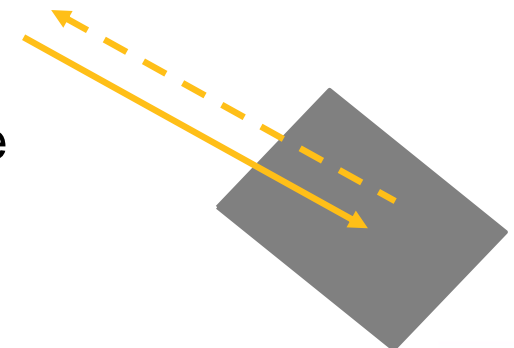
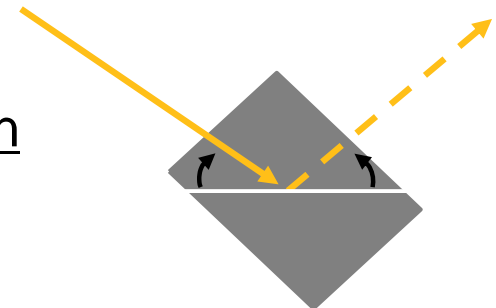
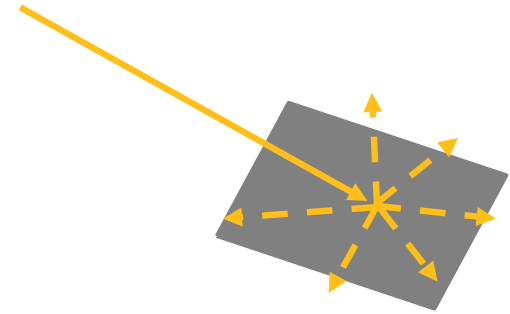


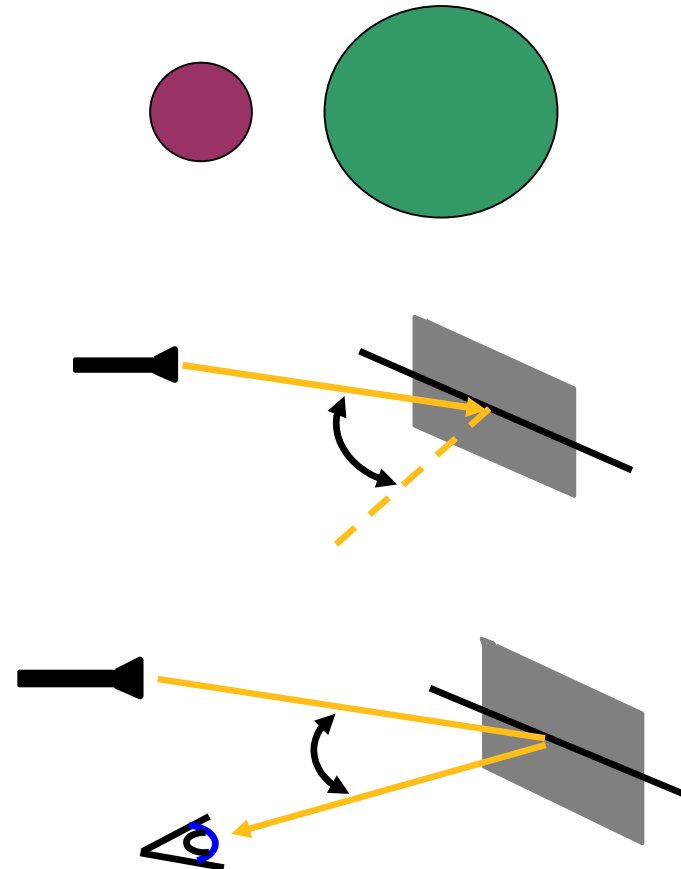
# 3 Types of Reflection

- Diffuse
  - Light is scattered in all directions
- Mirror or Specular
  - Angle of Incidence = Angle of Reflection
- Retroreflection
  - Light is Reflected back towards the source

