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

¹Much good work has been done upon chromesthesia 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.
<table>
<thead>
<tr>
<th>Name</th>
<th>Description/Color</th>
<th>Record Date</th>
<th>Result</th>
<th>Comment/Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ANKIE</strong></td>
<td>Melon.</td>
<td>JULY 2, 1895</td>
<td>First Record</td>
<td>*(See Standard Dictionary Color Chart, Vol. II, p. 1723.)</td>
</tr>
<tr>
<td><strong>CECILIA</strong></td>
<td>(Indefinite.)</td>
<td>AUG. 3, 1895</td>
<td>Second Record</td>
<td>Melon with a single tissue paper over it.</td>
</tr>
<tr>
<td><strong>CHARLES</strong></td>
<td>Straw with tissue</td>
<td>AUG. 10, 1895</td>
<td>Third Record</td>
<td>Orange with double tissue over it.</td>
</tr>
<tr>
<td><strong>CHARLIE</strong></td>
<td>Light yellow with</td>
<td></td>
<td>*Sixth Record, MAR.</td>
<td>Orange with double tissue. <em>It seems uncertain.</em></td>
</tr>
<tr>
<td><strong>CORNELIA</strong></td>
<td>(Not clear.)</td>
<td></td>
<td>11, 1903.</td>
<td></td>
</tr>
<tr>
<td><strong>DORA</strong></td>
<td>Cherry with tissue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>EDITH</strong></td>
<td>Light bluish gray</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>EDNA</strong></td>
<td>Light bluish gray</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ELIZABETH</strong></td>
<td>Bluish gray, Pacific.</td>
<td>(Unable to decide.)</td>
<td>(Indefinite.)</td>
<td>Robin's-egg blue with double tissue, &quot;but needs a little more gray.&quot;</td>
</tr>
<tr>
<td><strong>EMMA</strong></td>
<td>Light yellowish white.</td>
<td>(Unable to decide.)</td>
<td>Light yellowish.</td>
<td>Straw with double tissue over it, &quot;but should be lighter.&quot;</td>
</tr>
<tr>
<td><strong>ESTHER</strong></td>
<td>(Seems indefinite.)</td>
<td>(Indefinite.)</td>
<td>Y of the normal spectrum with light tissue.</td>
<td>Salmon pink with double tissue over it, &quot;it grew redder.&quot;</td>
</tr>
<tr>
<td><strong>GERTRUDE</strong></td>
<td>(No decision.)</td>
<td>Y of the normal spectrum with double tissue over it.</td>
<td>(No decision.)</td>
<td>Lemon with double tissue, &quot;nothing like it in the Dictionary.&quot;</td>
</tr>
<tr>
<td><strong>GODFREY</strong></td>
<td>O in the lowest strip of the color spectrum with tissue over it. &quot;It has a reddish cast.&quot;</td>
<td>Y of the normal spectrum with double tissue over it.</td>
<td>(No record taken.)</td>
<td>Lemon with double tissue, &quot;better if the color were in liquid.&quot;</td>
</tr>
<tr>
<td><strong>HELEN</strong></td>
<td>Bluish gray, &quot;More bluish than Elizabeth.&quot;</td>
<td>Bluish gray, &quot;when in a darkened room.&quot;</td>
<td>Bluish gray, &quot;About the color of the cover of the Eclectic Magazine when in a shadow.&quot;</td>
<td>Turquoise, &quot;but it ought to be duller and have more blue in it.&quot;</td>
</tr>
<tr>
<td><strong>HENRY</strong></td>
<td>(No decision.)</td>
<td>Dull gray, tinted with blue.</td>
<td>(No record taken.)</td>
<td>Gray with tissue over it, &quot;lower parts of E and H lighter.&quot;</td>
</tr>
<tr>
<td><strong>JACK</strong></td>
<td>Black, &quot;Color of the letters when made with printers' ink.&quot;</td>
<td>Black, &quot;like printers' ink.&quot;</td>
<td>(No record taken.)</td>
<td>Gray with tissue, &quot;but needs more black in it so as to look like black ink.&quot;</td>
</tr>
<tr>
<td><strong>JAMES</strong></td>
<td>(No record.)</td>
<td>O of the normal spectrum with light tissue.</td>
<td>(No record.)</td>
<td>Brown with double tissue.</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
