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(1893) 5: 416-418

NOTES AND LITERATURE.

NOTE ON COLOR-HEARING.

In 1887 I met a remarkable case of color-hearing and made quite full notes. The matter was one of which, at that time, I had never heard, and thinking I had a new field for study, I went hunting for victims, subject to pseudo-chromesthesia. I studied some blind cases and had a theory. Just then I discovered Galton's Study upon the same subject and dropped the matter. I made a second observation upon my original subject in 1891, and this spring made a third one, and believe the case of sufficient interest to make a record of it.

I have no theory to offer. I do not agree with Mr. Galton's, however, but consider one of the physiological explanations preferable. When I first studied the subject, I believed that the phenomenon was due to crossing or mingling of fibres of the auditory and visual nerves—a theory which I see has been held by some writers. I am not qualified to urge the theory or reject it; but I am heartily thankful to Mr. Krohn for his late valuable synopsis of the subject, and its literature.

G. L. is a young lady of unusually quick and bright mind; she has some artistic power and is a writer of ability. From early childhood she has had color-hearing. When a very little girl she was laughed at because she said that names were colored. That in her case it is truly sound that is colored is shown by the fact that names were colored before she could spell or read at all. At the same time she has mental imagery of great clearness and now sees the colored words when she hears them. Although all words are colored, letters, numbers and personal names are the most clearly and definitely affected. In my first test I gave many words like snow, sky, ink, grass, and the like, to see if natural quality of objects had influenced the result, but could not see that it had. Unfortunately different lists were used on the three occasions, and only letters, numbers and a few personal names occur in all these.

The letters of the alphabet bear the following colors for G. L.:

- | | |
|--------------------------------|----------------------------|
| A. Dirty-white. | N. Red, with white tinge. |
| B. Radish-color. | O. Pearl-white. |
| C. Corn-color. | P. Deep-bright-green. |
| D. Dark-brown. | Q. Light-gray-green. |
| E. Cloudy-white or light-gray. | R. Rich-reddish-brown. |
| F. Light-gray. | S. Sunshine-yellow. |
| G. Grayish-yellowish-white. | T. Blue. |
| H. Dark-gray, greenish tinged. | U. Gray-white. |
| I. Dirty-white. | V. Radish-color and brown. |
| J. Dark-greenish-bluish-gray. | W. Red, with white cloud. |
| K. Gray. | X. Brownish-beet-color. |
| L. Yellow. | Y. Dirty-white. |
| M. Geranium-red. | Z. Deep-beet-color. |

This list is that of 1893. Comparing it with the earlier ones, I find no important differences. The only real variants are as follows:

- | | |
|---------------------------------------|-------------------------------|
| 1887. | 1891. |
| D. Dark-brown. | H. Dark-stone. |
| G. Pearl. | Q. Light-green, yellow-edged. |
| K. White, edged gray. | V. Pinkish-terra-cotta. |
| Q. Greenish-yellow. | Y. Yellowish-gray. |
| V. Burnt-sienna and yellow. | |
| Y. Yellowish-white. | |
| Z. Pinkish, dirty-dark-mottled-brown. | |

We shall not attempt an analysis of the case, but will call attention to a few points. The vowels are all gray or white; M and N are almost alike; L and S are identical.

As to numbers:

- | | |
|---------------------------|-------------------------------------|
| 1. White. | 12. Corn-color, deeper-edged. |
| 2. Blue. | 13. Beet-color. |
| 3. Radish-color. | 14. Beet-color faded. |
| 4. Brownish-radish-color. | 15. Dark-green-gray. |
| 5. Dark-gray-green. | 16. Dark-green. |
| 6. Dark-rich-green. | 17. Light-sunny-yellow. |
| 7. Sunshine-yellow. | 18. Richer-deep-yellow, brown haze. |
| 8. Cadmium-yellow. | 19. Dark-dull, gray, green. |
| 9. Dark-dull-gray-green. | 20. Pale-gray-blue. |
| 10. Pale-sunshiny-yellow. | |
| 11. Corn-color. | |

The variants are of little consequence:

- | | |
|------------------------------|-------------------------------------|
| 1887. | 1891. |
| 5. Black, white-edge, misty. | 10. Golden, much like 7. |
| 10. White, yellow suffusion. | 13. Radish-color. |
| 15. Dark-gray. | 17. Yellow, "not so glorious as 7." |
| 20. Cadet-blue. | 18. "Almost old-gold." |

The radish-color of 3 is identical with that of B. The sunshine-yellow of S and L is that of 7 and 8. Notice in Alice later it recurs; it is plain that the L sound prevails. The influence of the first part of all the "teens" is plain in the above list.

