DR. LIEBREICH ON TURNER AND MULREADY

DR. R. LIEBREICH, in a lecture delivered at the Royal Institution on Friday, the 8th inst., "On the effects of certain faults of vision on painting, with special reference to Turner and Mulready," successfully vindicated the title of physical science to extend its researches into the domain of art criticism by applying optical laws to painting. The lecture may be said to consist of three parts, the first of which demonstrates, by the example of Turner, that there are certain conditions of the eye which alter the appearance of nature, whilst they leave the impression a picture produces upon the eye unchanged. The second part of the lecture proves, by the example of a French artist yet living, whose name, therefore, was withheld, that there is another defect of the eye, which produces an incorrect impression of the picture as well as of nature, the error, however, being dissimilar, and affecting the picture and nature in opposite ways. The third part of the lecture shows, by the example of Mulready, that there is yet another disease of the eye affecting colours in such a manner that pigments used in painting are influenced by the disease, whilst natural colours continue unaltered.

I.—Turner

Surprised at the great difference between Turner's earlier and later works, said the lecturer, he examined one of the great artist's later pictures from a purely scientific point of view, and analysed it with regard to colour, drawing, and distribution of light and shade.

It was particularly important to ascertain if the anomaly of the whole picture could be deduced from a regularly recurring fault in its details. This fault is a vertical streakiness, which is caused by every illuminated point having been changed into a vertical line. The elongation is, generally speaking, in exact proportion to the brightness of the light; that is to say, the more intense the light which diffuses itself from the illuminated point in nature, the longer becomes the line which represents it on the picture. Thus, for instance, there proceeds from the sun in the centre of a picture a vertical yellow streak, dividing it into two entirely distinct halves, which are not connected by any horizontal line. In Turner's earlier pictures the disc of the sun is clearly defined, the light equally radiating to all parts; and even where, through the reflection of water, a vertical streak is produced, there appears, distinctly marked through the vertical streak of light, the line of the horizon, the demarcation of the land in the foreground, and the outline of the waves in a horizontal direction. In the pictures, however, of which I am now speaking (the lecturer proceeded to say), the tracing of any detail is perfectly effaced when it falls in the vertical streak of light. Even less illuminated objects, like houses or figures, form considerably elongated streaks of light. In this manner, therefore, houses that stand near the water, or people in a boat, blend so entirely with the reflection in the water, that the horizontal line of demarcation between house and water or boat and water entirely disappears, and all becomes a conglomeration of vertical lines. Everything that is abnormal in the shape of objects, in the drawing, and even in the colouring of the pictures of this period, can be explained by this vertical diffusion of light.

How and at what time did this anomaly develop itself? Till the year 1830 all is normal. In 1831 a change in the colouring becomes for the first time perceptible, which gives to the works of Turner a peculiar character not found in any other master. Optically this is caused by an increased intensity of the diffused light proceeding from the most illuminated parts of the landscape. This light forms a haze of a bluish colour which contrasts too much with the surrounding portion in shadow. From the year 1833 this diffusion of light becomes more and more vertical. It gradually increases during the following years. At first it can only be perceived by a careful examination of the picture; but from the year 1839 the regular vertical streaks become apparent to every one. This increases subsequently to such a degree, that when the pictures are closely examined they appear as if they had been wilfully destroyed by vertical strokes of the brush before they were dry, and it is only from a considerable distance that the object and meaning of the picture can be comprehended. During the last years of Turner's life this peculiarity became so extreme that his pictures can hardly be understood at all.

It is a generally received opinion that Turner adopted a peculiar manner, that he exaggerated it more and more, and that his last works are the result of a deranged intellect. I am convinced of the incorrectness, I might almost say of the injustice, of this opinion. According to my idea, Turner's manner is exclusively the result of a change in his *eyes*, which developed itself during the last twenty years of his life. In consequence of it the aspect of nature gradually changed for him, while he continued in an unconscious, I might almost say in a naïve manner, to reproduce what he saw. And he reproduced it so faithfully and accurately, that he enables us distinctly to recognise the nature of the disease of his eyes, to follow its development step by step, and to prove by an optical contrivance the correctness of our diagnosis. By the aid of this contrivance we can see nature under the same aspect as he saw and represented it. With the same we can also, as I shall prove to you by an experiment, give to Turner's early pictures the appearance of those of the later period.