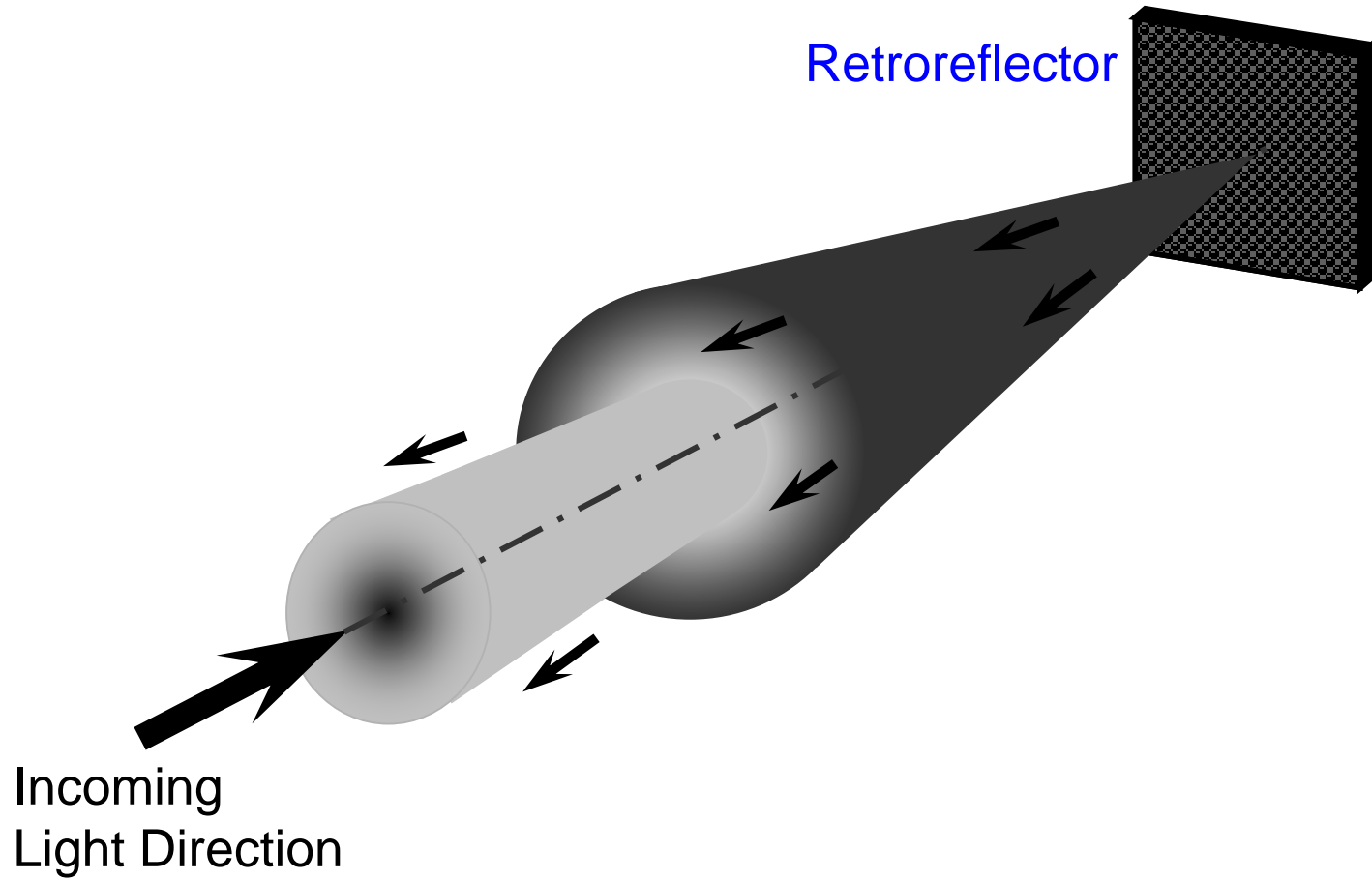


# The Returned Light We See...

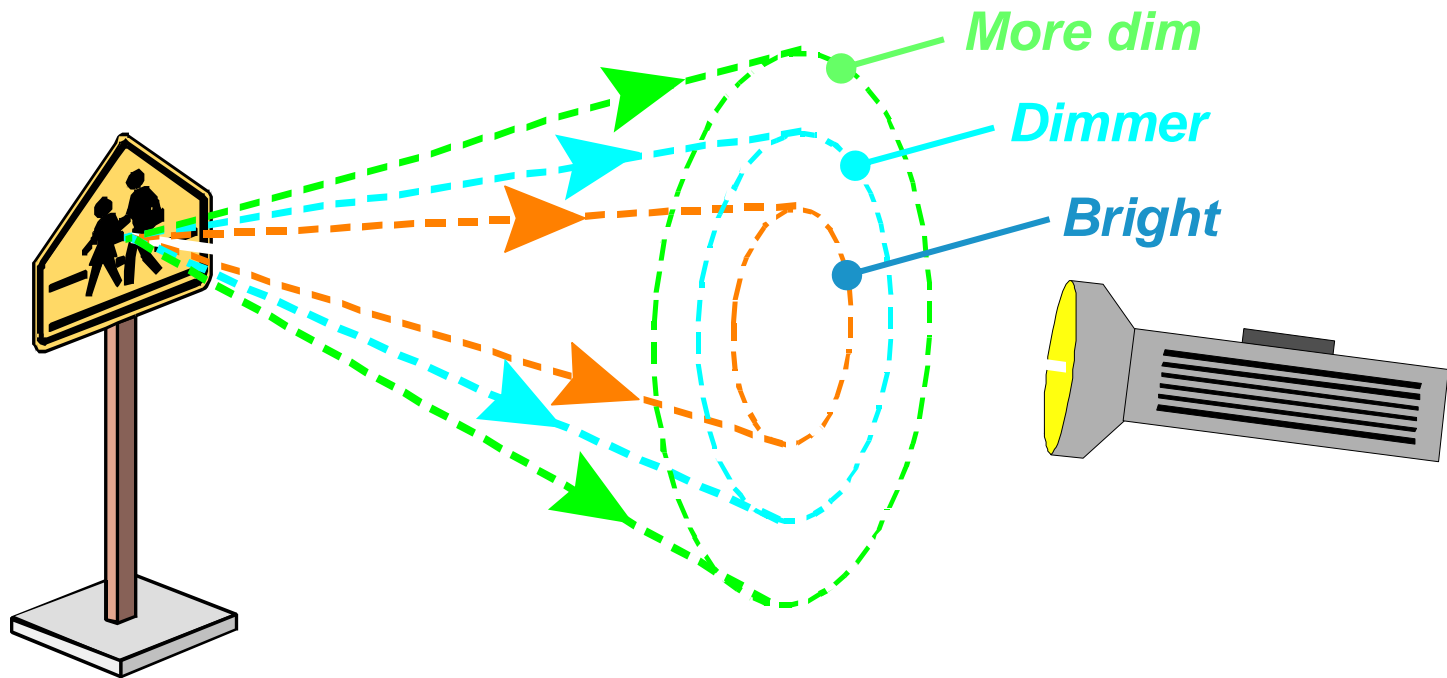
- IS DEPENDANT ON...
- The Size of Retroreflector
- The Entrance Angle
- The Observation Angle



