

## PROJECT

### PRISMS ARE USED IN BINOCULARS.

#### COLLECT INFORMATION WHY PRISMS ARE USED IN BINOCULARS

**Title of the Project** : Why prisms are used in binoculars.

**Purpose of the project** : To know the usage of prisms in binoculars.

**Hypothesis** : Total internal reflection can be applied to many different devices that perform in various ways. It is used to prismatic binoculars to magnify the light rays and created a non inverted, clarified visual of something off in the distance.

**Tools** : observation and collecting data

**Materials** : internet, some physics books and science magazines.

#### **Procedure:**

We collect information about binoculars in internet. We collect data from various books and magazines about the history of binoculars. We collect pictures and data about the prismatic binoculars.

**Introduction:** Binoculars are a kind of tool that lets people see far-away things more clearly, using a technology called optics. They are made of a pair of matched telescopes that are held in front of the user's eyes.

The two telescopes have lenses that focus light and magnify the image, a process called magnification. This way, when someone looks through the binoculars at a far-away object, it looks much closer.

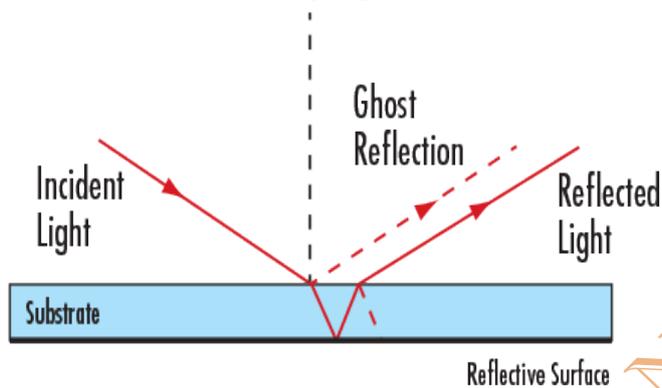


#### **Working process of binoculars:**

- 1) When binoculars are pointed to the distant object, the light rays from the object fall on the objective lens.
- 2) The objective lens picks up the light rays; makes a focused image.
- 3) This image is picked up by the smaller lens and is then magnified.
- 4) The magnified image is then sent to the prism.
- 5) It flips the image and sends it to the eyepiece to make a 3D image, so we view the image.

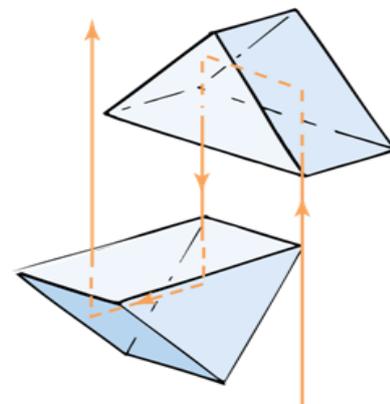
### Prisms instead of mirrors:

- ❖ Mirrors always absorb a portion of the light, hence the intensity of the incident light gets reduced, whereas prisms indulge themselves in complete internal reflection, where the intensity of the incident light is conserved. For this advantage, optical devices, like telescopes generally use prisms instead of mirrors.
- ❖ prisms are used in binoculars instead of mirrors for better reflection. general right angled prisms or bi prisms are used in binoculars. by using prisms in binoculars we can increase the reflection efficiency upto 95%.
- ❖ Prisms make use of "total internal reflection" (TIR), an advantage over the losses you'd expect from mirrors. Mirrors only reflect about 95% of that reflected by prisms using appropriate TIR angles. Prisms also avoid the refraction distortion that can result when using a glass fronted, reflective coated mirror.