After he had reached the age of fifty-five, the crystalline lenses of Turner's eyes became rather dim, and dispersed the light more strongly, and in consequence threw a bluish mist over illuminated objects. In the years that followed, as often happens in such cases, a clearly defined opacity was formed in the slight and diffuse dimness of the crystalline lens. In consequence of this the light was no longer evenly diffused in all directions, but principally dispersed in a vertical direction. At this period the alteration offers, in the case of a painter, the peculiarity that it only affects the appearance of natural objects, where the light is strong enough to produce this disturbing effect, whilst the light of his painting is too feeble to do so: therefore, the aspect of nature is altered, that of his picture correct.

The lecturer proceeded to demonstrate the truth of his remarks by a series of experiments, which showed, for instance, a natural tree, and then, by means of lenses prepared for the purpose, changed it into a "Turner-tree;" likewise the artist's early picture of "Venice" was shown, and, by means of lenses, changed into the "Venice" of Turner's later period.

II.—Astigmatism

The optical state of the eye during its adaptation for the farthest point, when every effort of accommodation is completely suspended, is called its refraction.

There are three different kinds of refraction: firstly, that of the normal eye; secondly, of the short-sighted eye; thirdly, of the over-sighted eye.

1. The normal eye, when the activity of its accommodation is perfectly suspended, is adjusted for the infinite distance; that is to say, it unites upon the retina parallel rays of light. (Fig. 1.)

2. The short-sighted eye has in consequence of an extension of its axis a stronger refraction, and unites, therefore, in front of the retina the rays of light which proceed from infinite distance. In order to be united upon the retina itself the rays of light must be divergent, that is to say, they must come from a nearer point. The more short-sighted the eye is, the stronger must be the divergency; such an eye, in order to see distinctly distant objects, must make the rays from a distant object more divergent, by aid of a concave glass. (Fig. 2.)

3. The over-sighted (hypermetropic) eye, on the contrary, has too weak a refraction ; it unites convergent rays of light upon the retina ; parallel or divergent rays of light it unites behind the retina, unless an effort of accommodation is made. (Fig. 3.)

Hypermetropy, the lecturer explained, does not essentially influence painting, and is easily corrected by convex glasses. Short-sightedness, on the contrary, generally influences the choice of subject as well as its manner of execution.

Sometimes the shape of the eye diverges from its normal spherical form, and this is called astigmatism. This has only been closely investigated since Airy discovered it in his own eye. Figure to yourself meridians drawn on the eye as on a globe, so that one pole is placed in front ; then you can define astigmatism as a difference in the curvature of two meridians, which may, for instance, stand perpendicularly upon each other ; the consequence of which is a difference in the power of refraction of the eye in the direction of the two meridians. An eye may, for instance, have a normal refraction in its horizontal meridian, and be short-sighted in its vertical meridian. Small differences of this kind are found in almost every eye, but are not perceived. Higher degrees of astigmatism, which decidedly disturb vision, are, however, not uncommon, and are therefore also found among painters.

I observed a very curious influence of astigmatism upon the works of a portrait painter. He was held in high esteem in Paris, on account of his excellent grasp of character and intellectual individuality. His admirers considered even the material resemblance of his portraits as perfect ; most people, however, thought he had intentionally neglected the material likeness by rendering in an indistinct and vague manner the details of the features and the forms. A careful analysis of the picture shows that this indistinctness was not at all intentional, but simply the consequence of astigmatism. Within the last few years the portraits of this painter have become considerably worse, because the former indistinctness has grown into positively false proportions. The neck and oval of the face appear in all his portraits considerably elongated, and all details are in the same manner distorted. What is the cause of this? Has the degree of his astigmatism increased? No ; this does not often happen ; but the effect of astigmatism has doubled, and this has happened in the following manner :—An eye which is normal as regards the vision of vertical lines, but short-sighted for horizontal lines, sees the objects elongated in a vertical direction. When the time of life arrives that the normal eye becomes far-sighted, but not yet the short-sighted eye, this astigmatic eye will at short distance see the vertical lines indistinctly, but horizontal lines still distinctly, and therefore near objects elongated in a horizontal direction. The portrait painter, in whom a slight degree of astigmatism manifested itself at first only by the indistinctness of the horizontal lines, has now become far-sighted for vertical lines, therefore he sees a distant person elongated in a vertical direction ; the portrait he paints, on the contrary, being at a short distance, is seen enlarged in a horizontal direction, and thus painted still more elongated than the subject is seen ; so the fault is doubled.

The lecturer proved these remarks by showing a picture which he made to appear in its natural shape or distorted by elongation, in either a vertical or a horizontal direction, by means of a lens which he held at various distances from the optical apparatus.

