

A Contribution to the Theory of Sight

(From "Natur Forcher") - P. 392.

In the teachings of perception by sight, two theories stand opposite⁵¹ to each other to day as they have in centuries past, viz - the Native - and the Empiric.

Although the last has gained more and more ground yet it has not been able to fully displace the other.

Those who hold the Native theory contend that we possess an innate knowledge of the adjustment of the one sensible pointⁿ of the Retina,

through which our perception of space and proportion is obtained.

Those who hold the empirical theory on the contrary contend that we by the help of the different sensibilities of the various points of the Retina come by Experience to the perception of space and proportion.

To prove these theories is very seldom possible. It occurs only when those born blind have arrived at an age at which the mind has considerably developed and then suddenly receive perfect sight by an operation.

J. Hirshburg met with such an opportunity and used it to make

observations which are deserving of interest. The patient was a seven year old boy who was blind from birth by reason of a gray membrane over the pupils of his eyes so that he was only able to distinguish light. The left eye was first operated upon and four days afterward the first experiments were made; the first by candle light:

Her Hirshberg waved his finger eight or ten times before his eyes and asked him to count the motions. He answered hesitatingly and incorrectly. It seemed evident however that he received a tolerably sharp

Retina picture and although the nervous parts of the apparatus of sight were capable of performing their function. yet he was not able properly to estimate the Retina picture nor draw conclusions therefrom which other people have learned to do, without knowing it during their ^{infancy} (and are learning during all the years of their youth.)

while he was eating a bon-bon another. large square red bon-bon was held before him. He said it was red but was entirely ignorant as to what it was; but when it was put in his hand he recognized

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it at once by the touch. This was repeated on the following day with the same result although he could readily give the forms of different bodies by the sense of touch, he was entirely unable to do so by sight, neither was he inclined to use this newly acquired sense in obtaining a knowledge of the outer world but still relied upon the sense of touch.

Her Hershburg held his own face in a good light near the boy, showed him his nose placing the boy's finger upon it, then required him to find his ear by the sense of sight.

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The boy tried a short time in vain touching here and there, then ceasing to use his sight he placed his hand on his (Hirschbungs) face and slid it around to his ear as a blind person would do.

On the next day a clock was placed before him which he recognized by its ticking. He was required to put his finger on the figures (which it appears he had learned to do as a blind person) at which he placed his finger here and there until he found the face of the clock after which he readily pointed them out.

He was shown a table knife, spoon and

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fork which he looked at attentively and gave their colors correctly but could not describe them nor tell what they were, but knew them at once by touch.

An object shown him once was not recognized at a second time.

At the third time he recognized the table knife without touching it. He was taken to the window but did not want to look out "because there was so much there". Two Table knives were placed before him at different distances; the nearer one he named rightly, on trying to take it he grasped entirely over and past it, being required to go to a spot three or four steps away, he

he would not use his sight but felt his way as the blind do.

On the sixth day he recognized the table knife at once, the spoon after much hesitation, the fork not at all.

His perception of space began to become clearer. When anything round was shown him he would make a circle with his finger. He also described four cornered objects correctly. He recognized very different objects as different, but judgment of distance was still very very difficult for him, he overestimated them, while on the day before he had greatly underrated them evidently because he had no thought that

one with his sense of sight could see so far. But this he was rapidly learning so that he could go about freely in the room.

The seventh day showed nothing new and on the eighth day his right eye was operated upon and the experiments resumed on the 15th day.

Close to him the distance of things were now more correctly recognized and he knew the objects before shown him. On the 18th day his left eye was tried in a different room. He recognized that it was different from his own and found his way about very slowly, but correctly. A cherry

was held before him; he said it was round & yellow, but could not tell what it was - he knew it at once by the touch. Of a dark brown plum he said, "it is black, is round, it may be a cork" - recognized it at once by the touch. Of an apple he said it was red-yellow, and round - it is a cherry. On touching it said it was an apple.

His improvement was unmistakable. He had already so much better ideas of the impressions he had received, that when an unknown Retina picture was considered, he would venture a description. The cherry which he had

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seen but once was recognized after a quarter of an hour, without hesitation.