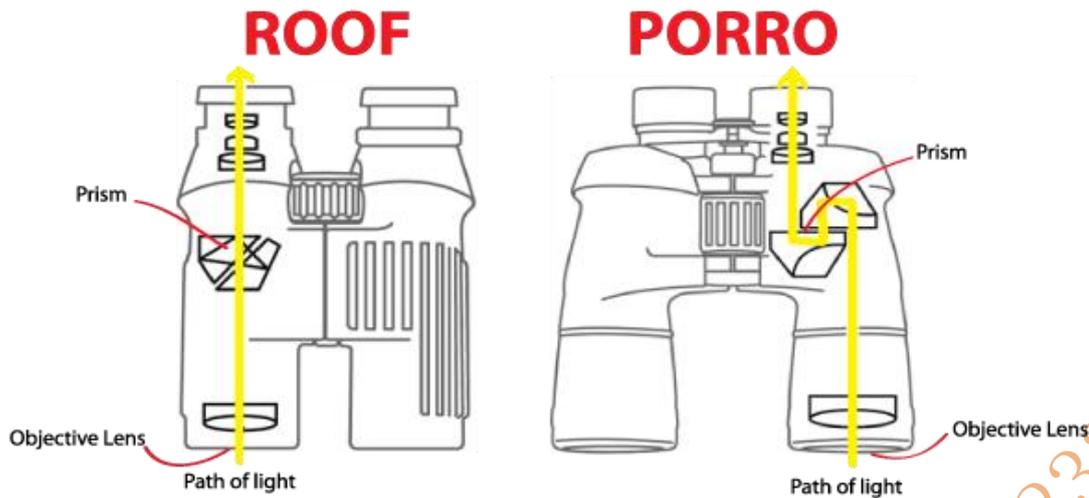


Reflection from a Second Surface Mirror showing the ghost reflection and refraction in the mirror substrate.

Since mirrors typically reflect only 90 to 95% of incident light, prisms are often used instead of mirrors in many optical instruments.



**Prismatic binoculars:** There are two basic types of binoculars: porro prisms and roof prisms. You can identify the prism construction of your binoculars at a glance. Porro prism binoculars have a right-angled bend between the objective lens and the eyepiece, which makes them form an M shape when standing on their objective lenses. Roof prism binoculars are typically straight with the objective lens in line with the eyepiece, so they take on an H shape when stood upright.



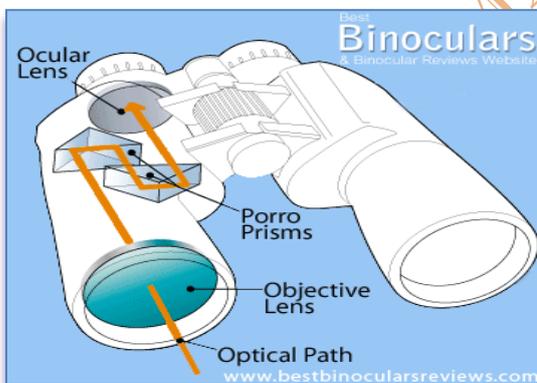
### Porro prism binoculars:

Porro prism binoculars (also known as “porros”) first appeared in the mid-1800s, the design of an Italian optician named Ignazio Porro, and feature two right-angled prisms in each binocular barrel. Today, porro prism binoculars are considered “traditional” binoculars, since they were the most common design until roof prism designs gained popularity in recent years.



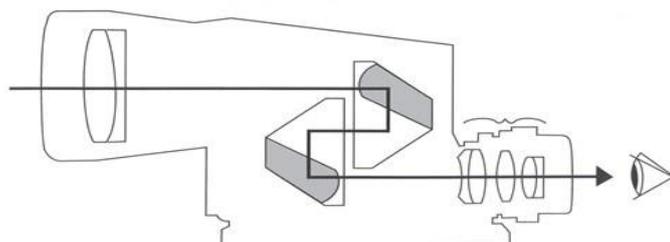
Ignazio Porro

Porros rely on an external focus mechanism, which causes the eyepieces to slide forward or backward along an external tube. This type of focusing allows for sharp images of close subjects, as well as precise focusing on close-proximity objects as near as 6 to 10 feet.



The advantages of porro prism binoculars are:

- Brighter images due to greater transmission of light
- Fast focusing
- Close focusings
- Wider field of view



The disadvantages of porro prism binoculars are:

- Weight (due to the large prisms)
- Bulky design because of the angled prisms, making them harder to hold if you have smaller hands
- Less durability, as the external focusing mechanism is more easily jarred out of alignment.