III.—Mulready

The lens, continued the lecturer, always gets rather yellow at an advanced age, and with many people the intensity of the discoloration is considerable. This, however does not essentially diminish the power of vision. In order to get a distinct idea of the effect of this discoloration, it is best to make experiments with yellow glasses of the corresponding shade. Only the experiment must be continued for some time, because at first everything looks yellow to us. But the eye soon gets accustomed to the colour, or rather it becomes dulled with regard to it, and then things appear again in their true light and colour. This is at least the case with all objects of a somewhat bright and deep colour. A more careful examination, however, shows that a pale blue, or rather a certain small quantity of blue, cannot be perceived even after a very prolonged experiment, and after the eye has long got accustomed to the yellow colour, because the yellow glass really excludes it. This must, of course, exercise a considerable influence when looking at pictures, on account of the great difference which necessarily exists between real objects and their representation in pictures.

These differences are many and great, as has been so thoroughly explained by Helmholtz. Let us for a moment waive the consideration of the difference produced by transmitting an object seen as a body upon a simple flat surface, and let us only consider the intensity of light and colour. The intensity of light proceeding from the sun and reflected by objects is so infinitely greater than the strongest light reflected from a picture, that the proportion expressed in numbers is far beyond our comprehension. There is also a great difference between the colour of light or of an illuminated object, and the pigments employed in painting, and it must appear wonderful that the art of painting can produce by the use of them such perfect optical delusions. It can, of course, only produce optical delusions, never a real optical identity ; that is to say, the image which is traced in our eye by real objects is not identical with the image produced in our eye by the picture.

Returning to our experiment with the yellow glass, we shall find that it affects our eye very much in the same way as a yellow tint of light. The small quantity of blue light which is excluded by the yellow glass produces no sensible difference, as the difference is equalised by a diminution of sensibility with regard to yellow. In the picture, on the contrary, there is found in many places only as much blue as is perfectly absorbed by the yellow glass, and this therefore can never be perceived, however long we continue the experiment. Even for those parts of the picture which have been painted with the most intense blue the painter could produce, the quantity of blue excluded by the yellow glass will make itself felt, because its power is not so small with regard to pigments as with regard to the blue in nature.

With aged people we often find the crystalline lens to be of a yellowish tint. In pictures painted after the artists were over sixty, therefore, the effect of the yellow lens can often be studied. As a striking example, the lecturer mentioned Mulready. It is generally stated that in his advanced age he painted too purple. A more careful examination shows, however, that the peculiarity of the colours of his later pictures is produced by an addition of blue. Thus, for instance, the shadows on the flesh are painted in pure ultramarine. Blue drapery he painted most unnaturally blue. Red of course became purple. If we look at these pictures through a yellow glass all these faults disappear ;—what formerly appeared unnatural and displeasing is at once corrected ; the violet colour of the face shows a natural red ; the blue shades become grey ; the unnatural glaring blue of the drapery is softened. It happens that Mulready has painted the same subject twice, first in the year 1836, when he was fifty years of age and his lens was in a normal state, and again in 1857, when he was seventy-one and the yellow discolouring had already considerably advanced. The first picture was called when exhibited "Brother and Sister ; or, Pinching the Ear ;" the second was called "The Young Brother." If we look at the

second picture through a yellow glass, the difference between the two almost entirely disappears, as the glass corrects the faults of the picture. The smock of the boy no more appears of that intense blue which we may see in a lady's silk dress, but never in the linen smock of a peasant. It changes into the natural tint we find in the first picture. The purple face of the boy

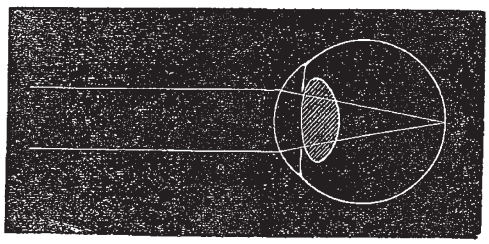

FIG. 1

also becomes of a natural colour. The shades on the neck of the girl and the arms of the child, which are painted in a pure blue, look now grey, and so do the blue shadows in the clouds. The grey trunk of the tree becomes brown. Surprising is the effect upon the yellowish green foliage, which, instead of appearing still

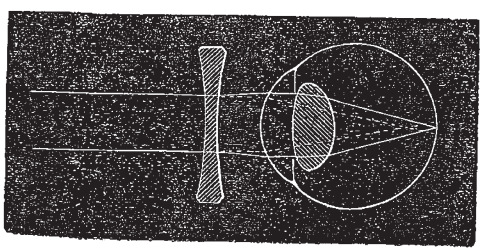

FIG. 2

more yellow, is restored to its natural colour, and it shows now the same tone of colour as the foliage in the earlier picture. This last fact is most important to prove the correctness of my supposition. The endeavour to explain this fact became for me the starting-point of a series of investigations to ascertain the optical qualities of the pig-

