Hot spot

More Details

Mirrors and light

Mirrors reflect light and thereby show what is in front of them. The angle at which light rays hit a mirror (angle of incidence) and the angle of reflected light rays (angle of reflection) are always the same.

When parallel rays of light fall on a flat mirror, the angles of incidence are the same for all rays – and so are the angles of reflection. As a result, the reflected rays are also parallel. A flat mirror shows a realistic reflection.

In contrast, mirrors with a curved surface distort the image of the objects in front of them. Parallel incident light rays are no longer parallel when reflected since the individual light rays have different angles of incidence and correspondingly different angles of reflection, due to the mirror's curvature. The reflected light rays travel in different directions.

The mirror in this exhibit is a special case: it has the shape of a paraboloid and therefore reflects light in a way that makes all reflected light rays meet at the so-called focal point in front of the mirror – the light rays are focused (Fig. 1). To find the focal point, you can try to catch the red light spot with your hand. The point at which the light spot becomes very small and sharp is the focal point.

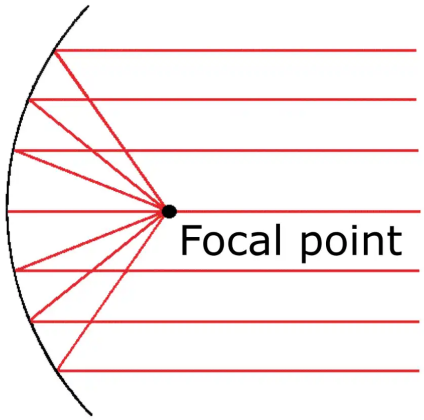

Fig. 1: A parabolic mirror focuses all rays in the focal point.

Look at your reflection in front of and behind the focal point. Between the focal point and the mirror, the image is the right way round and beyond the focal point, the image is turned upside down (Fig. 2).

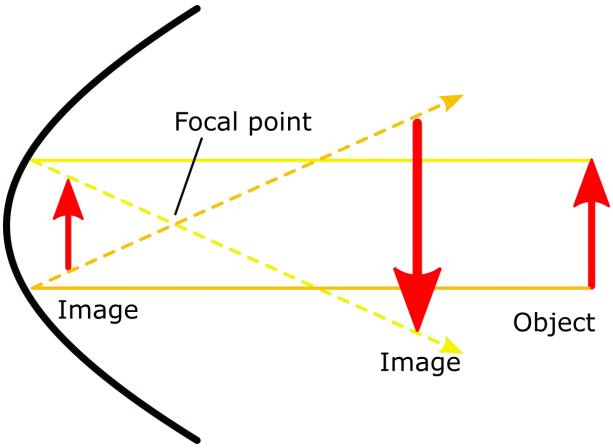

Fig. 2: Mirror images created by a parabolic mirror appear upright between the focal point and the mirror, beyond the focal point they appear upside down.

Mirrored heat

The lamp in this exhibit does not only glow red but emits another type of light – infrared light. These are electromagnetic waves of which the wavelength is not the appropriate length to stimulate the photoreceptors in our eyes. Therefore, we cannot see infrared light. However, heat sensors in the skin can perceive it. The infrared light is focused by the mirror in the same way as visible light, which is why it is warmest at the focal point. With large parabolic mirrors, a temperature of several thousand degrees can be reached.

A parabolic mirror can focus many types of radiation such as visible light emitted by stars. Astronomers use such mirrors to concentrate light from faint stars to produce sharp images. Solar ovens, also called solar cookers, focus sunlight to heat and cook food (Fig. 3). In many solar thermal systems, sunlight is also focused and used to generate electricity. A satellite dish on the roof of a house uses the same

principle to focus another type of radiation: radio waves from television satellites.

Fig. 3: Solar cooker