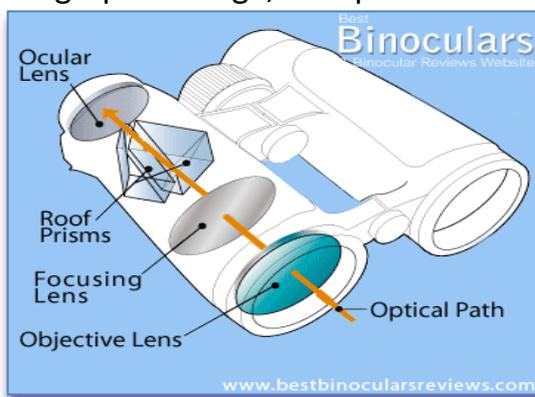
Porro prism binoculars make perfect general use optics for birdwatching, viewing wildlife, watching sporting events, and so forth.

### Roof prism binoculars

Roof prism binoculars were also developed in the mid-1800s, but by a German manufacturer who oriented the light-directing prisms inside straight barrels. Because of this design, roof prism binoculars produce more reflections than porros, so special coatings are applied to enhance the final image's brightness. These coatings also increase the binocular's cost.

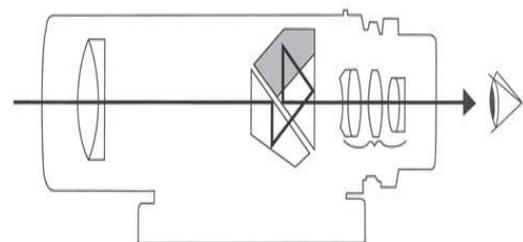
Most of the focusing hardware is located internally, with an external focusing knob or wheel. Recent design advances have enabled roof prism binoculars to focus as close as, if not closer than, their porro counterparts.

Roof prism binoculars have grown in popularity in the past few decades, primarily because many leading optics manufacturers are producing high-quality roof prism optics. At the mid- to high-price range, roof prism binoculars dominate the optics market.



The advantages of roof prism binoculars are:

- Ease of handling
- Close focusing in advanced models
- Increased durability due to fewer external moving parts
- Better power-to-weight ratio (a pair of 10x roof prism binoculars weighs less than a pair of 10x porros)



**Interpretation of the student:**

We collected data of prismatic binoculars in internet. We collect the data about total internal reflection in our text book. We understand that why the prisms used instead of mirrors in binoculars.

**Conclusion :**

Total internal reflection can be applied to many different devices that perform in various ways. It is used to prismatic binoculars to magnify the light rays and created a non inverted, clarified visual of something off in the distance. And is used for sight seeing.

**References:** Internet, physics books and magazines.

K. VENKATARAMANA,  : 8008423323

**PROJECT REPORT**

**sTitle of the project** : Why prisms are used in binoculars.

**Class** : 10th

**Subject** : Physics

**School** : Z.P.H.School, Lolugu, Ponduru mandal, srikakulam district.

**Time frame** : 5 days

**Toole/references** : internet, science magazines and physics books.

**Detailes of procedure :**

We collect information about binoculars in internet. We collect data from various books and magazines about the history of binoculars. We collect pictures and data about the prismatic binoculars.

**Observations :**

- In binoculars the two telescopes have lenses that focus light and magnify the image, a process called magnification.
- Mirrors always absorb a portion of the light, hence the intensity of the incident light gets reduced, whereas prisms indulge themselves in complete internal reflection, where the intensity of the incident light is conserved. For this advantage, optical devices, like telescopes generally use prisms instead of mirrors.

**Project outcome:**

Total internal reflection can be applied to many different devices that perform in various ways. It is used to prismatic binoculars to maginify the light rays and created a non inverted, clarified visual of something off in the distance. And is used for sight seeing.

**Names of the group members and work allotment:**

Sl.no.	Name of the group member	Work allotment
1		
2		
3		
4		
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Date of submission :

signatures