

ARE CHROMÆSTHESIAS VARIABLE?

A STUDY OF AN INDIVIDUAL CASE.¹

By Professor F. B. DRESSLAR, University of California.

In the spring of 1895, while making some psychological experiments with a class of normal school students, it became evident to me that one member of the class, an intelligent young woman, had in some way developed a large number of color associations. Upon questioning her carefully, so as to avoid as far as could be all possibility of suggestion, I also found that she had clearly marked 'forms' for number series, for days of the week, months of the year, hours of the day, in fact for all associated groups of figures, letters, or names. She was as much interested in finding that the other members of the class did not image as she did, as they were in learning of the mental imagery which she employed.

After some preliminary study of her subjective color sensations, it occurred to me to institute a series of tests to determine what changes, if any, her associations of this kind would undergo. It was plain in the beginning that the experiments would have to cover a number of years, and that a considerable space of time would have to elapse between each test in order to eliminate the element of memory. It was found, too, after beginning the work, that the tests to be of real value must be of short duration; that is, the element of mental fatigue must not be introduced. It was noticeable that, in order to make any careful estimate or judgment of the exact color sensation attendant upon a given image, the subject was compelled to discriminate very carefully and at the expense of a good deal of mental energy. For example, it was easy for her to decide at once that a given name was "reddish," but when she was

¹ Much good work has been done upon chromæsthesia and kindred topics in the last few years, but not so much, the writer trusts, as to make the record of repeated tests at long intervals upon a single subject without interest.

pressed to describe in detail, notwithstanding objective standards were at times furnished, it seemed to impose upon her a severe mental strain, and one which, if persisted in for any considerable length of time, would introduce the disturbing element of fatigue.

After some preliminary tests, the work began with observations on a list of common Christian names. These were selected because it was found that the color feeling associated with them seemed quite marked, and in a way, influential. That is to say, there seemed to be a personal element in names which was lacking in the case of other words; and this had apparently helped to make the associations clear. This last statement, however, must be understood as in no sense representing the result of serious investigation. It represents a conviction arrived at during the preliminary tests. It would have introduced into the work a great many difficulties in the way of suggestions, if any other plan had been pursued. Later results showed the necessity of this precaution. And it may not be out of place to say that throughout the whole investigation much care has been taken to prevent suggestion.

The following list of names was taken for the first tests, and, in order to have some generally accessible standard with which to compare impressions, the colors given on page 1723, Vol. II, of the Standard Dictionary were taken. As will be seen, however, these were insufficient in variety of colors, tints, and shades, and in a few cases other standards were introduced.

The method used in these first tests consisted in announcing the names to the subject while she found an objective color to match that associated with the name. In these tests she saw neither the whole list of names nor the records of the matchings made. For each of the three tests here tabulated the names were presented in a different order, and in no case alphabetically. They have been here uniformly arranged, merely to make the comparison of results easier.

Records 4 and 5 belong, chronologically, to the series arranged above, as has been indicated; but owing to the fact that the color chart in the dictionary was not taken as a standard in either of these tests, it seems better to tabulate the results separately, while the words are arranged in the same order.

	FIRST RECORD, JULY 2, 1895.	SECOND RECORD, AUG. 3, 1895.	THIRD RECORD, AUG. 10, 1895.	* SIXTH RECORD, MAR. 11, 1903. * See below for fourth and fifth series.
ANNIE,	(See Standard Dictionary Color Chart, Vol. II, p. 1723.) Melon.	Melon with a single tissue paper over it.	Orange with double tissue over it.	Orange with double tissue. "It seems uncertain."
CECILIA,	(Indefinite.)	(Very little color.)	About the same as the margin of the leaf of the Dictionary.	
CHARLES,	Straw with tissue† over it. "It is a dull shade." († Always the tissue leaf found in the Dictionary at this place.)	Straw with tissue.	Canary with tissue.	Straw with double tissue over it.
CHARLIE,	Light yellow with tissue.	Straw with thin tissue. "Lighter than Charles."	Straw with tissue.	Straw with double tissue, "but much lighter."
CORNELIA,	(Not clear.)	(Indefinite.)	Lemon with a thick and a thin bit of tissue over it.	Straw with single tissue over it.
DORA,	Cherry with tissue over it.	Pink with thin tissue over it.	Clear melon with tissue over it.	Pink with tissue over it.
EDITH,	Light bluish gray. (Not on Chart.)	Bluish gray with tissue over it.	Light bluish gray.	Light bluish gray, "Nothing like it in the Dictionary."
EDNA,	Light bluish gray.	Bluish gray with tissue over it.	Light bluish gray.	Turquoise with double tissue over it. "But lighter, with more gray in it."