# Retroreflectivity Cone

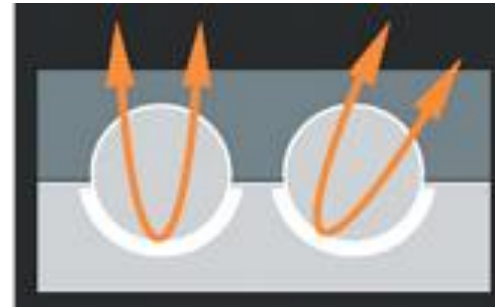


# Another Cone Illustration

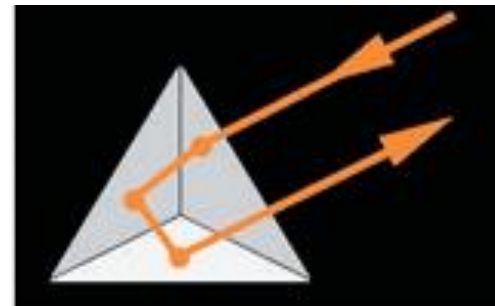
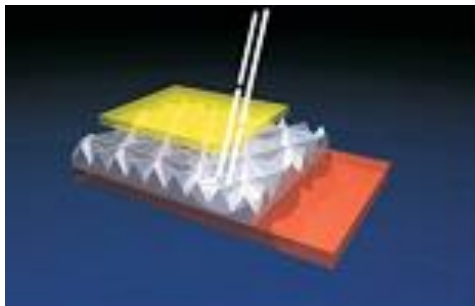


# Basic Types of Retroreflectors

- Glass Beads
  - Exposed Beads



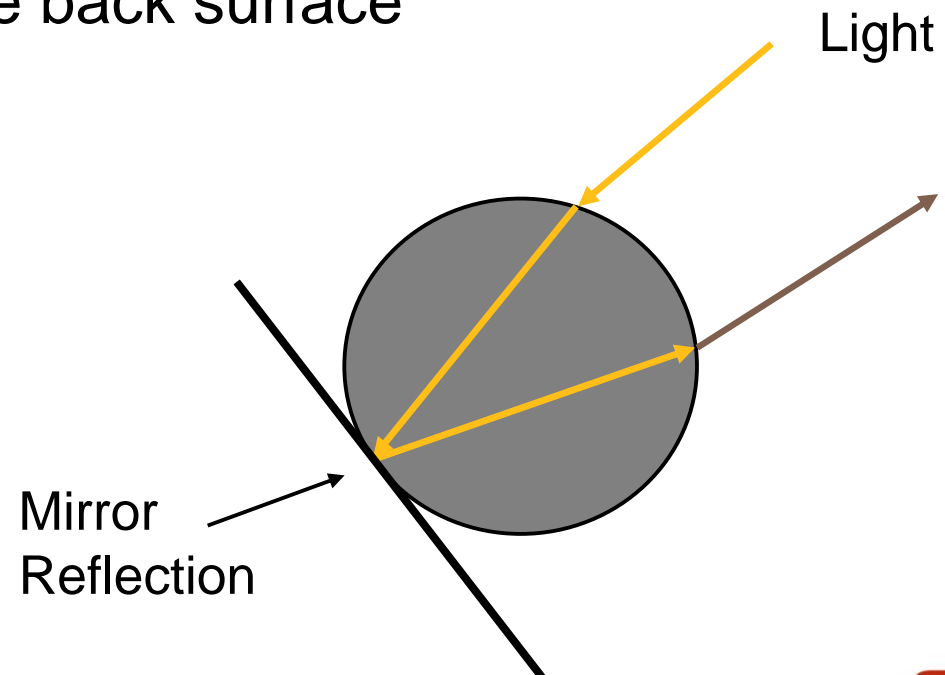
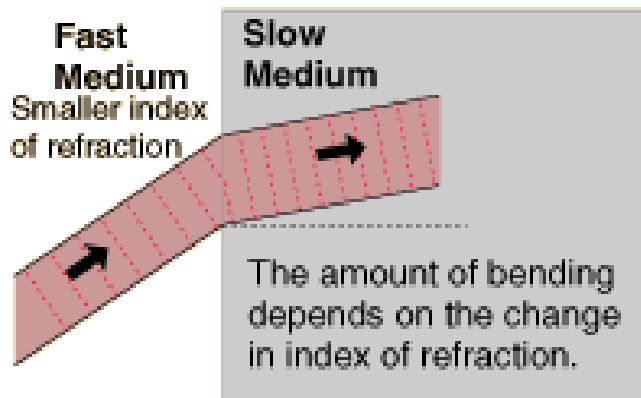
- Cube Corner Prisms (Micro-Prismatic)
  - Air Backed
  - Metalized



