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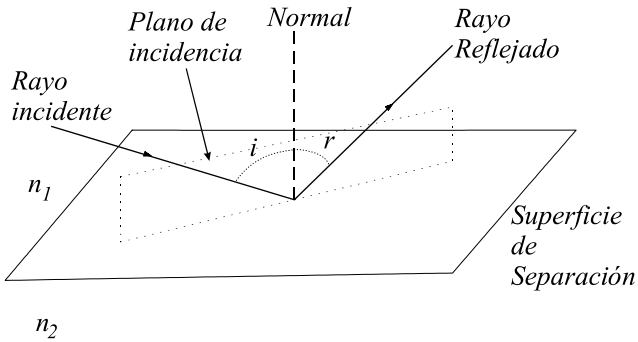
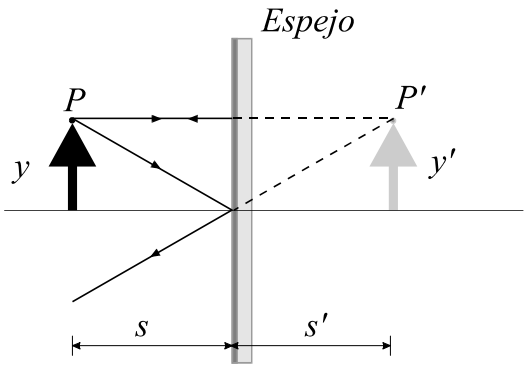
REFLECTION STUDY

Firstly, we can start with the definition: WHAT IS THE REFLECTION? … Which things do you connect (or associate) with this word, with this concept? It is the bounce (rebound??) of the light, or another wave over any surface?. The light coming from an object arrives, bounces and returns.

Look!, we can see THIS with a mirror, a sheet of paper and a beam light! (beam light: light shines out from objects in all directions; s narrow beam of light (specially one of a group going out from the same centre) shining out in one defined direction is called RAY. Notice that the inclination of the emergent beam, the reflected beam, is the same as the incident one. This is the REFLECTION LAW.

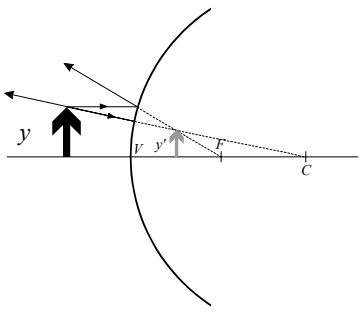


Thus, beams, which go out from every part of our body, are reflected in the mirror before arriving at our eye. And, What a wonderful thing!. Our eye thinks that those beams come from a point: THE IMAGE.

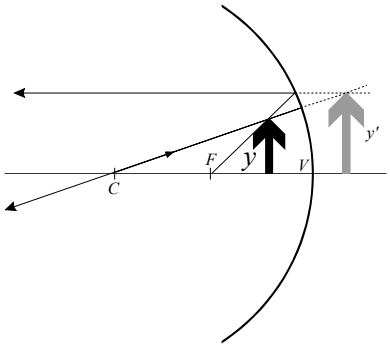


Our image, which seems identical to us, but inside the mirror. Inside? , but, wait a minute, behind the mirror there is nothing: it is what we will call a VIRTUAL IMAGE. And what will happen if the mirror is not flat?, whatever it happens, what is always fulfilled is the reflection law.…

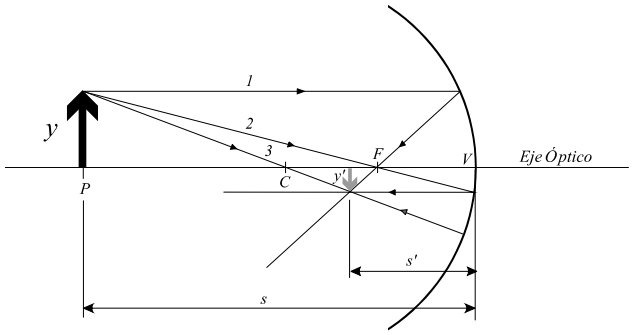
(If we have a flexible flat mirror, we can double it to give a convex figure. We will observe that the image is smaller than the original object, but deformed, because only in one direction the dimension has been reduced. And what about a spherical mirror?) In order to observe the image, we can also use a great Christmas bubble, (also we could use a saucepan in the convex part)… This image is also VIRTUAL. Now, we can observe the concave mirror, for example, with the bath mirror that magnifies, or the



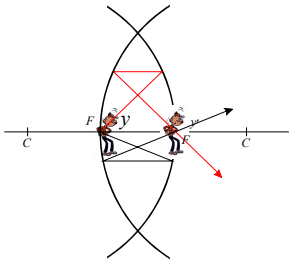
inner part of the saucepan, or the ice cream glass… Why can I see myself face up in the mirror and I can't do it in the saucepan?. IT IS A PROBLEM OF DISTANCES We can see ourselves either quite big and virtual (batch mirror)



Or face down and generally smaller and REAL.