370

DRESSLAR:

[634

ELIZABETH,	Bluish gray, Pacific.	(Unable to decide.)	(Indefinite.)	Robin's-egg blue with double tissue, "but needs a little more gray."
EMMA,	Light yellowish white.	Light yellowish.	Margin of the leaf of the Dictionary with tissue over it.	Straw with double tissue over it, "but should be lighter."
ESTHER,	(Unable to decide.) "Seems indefinite."	(Indefinite.)	Salmon pink with double tissue over it. "It grew redder."	Salmon pink with double tissue over it.
GERTRUDE,	(No decision.)	Y of the normal spectrum with light tissue.	Y of the normal spectrum with double tissue over it.	Lemon with double tissue. "Better if the color were in liquid."
GODFREY,	O in the lowest strip of the color spectrum with tissue over it. "It has a reddish cast."	Melon with tissue over it.	Salmon pink with tissue over it.	Y O of the lowest strip of the color spectrum.
HELEN,	Bluish gray. "More bluish than Elizabeth."	Bluish gray "when in a darkened room."	Bluish gray. "About the color of the cover of the Eclectic Magazine when in a shadow."	Turquoise. "But it ought to be duller and have more blue in it."
HENRY,	(No decision.)	(No record taken.)	Dull gray, tinted with blue.	Gray with tissue over it. "Lower parts of E and H lighter."
JACK,	Black. "Color of the letters when made with printers' ink."	(No record taken.)	Black "like printers' ink."	Gray with tissue. "But needs more black in it so as to look like black ink."
JAMES,	(No record.)	"James does not feel active to-day and hence do not want to decide on it."	O of the normal spectrum with light tissue.	Brown with double tissue.

[635]

ARE CHROMASTHESIAS VARIABLE?

371

JANE,	(No record.)	(No record.)	"It is the color of a light roan horse and a dismal color." (Nothing like it in the dictionary.)	Apple green with double tissue. "But needs to be a little darker."
JESSIE,	Pink with tissue over it.	(No record.)	Pink with double tissue.	Scarlet with double tissue.
JOHN,	"Yellowish brown."	Yellowish brown with light tissue.	Yellowish brown with light tissue.	Coffee with single tissue over it. "But needs more brown."
JULIA,	(No record.)	(No record.)	Vg of the lower line of spectrum colors. "Yellowish green, like sage."	Olive green with single tissue. "But lighter and more like sage."
MARY,	"Indistinct shade of red."	Terra cotta with tissue over it.	Red I, with tissue over it.	Rose with double tissue. "It would be better were it duller."
MAUD,	"Like lustrous black morocco leather."	Gobelin blue with tissue over it.	Gobelin blue with tissue. "But a little blacker."	Olive green with double tissue. "But needs to be blacker."
MINNIE,	Nile green with tissue over it.	Blue with double tissue over it. "But should be darker."	Antwerp blue with tissue over it.	Gobelin blue with double tissue over it.
OTIS,	(No record.)	Salmon	"Light yellow scratch paper, with tissue paper held a little above it."	Straw with double tissue over it. "But some lighter, and the last part containing a shade of red due to the S."
OTTO,	"White of a yellowish cast." (Not in the dictionary.)	(No record.)	(No record.)	Straw with double tissue over it.