Long lists of names were given in each test, and to all the answers came immediately and definitely. Forty-one names occur in all three lists. Of these only five can be considered variable at all. They are as follows:

- | | | |
|-----------------------------------|-----------------------|---------------------|
| 1893. | 1891. | 1887. |
| Nancy—Dull-red. | Dark-dirty-radish. | Whitish-brown. |
| Susan—Bright-blue, (with yellow). | Radish (with yellow). | Blue (with yellow). |
| William—Faded-light-red. | Gray (buff tint). | White (red edged). |
| Clifford—Light brown (and corn). | Light-gray (and buff) | Gray. |
| Moses—Red (yellow lining). | Pale-red (and yellow) | White and gray. |

Out of the forty-one, Moses is the only real disagreement. Notice how sounds combine and control. The N in Nancy is clearly

the red or brown foundation. S gives a yellow always in Susan. The yellow lines for S in Moses appear on the red ground of M. We have not room of course for the whole name list, but here are some of the simpler cases:

Mamie—Yellowish-red.	John—Vandyke-brown.
Julia—Radish-color.	Henry—Gray-blue.
Minnie—Light-red.	Harry—"A bright luminous blue."
Laura—Light-yellow.	

Fringes, crosslines, cloud tints occur, and always interestingly.

Mary—"Pearl white, suggestive of red lines."

Jane—"A deep sombre uncompromising green."

Caroline—"Thin but clear deep, bright blue, showing sunshine lines behind."

Frederick—"Brown made lighter and colder by white."

Moses—"Red, with fine lines of yellow."

Joseph—"Gray, with slight, fine lines of corn-color and black."

It is frequently in these detailed cases that the agreement between different observations is the most striking.

In closing we desire to add a few notes made on blind subjects at the State College for the Blind, Vinton, Iowa, in 1887. We seemed to find among the congenital blind absolutely no conception of color, and no tendency to imagine it in terms of other sensations. On the other hand we believe that those who have become blind in childhood, after learning colors, very soon come to perceive color sensations in their hearing. We examined perhaps a dozen. Of these, three were born blind, or were blind from infancy. Of the rest, at least three had color hearing to a marked degree. The most interesting case was Miss N. This lady had pseudo-chromesthesia before she became blind. Musical notes are colored to her:

Do—Brown.	La—Dark-red.
Re—Gray.	Si—Light-clear-yellow.
Mi—Light-red.	Do—Lighter brown than lower Do.
Fa—Black.	
Sol—Real white.	

The alphabet is colored, also numbers. In her case color is plainly associated with a mental *picture*, for 10 is colored white (1) and black (0), and 11 is very white. So words and names are colored from their component letters. Ink is white (I), green (N), yellow (K). The tones of musical instruments are colored. Thus: the

Violin—Red.	Guitar—Blue-purple.
Clarinet—Reddish-yellow.	Flute—"Diamond clear."
Piano—Low notes, black; high notes, clear, like crystal or yellow glass.	Harp—Brown and blue.
	Banjo—"Almost like violin, but darker."

Voices are distinctly colored: my own was "brown and gray, real light," while my little boy companion spoke in "real dark brown" tones. The months are colored and I could not detect any association influence from sky or weather. The color-sound and mental-imagery of the blind is, I am convinced, an interesting special field of study.

PROF. FREDERICK STARR.

The article in Vol. V, No. 2, of this JOURNAL concerning the experiments conducted under Prof. Jastrow's direction in reference to our estimation of verticals and angles, leads me to think that an observation of my own, which I have not seen recorded by any writer, may not be without interest to the readers of this JOURNAL.

Let the experimenter prepare a large sheet of paper thus: Set this in some convenient position, with its lower line horizontal against a dark background, the paper itself being well illuminated. The observer's eyes themselves should be screened from strong light. Let the observer lie down, resting on the left side, facing the paper, the plane of which must be about perpendicular to the line of vision.

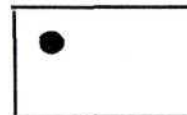


FIG. 1.

Let him gaze at the black spot steadily for as long as may be necessary to obtain a strong *after-image*. This will be *thought* as shown in Fig. 2.

Let the observer now, with eyes still closed, roll over to the right; he will find that he *thinks* the image turning on an axis in the same direction, and when he reaches a position in which he is lying on his back he will *think* the position of the image as seen in Fig. 3.

If he turns still further until he is lying upon his right side, having made a $\frac{1}{2}$ revolution, he will *think* the image as presented in Fig. 4, it having made only a $\frac{1}{4}$ revolution.



FIG. 2.



FIG. 3.



FIG. 4.

If he turn with face down he will think the image as seen in Fig. 5.

If he turn one more quarter, one would suppose from what has preceded that he would think the image as shown in Fig. 6; but in fact somewhere between Figures 4 and 5 there is a change, and when he reaches the end of this last $\frac{1}{4}$ turn the image is thought as it was when he originally lay in this position on his left side. See Fig. 7.



FIG. 5.



FIG. 6.



FIG. 7.

This simple experiment seems to me to indicate that our judgments of verticality are determined largely by relation of our retinal images with the consensus of the feelings involved in balance or relation of our whole mass to the direction of the force