some States have passed laws making it a misdemeanor. Such spraying not only kills off honeybees, causing a loss to the bee keeper, but interferes with the proper pollination of the blossoms and is thus a detriment to the fruit grower. Bee keepers should do everything in their power to prevent the practice.

Laws against the adulteration of honey.—The National Food and Drugs Act of 1906, and various state pure food laws, are a great aid to the bee keeper in preventing the sale of adulterated extracted honey as pure honey. Bee keepers can often aid in this work by reporting to the proper officials infringements of these laws which come to their notice.

When bees are a nuisance.—Some cities have passed ordinances prohibiting the keeping of bees in certain areas, but so far none have been able to enforce them. If bees are a nuisance in individual cases, the owner may be compelled to remove them. The National Beekeepers' Association will help any of its members in such cases, if they are in the right, as well as in cases where bees sting horses. Bee keepers should be careful not to locate bees where they can cause any trouble of this kind.

SUPPOSED INJURY OF CROPS BY BEES.

Bee keepers are often compelled to combat the idea that bees cause damage to fruit or other crops by suck-

ing the nectar from the flower. This is not only untrue, but in many cases the bees are a great benefit in pollinating the flowers, making a good crop possible. A more frequent complaint is that bees puncture fruit and suck the juices. Bees never puncture sound fruit, but if the skin is broken by some other means bees will often suck the fruit dry. In doing it, however, they are sucking fruit which is already damaged. These and similar charges against the honeybee are prompted by a lack of information concerning their activities. Bees may, of course, become a nuisance to others through their stinging propensities, but bee keepers should not be criticised for things which bees do not do.

Some Mental Illusions of Vision

Explanations of Various Optical Phenomena

By R. T. Lewis, F.R.M.S.

NOTWITHSTANDING the popular saying that "seeing is believing," neither of our faculties is subject to such complete illusions as our sense of sight, some being optical, others ocular, while again others are purely mental.

To the first kind belong those due to refraction—such for instance as the mirage, or the apparent displacement of an object from its true position; to the second kind may be referred the phenomena of irradiation, and of subjective images and colors; while the third includes the impression which most persons have of the apparent increase of the size of the Sun and Moon when rising or setting, and the similar increase in the apparent size of constellations, or the distance apart of stars when seen near the horizon, as compared with our estimate of such at their meridian altitude.

That this last-named illusion is neither optical nor ocular is shown at once by the fact that when seen through a telescope no such apparent increase is found to exist; indeed, when accurately measured, after making all necessary corrections for height of barometer, temperature, and refraction in altitude, it is found that the apparent diameter of either body is really greatest when on the meridian, inasmuch as they are then some 4,000 miles nearer to us than when near the horizon, though the difference is too small to be appreciated by the naked eye.

It should be noted, however, that the amount of the apparent augmentation varies considerably with individuals; artists, for instance, depict the rising moon of a variety of exaggerated sizes up to about 15 deg. diameter, or about thirty times greater than it should be drawn, and one not infrequently hears it described as looking "as large as a dinner plate," whereas a three-penny bit held at arm's length is rather larger than is necessary to hide it completely.

That this almost universal illusion is entirely mental, is not easy to demonstrate, although it will be readily admitted that if a false impression of the distance of an object can be created, the mental estimate of its actual size will be proportionately altered; in other words, if an object we believe to be near to us appears of a certain size, and one of the same kind believed to be at a distance appears also of the same size, we at once from experience correctly judge that the latter must be the larger of the two. Hence though the Moon, whether high or low in the sky, practically subtends the same angle, and therefore its image on the retina of the eye is in both positions the same, we naturally from experience imagine it must be a larger body in the latter case, because though so much farther off it appears to be of the same size as the Moon we see when apparently nearer.