From this time forward both his eyes were left free. On the 20th. day he was able to recognize the distance and order of things near him with tolerable precision.

By the use of his right eye he had not to relearn that which he had learned with the left. His advancement was now very marked. He could walk along the border of a carpet with a good degree of precision and found a coin thrown on the floor, without much difficulty. After the 21st. day he

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went freely through the whole house, and rapidly learned to know the different pieces of furniture etc. in the different rooms and had acquired a considerable degree of acquaintance with his outward surroundings in general and seemed to be gaining a proper idea of the use and general scope of the sense of sight. Seeing a small clock, he said, "that is pretty - I do not know what it is; I have never before seen it."

Although this case may be insufficient to prove satisfactorily the correctness of the Empiric theory of sight, on account of the youth of the patient,

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still the evidence it gives ~~are~~ is decidedly in that direction, and opportunities for such observations are very rarely met with.

(From Graefe's Archiv für Ophthalmologie)

Remarks.

The image of any object to which the eye may be directed is received upon the Retina just as it is upon the ground glass of the photographer's camera.

If the object be near the camera picture is large, if distant it is correspondingly small consequently if the object be a house for example and nothing else be shown in the picture it will be im-

possible to tell by looking at the picture whether it be really a house at a very great distance or a very diminutive house at a very short distance. If however something else be shown as a ~~house~~, man, tree or anything ^{with}, the apparent size of which at certain distances we have become familiar, we will be able to form some judgment as to the size and distance of the house shown by the comparative size of these objects and the house. All this is primarily true of Retina pictures. No Retina picture can give us any idea ^{either} of the size or distance, for the one counterbalances the other and there can be nothing in the picture to afford the mind any

possible clue to either, unaided by the other senses. If however the sense of Touch has been brought to the aid of sight and has once or repeatedly operated in conjunction with sight in the determination of size and distance and the sight has been practiced upon the object at different distances and our perception thus aided by educated to judgment of the Retinal picture received we come at last to form opinions from considering this picture alone and we say that we see ^{that} such an object is distant, another is near, this is large, that is small &c. &c. when really all we receive by

the eye is simply light and shade.

Our judgment as to what these lights and shades may mean is extra visual, or in other words, is made up from our previous knowledge of such pictures, gained through the medium of the other senses, acting primarily in conjunction with sight.

It thus happens that when the unaided eye first looks out upon the world the mind is entirely unable to form any judgment whatever of the Retina picture afforded - the mind has no basis from which to act - no facts in store to work with.

It would appear from these facts that our perception by sight is just as much

the result of education, as the result of the exercise of any faculty of the mind and that the correctness of these perceptions may be probably as much enhanced by judicious study of Retina pictures as the faculty of computing minutes by the study of mathematics.

A story is told of Agassiz, that once he was bantered by some skilled riflemen to join them at target shooting. This scientist had never used a rifle in his life and it was of course ^{it was} expected that he would make wild shots; but to their astonishment the man of science placed his balls closer to the centre than any of them were able to do. This result was in

direct keeping with the long and rigid training or education of his sight or perceptions or reading of Retina pictures in making his various observations in the course of his study of nature.

In health and with normal organs of sight this Retina picture is always perfectly made, whether the person be educated or not - whether the person understands the picture or not even though he can form no tangible idea of the form size or distance of the object seen. The eye has performed its whole object duty in placing the object upon the screen, when it is within reach of, and may be considered by the faculties of the mind.

This the eye does simply as an instrument and its work is finished.

It is now the business of the mind to consider the Retina picture presented and determine its meaning. This it has no means of doing from the contemplation of the Retina picture alone as such.

But the evidences of the other senses must be brought to its aid, especially that of touch, before the image can in any wise be understood and it is by this process of testing, proving, and studying of these Retina pictures that we gain such a knowledge of them as finally to arrive at a correct perception of the nature proportions and

distance of an object through unaided vision and as a consequence for the highest utilization of the sense of sight we require systematic study of and especial training in its use.