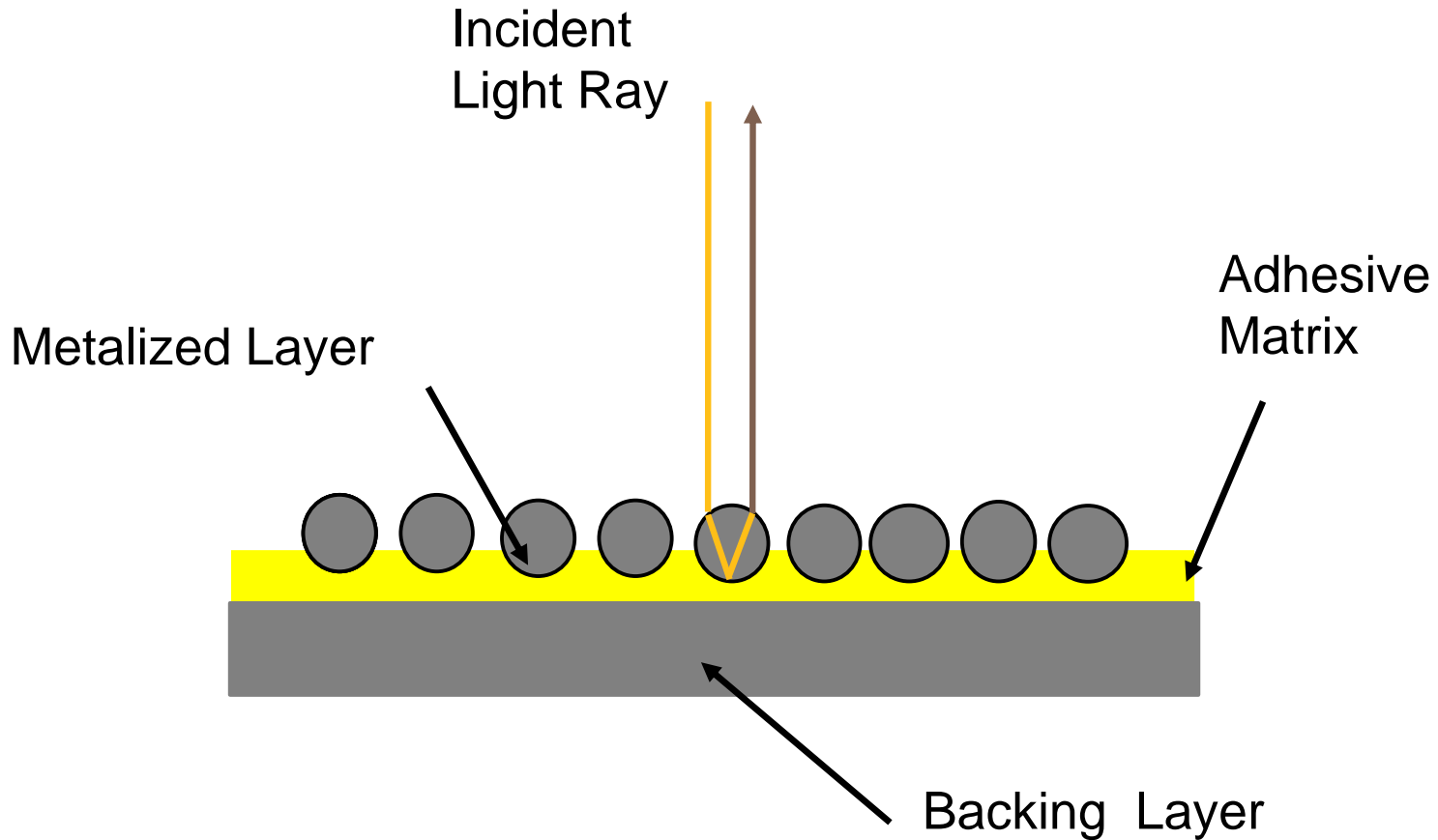
# Glass Bead Retroreflectors

- Glass Beads

- High Index of Refraction material bends light
  - Every substance has a specific bending ratio, or Refractive Index
- Focuses light onto the back surface
- Mirror reflection off the back surface



# Exposed Bead Retroreflectors



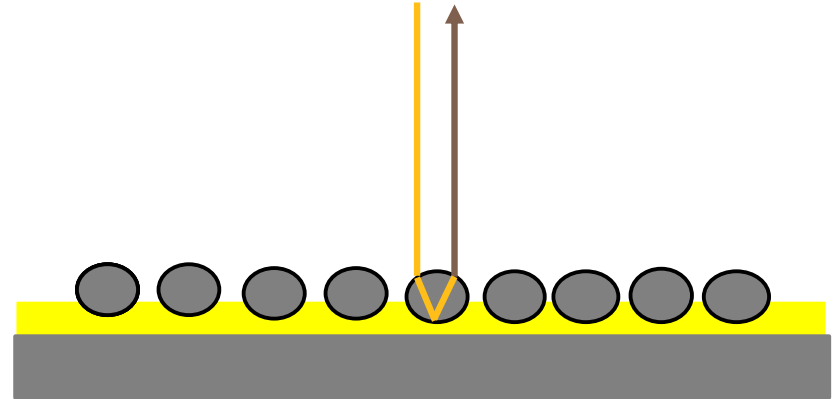