However, we are not used to real images and it takes a lot to see them. Let us help a little...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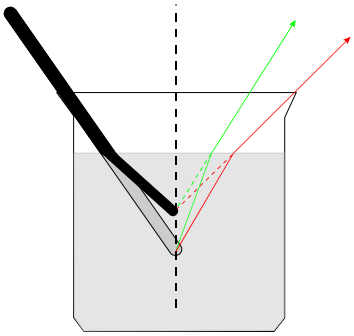
Let us consider another fundamental phenomenon of the Optics: the REFRACTION. How can we observe the refraction? In several ways:

- Pencil or wooden stick with a glass.

- Projector and small bucket or bowl

- Flask. With regard to the pencil in a glass, it looks like if it was broken! ,

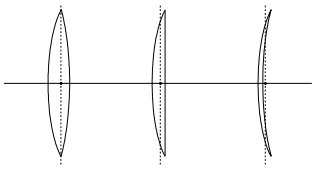
The same can be observed with the projector and the plastic container. So Why does this happen? When diffusing light finds a division between two material environments, such as water and air, it changes its diffusion direction due to the different speed it does depending on the environment it is.



And this also happens with the prism, but now we see the objects that there are behind clearly, an IMAGE of them.
We are accompanied in our daily life by this phenomenon: glasses, cameras, telescopes, and other phenomena for instance the rainbow, the colors of the sky,...
Let us take, now, a flask full of water. Inside this there is a material environment where refraction takes place, and through

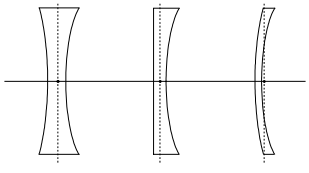
Tipos de Lentes

Convergentes



Biconvexa *Plano-convexa* *Convexo-cóncava*

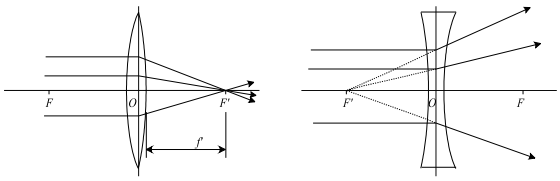
Divergentes



Bicóncava *Plano-cóncava* *Convexo-cóncava*

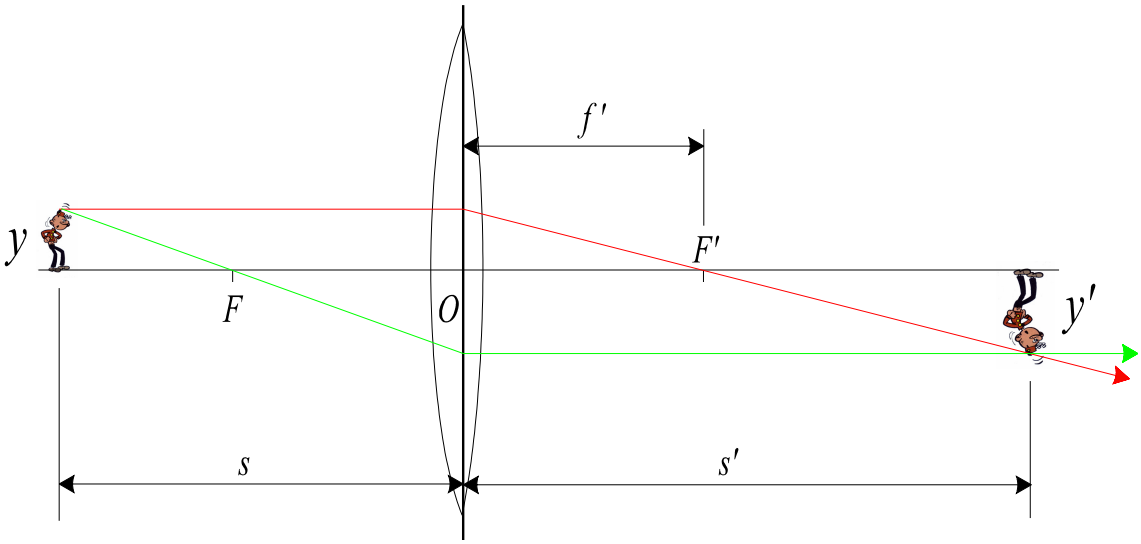
it... Good Gracious! We can see an image of the objects behind the plask and moreover, we see them face down. But it is a little big object. If we could join the walls much, we would have A LENS! … There are two kinds of lenses: lenses that bring objects closer (convergent) and lenses that move them away (divergent)

