That some bodies, such as the sun—the stars—flame of all kinds—bodies heated to a red heat, are self luminous, possessing in themselves the power of throwing off light; others again, not being themselves the source of light, reflect that which they receive from self-luminous bodies. The flame of a candle is seen by the light which proceeds directly from it; the things in the room are seen by the light thrown upon them from the candle, and reflected back to the eye.

Why does the light passing through a window light the whole room, and not appear a mere column of light, the base of which is equal to the size and figure of the window, and why any light on each side of this column? Or, rather why is it not a set of separate columns, as many in number as the panes of glass, and having circular, or square bases, etc., according as the panes may be circles, squares, diamonds, etc., with dark spaces of the thickness of the bars of the window between each column of light; so that a person walking from one side of the room to another would pass through alternate sections of light and darkness—the same, also, vertically, from the bottom to the top, caused by the cross bars: each column of light, supposing the floor to be horizontal, and the window at right angles to it, would be inclined to the plane of the room, at an angle equal to the angle of incidence on the glass.

In bringing candles into a room during twilight, whether would there be more or less light in the room by closing the window-shutters?

Light is sent off from luminous bodies in every direction, and proceeds in straight lines.

Instance a ray of light admitted or finding its way through a small hole into a dark room—if there is dust or smoke in the room its progress will be distinctly observed proceeding in a straight line—if it is received on a dark surface, at the opposite side of the room in which it enters, most of the light is absorbed, and the room scarcely lighted at all by it—if on a white surface, such as a sheet of paper, much more light is reflected on the objects around.

Also beams of light from the sun, passing through the opening in a cloud, darting in straight lines to the ground—the outline of a shadow, being always that of the object seen from the luminous point, shows the same.

Hold a flat object between the candle and the wall, the image is of the exact form of the outline of the object—the image of a globe—of a flat circle of the same diameter, held parallel to the wall, and to the flame of the candle—of a cylinder, with its end towards the centre of light, is the same, and these different bodies would not be distinguished from each other by their shadows.

The shadow of a flat circle, when held slantingly, would differ, etc How? what would it be when the circle is held with its plane perpendicular to the surface on which the shadow is cast? The darkness of a shadow will not be in proportion to the real darkness, but in proportion to the quantity of light on the surrounding objects; try the shadow of a hand on the wall, as made by one candle, then place another so that the shadows from the two candles coincide; it will be seen that this appears much darker than the former one, and why? Vary the position of the candles so that part of one shadow rests on the other—the comparative darkness will be very visible.

When the body from which light comes is less than that which causes the shadow, the shadow will be greater than the body—the shadow of a hand on the wall (luminous body—flame of a candle), of a small paper figure of a man, may be made of any size greater than itself, by varying the distance of the candle and object from the wall.

When the body from which light comes is greater than the body causing the shadow, the latter will always be less than the object; this is the case with the shadows of all the planets and of the earth, because less than the sun—the nearer to the body causing the shadow, the greater the shadowed surface.

When light falls upon any body whatever, part of it is reflected, part of it absorbed, and either lost in it, or proceeds through it; when on a brightly polished surface, most of it is reflected, and the remainder lost,—when on glass or water, very little is reflected, and the greater part transmitted through it.

"The quantity of light which is reflected by a substance of any kind, depends not only on the nature of the substance, but also on the obliquity of its incidence; and it sometimes happens that a surface which reflects a smaller portion of direct light than another, reflects a greater portion when the light falls very obliquely on its surface. It has been found that the surface of waters reflected only one fifty-fifth part of the light falling perpendicularly upon it—that of glass one-fortieth, and that of quicksilver more than two-thirds: but when the obliquity was as great as possible, the water reflected nearly three-fourths of the incident light, and the glass about two-thirds only."—YOUNG's *Lectures.*

A given quantity of light or heat, such as that from a candle or from the sun, will be less intense the greater the space it is spread over—the intensity of both diminishes as the square of the distance increases; a person standing near a fire (the heat given out remaining constant), if he remove to twice the distance, will only receive ¼ of the warmth, at three times only 1/9, at four times 1/16; the same of light.

Light falling on polished metals, or any polished surface, is reflected at an angle made between the reflected ray, and a perpendicular to the reflecting surface, which is equal to the angle which the incident ray makes with the same perpendicular.

A glass mirror reflects the light while the heat is absorbed; but a metallic mirror reflects both light and heat, so that it is not quickly warmed, unless its surface is blackened.

When a ray of light falls perpendicularly, it is sent back in the same line.

The image of an object, placed before a plane mirror, appears to be at an equal distance from the glass with the object, but on the opposite of it. Place a boy or hold an object in such a position that the rays fall obliquely on the mirror; a person, in order to see it, must stand in a direction making the same angle with the other side.

Place two looking-glasses parallel to each other, and a lighted candle between them, and observe an infinite number of images, each in succession dimmer than the one before it, and why. Explain also the distances from each other and from the glass.

Light passes through some substances, as glass, water, ice, rock-crystal, etc., but, on entering, is bent at the surface; and in going out, if it passes through, is again bent at the other surface.

A ray of light entering from air into water is bent downwards—in passing from water into air, it is bent from the perpendicular to the surface of the water; so that a body in the water, as a fish, or the bottom of the river appears elevated, and the fish higher, or the water less deep than it really is—people not knowing this, mistake the depth of water; if looking perpendicularly downwards, the object appears in its true place.

Exp Put a shilling into an empty basin, place it on a table, and recede until the eye entirely loses sight of the shilling, or in fact of any particular point in the bottom of the basin, keep the head in that position, and let some one pour water into the basin, and the shilling will gradually appear—parts of the bottom surface of the basin will come in sight which before were not visible. If spirits of wine were used for this experiment, the shilling will appear more raised, and if oil still more; but in none of these cases will it be thrown aside to the right or to the left of its true place, however the eye be situated.

The ray having once entered one of these transparent substances, passes on in a straight line, and, when coming out on the other side, its direction is parallel to that in which it first entered. The different refractive powers of transparent liquids vary, but so constant is it in the same substance, that the purity of oils can be tested as a matter of commerce by their refractive powers, and that this mode of examination is had recourse to, in order to test whether an oil has been adulterated or not.

A ray of light from the sun, when it enters the atmosphere, which increases in density the nearer the earth, moves in a curve which is concave towards the earth, this causes the sun to appear to us in the horizon before he is actually above it.

Light proceeding from the sun, as well as heat, the more of the atmosphere they have to pass before they reach us, the less intense they will be—much of both being lost in the passage. The stratum of air, also, in the horizon is so much more dense than that in the vertical, that the sun's light is diminished 1000 times in passing through it, which enables us to look at him when setting without being dazzled. The loss of light and of heat by the absorbing power of the atmosphere increases with the obliquity of incidence. There is no known substance which is perfectly pervious to light; all transparent substances absorb in different degrees the light falling upon them. The clearest crystal, the purest air or water, stop some of the rays of light on its passage through them, and of course the thicker the medium the greater the quantity of light absorbed; on this account objects cannot be seen at the bottom of very deep water, and there are more stars visible to the naked eye from the tops of mountains than from the valleys: the quantity of light incident on any transparent substance is always greater than the sum of the reflected and refracted rays. Bodies which reflect all the rays appear white, those which absorb them all seem black; but most substances, after decomposing the light which falls upon them, reflect some colours and absorb he rest,