# Exposed Bead Retroreflectors

- Benefits

- Very low cost

- Limitations

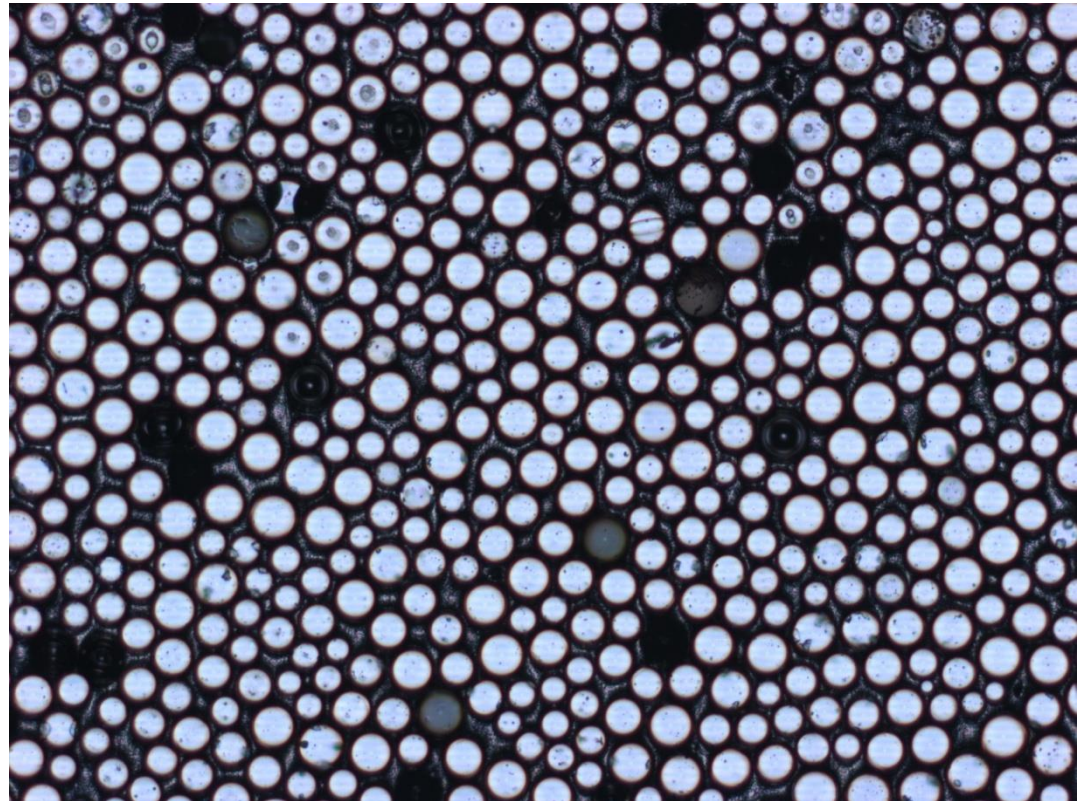
- Beads are exposed to the elements (moisture, dirt)
- Does not reflect color
- Beads rub off via abrasion
- Loses reflectivity during rainfall
- Generic look (hard to visually distinguish performance differences among high quality and knockoff's)