The experiment referred to in the accompanying diagram affords a convincing illustration of the curious mental effect produced by the creation of a false impression of distance, and is one which may be performed by any persons who possess sufficient control of the eyes to dissociate the focusing and the convergence, which though quite separate and independent actions, are from constant habit usually performed automatically together. A-B represents a stereoscopic slide, which we will suppose to be of the full Moon, placed at the normal distance of ten inches from the eyes, when the two pictures are seen clearly in focus. If while retaining the local distance we alter the convergence so that the axis of the right eye (R) passes centrally through the picture B, and that of the left eye (L) through the center of A, as shown by the two firm lines L-C and R-C, these axes will meet at the point C, which will be more or less distant from the plane of A-B according to the width apart of the eyes of the observer. The result of this will be that three images of the pictures A and B will be seen, of which the central one, consisting of A and B superposed, will be seen apparently at C, and

of course perfectly stereoscopic. If then without altering the distance between the eyes and the slide we look so "cross eyed" that the axis of R passes centrally through A, and that of L through B, as indicated by the two dotted lines, we shall again see three images, the center one apparently at D, but in this case pseudoscopic. It is clear that in both cases the images of the pictures on the sympathetic portions of the retina will be approximately the same, but in the former case where the Moon is seen apparently at C, or much farther off than it really is, the effect is that of a considerably magnified image, whereas in the latter case where the picture is seen apparently at D, or much nearer than it really is, the mental impression produced (after making due allowance for the difference between R-A and R-B) is that of a considerably smaller Moon than either of those seen at A-B, the mental illusion in each case being due to the fact that a false idea has been created, as to the distances of the objects observed.

Diagram Illustrating False Impressions of Distance

A further experiment may be suggested by means of the subjective image of any object which is gazed upon long enough to produce a continued impression upon the eyes. If, for instance, the filament of an incandescent electric lamp is steadily looked at for a few seconds, the impression produced by it upon the sympathetic portions of the eyes will persist until the vibrations so excited have run down, and a spectral image of the filament will meanwhile be seen so long as the convergence of the eyes is maintained at the same angle as when the lamp was originally looked at. If this image is projected upon the distant wall of the room it will appear of magnified proportions, whereas if thrown upon some surface nearer to the eye than the exciting cause, it will apparently be seen of very reduced dimensions, although in both cases the actual picture formed must be precisely the same.

As yet another, though somewhat different class of mental illusion in the case of vision, I may mention that I have before me a photograph of the "Challenger" medal, taken under a strong oblique light, falling upon it from the top. Knowing from experience that if the light falls in that direction upon a raised surface, the shadows would fall as depicted, the mental impression produced when the top of the photograph is held toward a source of light is that of a design in strong relief, although the sense of touch assures me it is flat; but if

the picture is turned round so that the light falls upon it from the bottom, experience immediately suggests that shadows, as they then appear, can only be thrown by an intaglio, and the mental suggestion is that of a sunk pattern, an illusion which would be complete but for the fact that the inscription still reads the right way about.

A false estimate of distance, and therefore of size, is very common to persons in the clear air of high mountainous regions, who under ordinary circumstances are accustomed to see landscapes through our own more murky atmosphere, and the common illusion of meeting suddenly with gigantic figures in the street on a foggy night, because they are much closer than imagined, will occur to most people.

It seems also quite within the limits of possibility that some of the errors of interpretation as to the meaning of what is seen under the microscope may be due to mental suggestion.

It will be understood that the extent of such illusions as have been referred to varies somewhat according to the "personal equation" of the observer, and that what has been described is simply the experience of the writer, who it may be of some interest to mention, has since he thought out the matter, almost entirely lost the impression that the Sun and the Moon appear larger when rising or setting than at other times, though he has been quite unable to divest himself from the illusion in the case of constellations or stars.—Knowledge.

Moving Picture Camera, as a Hand Camera, by Using a Gyroscope

At a recent meeting of the Societe de Physique, of Paris, an interesting method of taking moving picture views was presented by M. De Proszynski. Heretofore such a camera had to be mounted on a tripod to keep it quite steady and it was generally turned by a hand crank. The inventor succeeds in making a hand camera for use in taking such views. He keeps it steady by using the principle of the gyroscope in an ingenious way, so that holding it in the hand causes no trembling. But the problem was how to drive the gyroscope and also the film machine, as an electric motor with a battery is not practical, neither is a spring motor. He uses a small compressed air motor devised for the purpose, and it is very compact. It gives no shocks when running, which is, of course, an essential point. A unique feature is that an ordinary bicycle pump is used to fill the air cylinder of the motor, so that the whole can be made in the form of a hand camera about the size of a large kodak, and it is thus self-contained. The inventor showed what the camera would do by projecting some street views on a screen. These were taken when moving the camera about in the hand quite rapidly, and the images were remarkably sharp. We expect to illustrate this apparatus in the near future.

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