372

DRESSLAR :

[636

SAMUEL,	(No record.)	"Not clear but somewhat reddish."	II in the normal spectrum, in faint side of band with tissue placed over it.	
SARAH,	Dull faded terra cotta. "But lighter than that shown in the dictionary."	Scarlet with tissue above it.	(No record.)	Salmon pink with double tissue over it.
THOMAS,	(No record.)	(No record.)	Nile green with double tissue over it.	"Like ordinary black ink."

637]

ARE CHROMESTHESIAS VARIABLE?

373

Records 4 and 5 represent the attempt of Miss S. to match her subjective color sensations for the names with an objective series of colors, which she herself painted, pasted, or pencilled. Record 4 was made in the following way. The list of names, irregularly arranged on the left margin of the page, was furnished her. She then constructed opposite each name and in the middle of the page, a band of color matching her color association for the name. Record 5 was taken nearly three years later, and in the following way: The names on the left margin being concealed, she was asked to write, on the right margin opposite each color band, a name that would correspond in color to it. No list of names was furnished her for record 5, and hence any possibility of remembering her former matchings was reduced to a minimum.

It would have been better if these color representations could have been reproduced here just as she made them, but as this seemed a practical impossibility, it was thought best to have the matchings made by one wholly unacquainted with the tests, and in this way to be able to approximate the colors as originally made. In pursuance of this plan, Dr. F., a man skilled in color discrimination, was asked to take the original colors and match them with the colors in the dictionary. The reader can, therefore, by following the directions given in the spaces originally occupied by the color bands, reproduce very nearly the colors that were made by Miss S.

Immediately after record 4 was made Miss S. undertook to describe her introspection for these name colors. Herewith I append a part of this description, for the sake of its bearing on the whole experiment:—"I see the names in just about the colors indicated. When I think of the name Edith, for example, I see it as it appears written, and it is colored a bluish gray. The colors are all soft, as if seen in a mellow evening light. It seems impossible to show by colors, or express in words, the exact truth of the coloring. I see the name Gertrude as it appears written. The letters are pale yellow with a little tracing of brown. Jessie is a mixture of light with some shade of red, but it is not decided. It is very much like the color of this stamp just above the word farming. (Here was inserted a two cent postage stamp of the Buffalo Fair va-

riety.) The names, except Gertrude, do not appear as if written in colored ink. While I see them as they look written, the color is around them and seems a part of them. They are almost like objects."

From a study of these records it will be seen that there are several interchanges of these names, but in no case do the colors assigned to any one name differ materially. Taking into consideration the whole run of the experiments, and also the subject's analysis of her own consciousness, there seems to be no doubt of the fact that the variations here shown are due to inability to make exact matchings, rather than to any change in the subjective color sensations. For example, the color band that was made to suit her association for the name Edith, in test 4, is judged in test 5 to represent Helen. But it will be seen that the difference in color for these names has in all tests been very inconspicuous, and consists simply in a slightly differing shade of gray. The same general fact will be noticed in the other interchanges.

RECORD 4. Sept. 16, '98	MATCHINGS OF COLORS IN THE DICTIONARY WITH THOSE CORRESPONDING TO NAMES SET OPPOSITE. (See explanation in the text.)	RECORD 5. July 23, '01.
EDITH,	Dove—with a single tissue over it; but a little bluer and lighter.	HELEN.
EDNA,	Gray—with a single tissue over it; but duller.	EDITH.
DORA,	Cherry—with single tissue over it.	DORA.
ANNIE,	Red I—with single tissue over it.	ANNIE or SAMUEL.
MINNIE,	Gobelin blue—but a little lighter.	MINNIE.
OTTO,	White margin of Dictionary; but a little more yellow.	CECILIA.
GODFREY,	Melon—with a single tissue over it; but a shade darker.	SARAH.
MAUD,	Gray—but a little warmer.	MAUD.
HENRY,	Coffee—but lighter and not so solid.	JAMES.
JAMES,	Café-au-lait (very nearly).	JANE or JULIA.
JOHN,	Brown—but less massive.	JULIA.