# Close up of Glass Bead

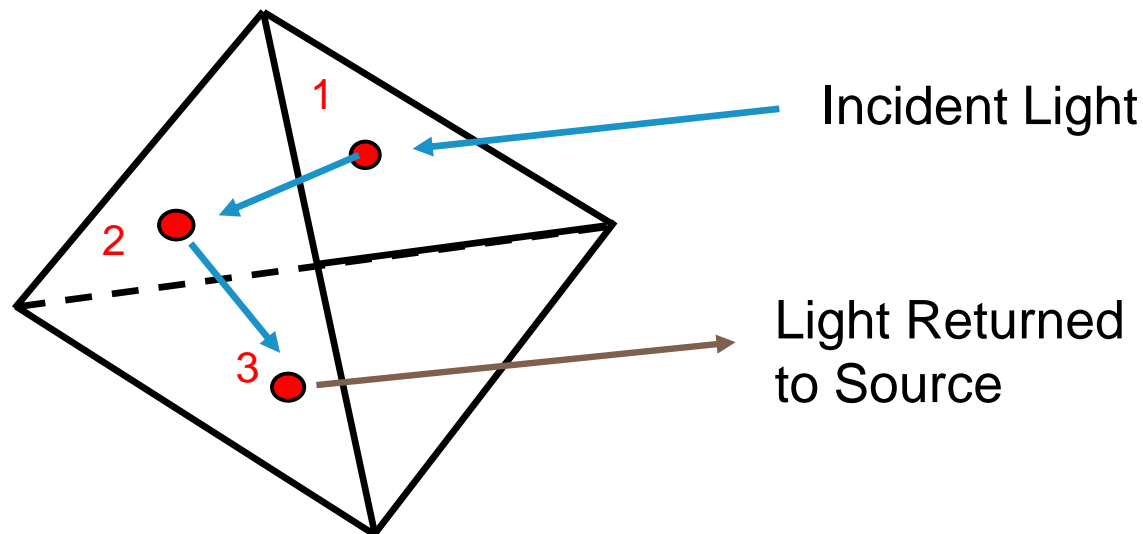
- Glass Bead reflective trim is 20% - 30% efficient in returning light to the source.
- This is due to
  - The shape of the beads, only the center of the bead reflects
  - Spaces between beads
  - Sizes of the beads



# Cube Corner Retroreflectors

- **Cube Corner Prisms**

- Reflects light off each of the 3 prism faces
- Optically efficient due to large effective area
- Total internal reflection (air backed)
- Specular or mirror reflection (metalized)



# Close up of Micro Prisms

- Prismatic reflective is 60% - 70% efficient in returning light to the source.
- This is due to
  - The area of the prism surface
  - The fact that the prisms nest more efficiently