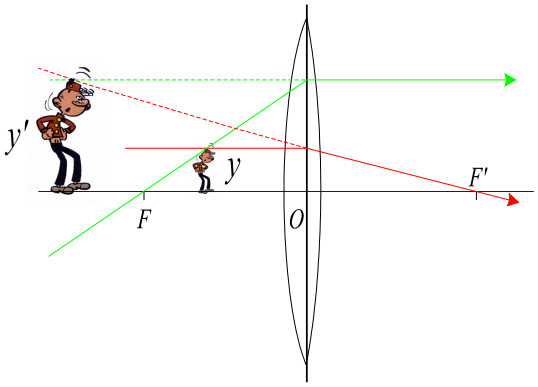
And Why do we know that they approach or they move away? … The comp experience and slide projector
(the comb on the table).



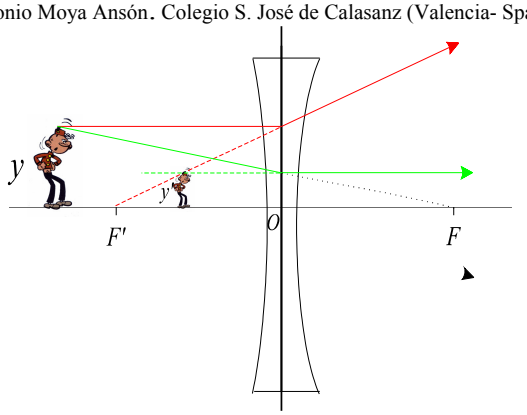
LENTE CONVERGENTE LENTE DIVERGENTE

As we see, the converging lenses, or magnifying glasses, help the lines of the comb to join, whereas the divergent ones separate them even more. Look, pay attention, in addition, the type of images that form… Assembly of lens, slide of an object, image on a screen object placed 20cm away from it, the image is looked for at the back.





THIS IS a MAGNIFYING GLASS and with diverging lenses



In fact, these lenses are very important so that we can see well. The thing is that this full of water sphere reminds us of the form of an eye, which that is also formed by a globe, the eyeball.
In this sense, I would like to discuss a bit about the functioning of the eye, where the image is formed on the retina, and not further back, as it happens now. Therefore, we must add some element to our eyeball to be able to bring the image closer until we make it converge in the retina.
What can we use? Very well! A LENS. A CONVERGENT ONE. As we see, the converging lenses or magnifying glasses, help the lines of the comb to move closer, whereas the divergent ones separate them even more.
What sort of lens will we need for our eye? … Very well, a convergent one. We just place the small magnifying glass in front of the flask, and observe how the image is indeed formed just at the back face. Our eye works correctly. What is more notice, that the image is very small and face down. For that reason it is important to mention the risks of watching an intense light, like the one of the laser, or the Sun, before an eclipse, directly. And the fact that it is inverted is normal, since we have seen with the lens. Thank heavens the brain turn the image upside down so that we can see well. And in relation to vision defects, what happens with a SHORT-SIGHTED eye? well, the image is not form on the retina, but before, within the eyeball. How to correct this defect? moving the image away,.....Therefore, with a DIVERGING LENS, therefore. And what about long-sighted people?. Quite the opposite, the image is formed beyond the retina, and we must bring it close to it, how? , obviously, with a converging lens.

DIFFUSION AND DIFFRACTION OF LIGHT

Another phenomenon in which the refraction of light takes part in a direct way is the one of the chromatic diffusion. Let us see: we send a ray of white light so that it is refracted in the water. We will use a mirror to see it refracted. The colours of the rainbow appear! and where does it come from?. Well, I suppose it comes from the white light. Perhaps it is white by the sum of all the colors of the visible spectrum, and for some reason they have been separated.

But we have said before that the deviation of the ray depended directly on the speed of the light in the material environment. So the different colours are diffused with different speed in the environment, As a result of this, different angles are turned aside and the colours of the rainbow are separated. What colour is separated more and what colour less? … If it is not seen with clarity in the previous experiment, we can use a prism and see that the red one is the one that is turned aside less, and the blue one, the one that more.

We can make the experiment of the reaction between $Na_2S_2O_3$ and HCl in a precipitated glass, 150cc of $Na_2S_2O_3$ in the glass (dissolution of 40g/l), then 10cc of HCl 2M, shake it well. and WE WILL OBSERVE THE GET DARK ACCORDING TO THE PRODUCT REACTION PRODUCT IS GETTING WHITE.