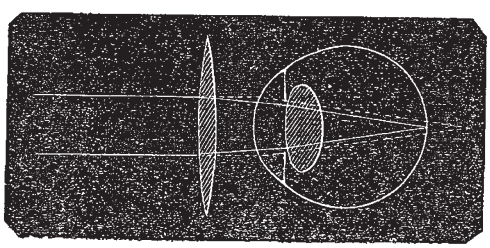

FIG. 3

ments used in painting, and thus to enable us to recognise them by optical contrivances when the vision of the naked eye does not suffice to analyse the colours of a picture.

If it is the dispersion of light which, as in Turner's case, alters the perception of nature, it can be partly rectified by a kind of diaphragm with a small opening (Donder's sthenopeical spectacles).

In cases of astigmatism, the use of cylindrical glasses will completely correct the aspect of nature, as well as of the picture. Certain anomalies in the sensation of colour may also be counteracted to some extent by the use of coloured glasses; for instance, by a blue glass, when the lens has become yellow, as was the case with Mulready.

If science aims at proving that certain works of art offend against physiological laws, artists and art critics ought not to think that, by being subjected to the material analysis of physiological investigation, that which is noble, beautiful, and purely intellectual would be dragged into the dust. They ought, on the contrary, to make the results of these investigations their own. In this way art critics will often obtain an explanation of the development of the artist, and artists will avoid the inward struggles and disappointments which often arise through the difference between their own perceptions and that of the majority of the public. Never will science be an impediment to creations of genius.

Dr. Liebreich's lecture will appear *in extenso* in the April number of *Macmillan's Magazine*.

THE NATURAL HISTORY OF EASTERN THIBET

DR. CAMPBELL, Superintendent of Darjeeling, has recently published a series of valuable papers on Eastern Thibet in *The Phœnix*, a monthly magazine for China, Japan, and Eastern Asia, ably edited by the Rev. James Summers, Professor of the Chinese Language in King's College. As a journal of this kind must naturally have only a limited circulation, and is not likely to be in the hands of many of our readers, we have no hesitation in abstracting from Dr. Campbell's contributions the following notes on the Zoology and Mineralogy of a country that at the present time is of special interest, both in a geographical and a commercial point of view. The following is a list of the animals of Eastern Thibet, the native name being attached to each :—*Goa*, an antelope; *Gnow*, the *Ovis ammon; Rigong*, the hare; *Kiang*, the wild ass; *Lawa*, the musk-deer; *Shaoo*, a large deer, *Cervus affinis; Cheu*, *Antelope Hodgsoni; Dong*, the wild yak of Thibet; *Pegoo*, the yak; A small cow, whose native name is not given; *Sauh*, cross between cow and yak; *Ba Sauh*, produce of female yak by bull; *Look*, sheep; *Peu Ra*, Thibet goat; *Phák*, the pig; *Cha*, the common fowl; *Damjhar*, the duck; *Damjhar Cheemoo*, the goose (besides the duck and goose there are numerous wild fowls, swimmers and waders, which migrate from India in March, and return in October); *Chungoo*, a reddish wild dog; *Koong*, a mottled civet; *Sik*, the leopard; *Tagh*, the tiger; *Somb*, the bear (a red and a black species); *Nehornehu*, a large sheep, goat, or antelope of various colours, four feet high, with enormous horns four feet long, sloping backwards, and a tail fifteen inches in length.

This completes Dr. Campbell's list of the indigenous mammals and birds. With regard to the *Dong* or wild yak of Thibet, he observes that it is the fiercest of all known ruminants, and will rarely allow a man to escape alive if it can come up with him. It is generally hunted on horseback, the great aim being to detach one from the herd. The horns of the full-grown buck are said to be three feet long, and the circumference must be enormous. They are used by the Grandees at marriage and other feasts as gigantic drinking cups, and handed round to the company. The horns so used are finely polished, and mounted in silver or gold and precious stones. A stuffed "Dong" is common in Thibetan Lamaserais, standing in front of the image of Mahákkáli, at whose shrine the animal is thus figuratively sacrificed.

Of *Look* or sheep there are four principal varieties—1st, Chang Look or northern sheep, very large, with fine wool; flocks of from 400 to 1,000 tended by one man. 2nd. Sok Look, rare, but greatly praised; it is a heavy-tailed sheep, coming from the province of Sok, east of Lassa; wool not very fine. 3rd. Lho Look, a very small sheep