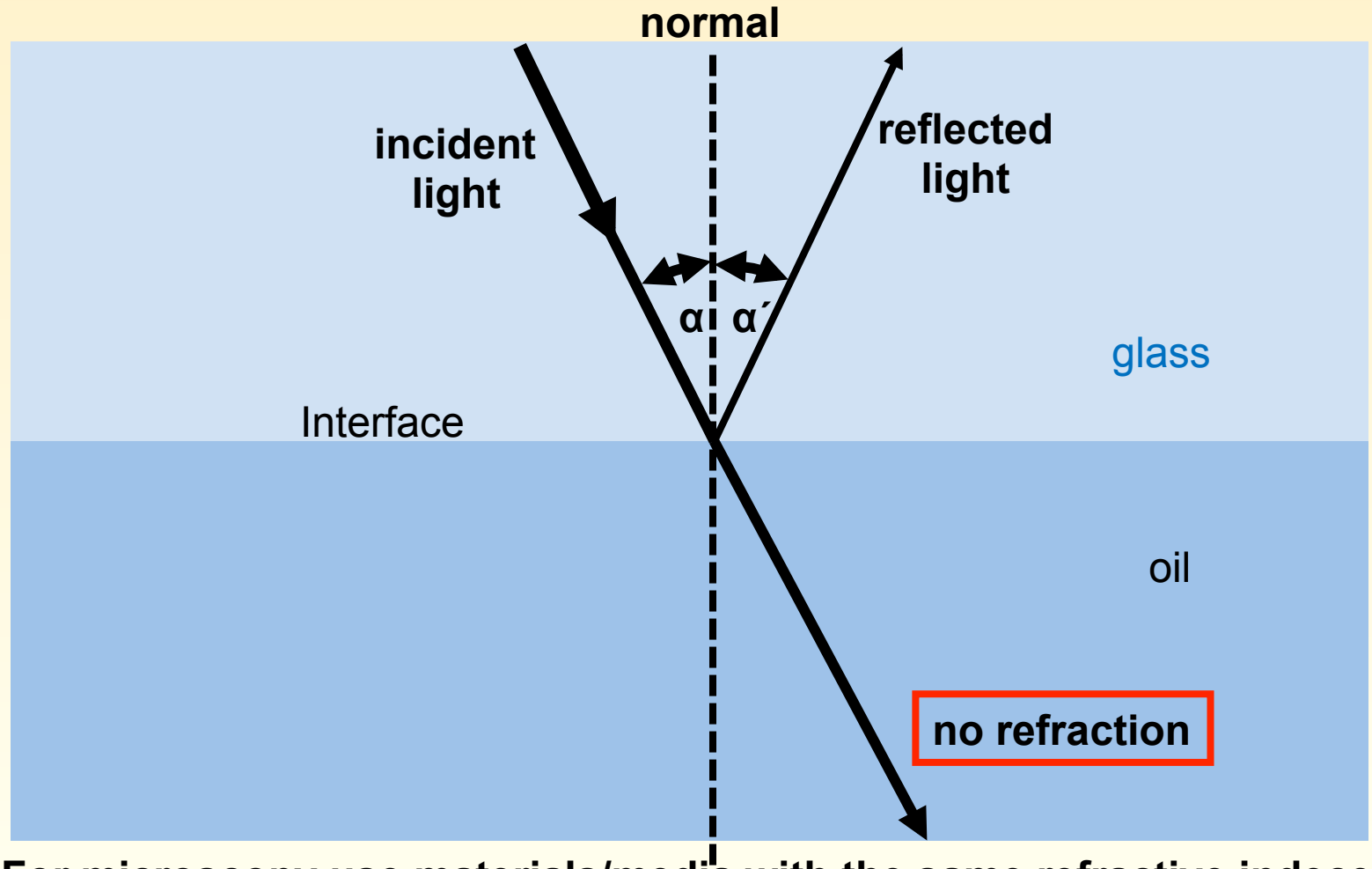


$$\frac{\sin\alpha}{\sin\beta} = \frac{n2}{n1}$$

n= refractive index

1.1. Properties of light - Refraction

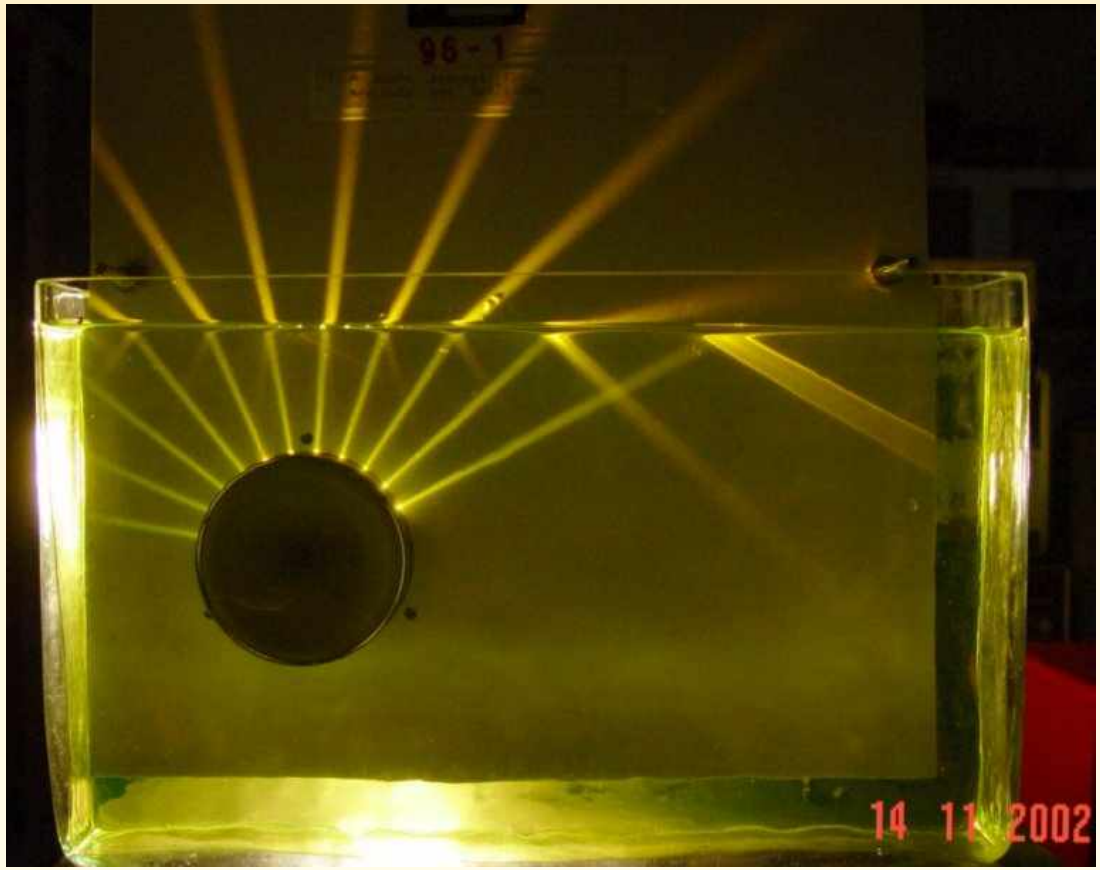
What happens if light passes from glass (n= 1.5) into immersion oil (n=1.5) ?



For microscopy use materials/media with the same refractive indeces!

1.1. Properties of light - Refraction

Total internal reflection



A ray of light strikes a medium boundary at an angle larger than a particular critical angle with respect to the normal to the surface.

If the refractive index is lower on the other side of the boundary and the incident angle is greater than the critical angle, no light can pass through and all of the light is reflected.

The **critical angle** is the angle of incidence above which the total internal reflection occurs.

Calculation