SAMUEL,	Salmon pink—with single tissue, but a pink.	SAMUEL.
THOMAS,	Dove—with single tissue, but not so solid.	THOMAS.
MARY,	Cardinal—single tissue over it.	DORA. (Not quite.)
CHARLIE,	Fawn—with single tissue, but paler.	CHARLES.
HELEN,	Turquoise—single tissue, but a little paler.	HELEN.
EMMA,	The color of the margin of the Dictionary.	OTTO.
JACK,	The color of good black ink.	JACK.
CHARLES,	Straw—with single tissue.	CHARLES.
CECILIA,	Margin of the Dictionary, but whiter.	OTTO.
CLAUD,	Margin of the Dictionary, but more yellow.	EMMA.
CORNELIA,	Pearl gray—with single tissue, but a little lighter.	"Not active."
JULIA,	Ochre—but greener.	JULIA OR JANE.
ELIZABETH,	Turquoise—with single tissue over it.	EDITH. (Not so dark.)
ZORA,	Gobelin blue—but a little lighter and less blue.	MAUD.
LIZZIE,	At BBG, in the third line of spectrum colors.	LIZZIE.
SARAH,	At ORO, in the third line of the spectrum colors.	DORA OR SAMUEL.

COLOR ASSOCIATIONS FOR LETTERS.

Early in the experiment, the hint came that the color sensations connected with names, or with words in general, were closely related with the colors associated to the letters composing the words. A month later than the first of the three tests tabulated above, a record of the associations for the different letters of the alphabet was taken, in the same manner as that described for words. The letters were not given in their order, as arranged here, but were mixed up indiscriminately. They have been arranged in their customary order simply for convenience.

	FIRST RECORD, AUG. 1895. Dictionary chart used as standard.	SECOND RECORD, SEPT. 1898. Descriptive. No objective standard used.	THIRD RECORD, JULY, 1901. Descriptive. No objective standard used.	FOURTH RECORD, APRIL 13, 1903. Dictionary chart used as standard.
A.	Pink—with tissue over it. "About the color of Annie."	"Reddish."	"Light color."	Salmon pink with double tissue over it; "but a little duller."
B.	Light blue. (Probably an error.)	"Yellowish brown."	"Blackish."	"Like ordinary black ink;" but lighter.
C.	"White."	"Cream."	"Pale cream."	"Light cream color."
D.	"Dark—a very dark brown."	"Brownish black."	"Dark."	Brown with double tissue. "But needs more black."
E.	Bluish gray, "like Elizabeth."	Grayish blue; "like Edna and Edith."	"Light gray."	"Very light bluish gray."
F.	"Dark, like printer's ink."	"Black."	Black—"has a denser appearance than T."	Between a "brownish black" and Gobelin blue with a single tissue over it.
G.	I—in normal spectrum.	"Yellowish red like Godfrey."	"Yellowish red."	Drab—with single tissue.
H.	Ecru—"with heavy tissue over it."	"Color of the name Henry."	(No record.)	"Like ordinary black ink."
I.	"Dark like ink."	"Dark like ink."	"Black, but not dead black."	"About the color of black ink."
J.	"Dirty greenish yellow, something like the color of Julia."	"When I first think of J, it is something like the color of sage; but it soon becomes black like ink."	"Dull black."	"Brownish, with dark sage green cast."

K.	Sapphire—with heavy tissue over it. "It is dark with a little blue. It is related to Kate."	"Deep gray blue."	(No record.)	"Like blue-black ink."
L.	"Printer's ink, but immediately verges toward the color of Lizzie, and yet it is not quite so bright as that name."	"Bluish black."	"Bluish."	"Bluish black ink."
M.	"About the same color as printer's black ink."	"Dark like ink."	"Bluish black."	Gobelin blue with double tissue over it. "A little duller."
N.	"Black like printer's ink."	"Dark."	"Dark like ink."	"Brownish black ink."
O.	"White with a very light yellow tinge."	"White."	"Light."	"About the color of water."
P.	Nile green—with heavy tissue over it. "And then a little green added."	"Something of a blue."	"Dark; not clear to me."	Peacock-blue with double tissue over it.
Q.	Between 9 and Fawn, "but nearer 9."	"Greenish yellow."	"Soft tan; but am conscious that this is not a good description."	Lemon with double tissue; "but duller."
R.	"Black-brown—with a slight reddish cast."	"Brown."	"Blackish but not like B."	"Brownish-black ink."
S.	Orange—with tissue. "Pretty red."	"Red—something like Dora and Samuel."	"Red—something like Samuel."	Salmon pink with double tissue over it.
T.	"Dark like heavy print."	"Black."	"Black like Thomas."	"Like black ink."
U.	"Color not clear."	"Something like W."	"Brownish."	

378

DRRSIAR :

[642

V.	Cyan-blue, with heavy tissue over it. "This is still a little too light."	"Dark."	"Something like W."	Gobelin blue with single tissue over it. "But a little blacker."
W.	"It has no definite color, but gives me a sort of liquid impression, as if produced by an easily flowing sound."	"Like watery ink."	"Watery black."	
X.	"Dark—no particular color. Somewhat like print on a page."	"Dark."	"Dark."	"The color of brownish black ink."
Y.	Fawn—with heavy tissue over it. "Not quite so decided."	"Dark like ink."	"Some dull color with mixture of dull yellow."	Ochre with double tissue over it. "But darker."
Z.	Lustrous black with a cover of heavy tissue. "Much like the dark stripes on a zebra."	"Color of a zebra."	"Changing from dark to light."	Gobelin blue with a single tissue over it.
&	"Very light bluish gray; fresh looking."	"Light, almost white."	(No record.)	

[643

ARE CHROMESTHESIAS VARIABLE?

379

The color charts in the Standard Dictionary did not, as in the case of words, furnish sufficient variety in colors, shades, and tints, to match all the letters. In these cases other means have been employed to describe the associations.

Near the close of the work I prepared the following list of questions, with a view to getting whatever help or caution the answers to them might disclose or suggest.

QUESTIONS.

1. What is the difference in your feeling, if any, in looking at a real color and thinking of a name with the same color?

Answer. A name color seems to be nearer to me; it seems more a part of me than the real outside color.

2. Do you see a name in color when you look at it as it appears written on a page with ink or pencil? *Answer.* No. It is an internal feeling, and is purely imaginary.

3. Do these associations influence your preference for names? *Answer.* They do. I do not like those names associated with the reds. I like bluish names. On the whole, however, my love for a name grows with love of the person bearing it.

4. Is there an æsthetic desire to see a person wear clothing of a color that will go well with the name color of that person? *Answer.* No. But there is a desire to see the name color and the complexion harmonize.

5. Does the color of a name influence your feeling toward the person bearing that name? *Answer.* No, not that I am conscious of.

6. Do these subjective color sensations come out brighter when your eyes are shut? *Answer.* Yes. I really seem to see the colors better; but I feel that the difference is due to the removal of other stimuli. It helps to get the light out of my eyes. Then it is necessary to concentrate my attention to get good color feeling in certain cases, and I can concentrate better when all conflicting stimuli are put aside.

7. Have you any regular associations coming up along with those of color? *Answer.* I have not.

8. Are you conscious of being troubled by these color associations at any time? *Answer.* They do not trouble me.

On the other hand they have been, and now are, a source of great pleasure and much help.

9. When you think of a name does it seem to occupy any special place or direction? *Answer.* I see most names about an arm's length in front of me. I see Samuel out in the air and in the direction in which he lived. When I think of the name Godfrey it is to my right and a little further away than Samuel.

10. Are you conscious of the names being a mixture of the colors of the letters composing it? *Answer.* I am very conscious that this is the case.

11. Does the position of a letter in a name give it special influence in shaping the color of a name? *Answer.* When the initial is a letter which has a decided color, it tends to color the whole name. Otherwise the letter of the most decided color will influence most.

12. Are you conscious of any changes taking place in your color associations for names or letters? *Answer.* The color of *s* seems to be changeable.

13. Do you know which first came to be associated with color—names, or letters? *Answer.* I do not.

14. Do the letters composing a word, or the digits making up a larger number, always fuse into a solid color, or do their colors remain dissociated to any degree? *Answer.* They do not always fuse into a solid color. [It will be seen that the solidity of the color depends on the dominating influence of some one or more strongly colored letters making up the word.]

15. Is your color association for a word the same when you call it up in memory as when you look at the word written or printed? *Answer.* No; the color is more marked when I merely think of a name, than it is when I see it written or printed.

16. Are you conscious of color associations with all kinds of words? *Answer.* I am.

17. Have you any color association for tones when not connected with words? *Answer.* I have a keen perception of difference in tones, but have no colors to correspond.

18. Is the color of a word influenced in any way by the quality of the tone used in speaking? *Answer.* It seems to

be. [I found by experiment that at times a harshly spoken word produced what the subject described as a "ragged appearance of the letters and colors;" while the same word spoken in a mild quiet voice had no such effect. In the latter case not only did the letters seem less irregular, but they were also inclined to take the script form in a smooth flowing hand.]

GENERAL SUMMARY.

1. During a period of time covering nearly eighty years, there have been no appreciable changes in the color feelings of this subject for the letters of the alphabet or for the names used in the tests.
2. The color of a name results from the mixing of the colors associated with the letters composing the name. But it will be observed that the initial letter and those having striking color characteristics dominate almost to the exclusion of those with weaker colors.
3. These color feelings are most pronounced when the nervous system is least fatigued, and when all objective stimulations are removed.
4. The subject of these experiments has experienced no inconvenience, so far as she can tell, from this striking mental tendency. On the other hand she thinks it has been of service to her.
5. These feelings are probably due to some form of suggestion, or direct perception, occurring in childhood, and have become fixed by habit.

ON THE GUESSING OF NUMBERS.

By Professor E. C. SANFORD, Clark University.

The psychology of Belief has received some attention from psychological writers, but the psychology of Guessing—the formation, in the absence of adequate data, of estimates and opinions about the ordinary affairs of life—has not often been considered. A thorough-going study of it might, however, be expected to throw light upon some of the less obvious, and perhaps unconscious influences, that determine opinion and action. The discussion which follows is a fragment of such a study with reference to a sort of guessing of which instances are particularly easy to obtain in quantity, the guessing of numbers in "Guessing Contests."

This field is not wholly a new one. Professor F. B. Dresslar has contributed to the *Popular Science Monthly* (Vol. LIV, 1898-99, pp. 781-786), a study on "Guessing, as Influenced by Number Preferences," based upon the guesses recorded in a "guessing contest" upon the number of seeds contained in a monster squash. Professor C. S. Minot reports in an early number of the *Proceedings of the American Society for Psychical Research* (Vol. I, 1885-89, pp. 86-95), an investigation of "Number Habit," which, though making use of material from quite a different source, bears upon the same general question. Still others have written with reference to number habit or number preference as these appear in the census returns and in judicial sentences. To these special reference will be made below.

The material for the present study was derived from a "guessing contest" conducted for advertising purposes by a Worcester dealer in photographic supplies, the prize being a valuable camera. The guesses were upon the number of beans in a "five pint" bottle filled to the cork with small white beans and conspicuously displayed in the show window. Customers were given with their purchases cards with places