<td>Color Name</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>--------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>--------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Jane</td>
<td>Pink with tissue over it</td>
<td>&quot;It is the color of a light roan horse and a dismal color.&quot; (Nothing like it in the dictionary.)</td>
<td>Apple green with double tissue. &quot;But needs to be a little darker.&quot;</td>
<td></td>
</tr>
<tr>
<td>Jessie</td>
<td>Pink with double tissue</td>
<td></td>
<td>Scarlet double tissue.</td>
<td></td>
</tr>
<tr>
<td>John</td>
<td>&quot;Yellowish brown.&quot;</td>
<td>Yellowish brown with light tissue.</td>
<td>Coffee with single tissue.</td>
<td></td>
</tr>
<tr>
<td>Julia</td>
<td>(No record.)</td>
<td>&quot;Vg of the lower line of spectrum colors. &quot;Yellowish green, like sage.&quot;</td>
<td>Olive green with single tissue. &quot;But lighter and more like sage.&quot;</td>
<td></td>
</tr>
<tr>
<td>Mary</td>
<td>(No record.)</td>
<td>Terra cotta with tissue over it.</td>
<td>Red I, with tissue over it.</td>
<td></td>
</tr>
<tr>
<td>Maud</td>
<td>&quot;Like lustrous black morocco leather.&quot;</td>
<td>Gobelin blue with tissue over it.</td>
<td>Gobelin blue with double tissue over it.</td>
<td></td>
</tr>
<tr>
<td>Minnie</td>
<td>Nile green with tissue over it.</td>
<td>Blue with double tissue over it. &quot;But should be darker.&quot;</td>
<td>Antwerp blue with tissue over it.</td>
<td></td>
</tr>
<tr>
<td>Otis</td>
<td>(No record.)</td>
<td>Salmon</td>
<td>&quot;Light yellow scratch paper, with tissue paper held a little above it.&quot;</td>
<td></td>
</tr>
<tr>
<td>Otto</td>
<td>&quot;White of a yellowish cast.&quot; (Not in the dictionary.)</td>
<td>(No record.)</td>
<td>Straw with double tissue over it. &quot;But needs to be blacker.&quot;</td>
<td></td>
</tr>
<tr>
<td>Samuel</td>
<td>(No record.)</td>
<td>&quot;Not clear but somewhat reddish.&quot;</td>
<td>Salmon pink with double tissue over it.</td>
<td></td>
</tr>
<tr>
<td>Sarah</td>
<td>Dull faded terra cotta. &quot;But lighter than that shown in the dictionary.&quot;</td>
<td>Scarlet with tissue above it.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thomas</td>
<td>(No record.)</td>
<td>Nile green with double tissue over it.</td>
<td>&quot;Like ordinary black ink.&quot;</td>
<td></td>
</tr>
</tbody>
</table>
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-
### 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.

<table>
<thead>
<tr>
<th>Letter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Light blue (blue-gray)</td>
</tr>
<tr>
<td>B</td>
<td>White (atmospheric gray)</td>
</tr>
<tr>
<td>C</td>
<td>Dark — a very dark brown</td>
</tr>
<tr>
<td>D</td>
<td>Black (like printer's ink)</td>
</tr>
<tr>
<td>E</td>
<td>Black (ink)</td>
</tr>
<tr>
<td>F</td>
<td>Black (ink)</td>
</tr>
<tr>
<td>G</td>
<td>Corn with heavy thickenings and over-inked (Color of the name Helen)</td>
</tr>
<tr>
<td>H</td>
<td>Dark like ink</td>
</tr>
<tr>
<td>I</td>
<td>Dirty greenish yellow, something like the color of Julia</td>
</tr>
<tr>
<td>J</td>
<td>Salmon pink — with single tissue, but a little paler</td>
</tr>
<tr>
<td>K</td>
<td>Green</td>
</tr>
<tr>
<td>L</td>
<td>Olive green — with single tissue, but a little paler</td>
</tr>
<tr>
<td>M</td>
<td>Yellowish red</td>
</tr>
<tr>
<td>N</td>
<td>Yellowish brown</td>
</tr>
<tr>
<td>O</td>
<td>Red</td>
</tr>
<tr>
<td>P</td>
<td>Bright red</td>
</tr>
<tr>
<td>Q</td>
<td>Brown</td>
</tr>
<tr>
<td>R</td>
<td>Black</td>
</tr>
<tr>
<td>S</td>
<td>Brown</td>
</tr>
<tr>
<td>T</td>
<td>Black</td>
</tr>
<tr>
<td>U</td>
<td>Black</td>
</tr>
<tr>
<td>V</td>
<td>Black</td>
</tr>
<tr>
<td>W</td>
<td>Black</td>
</tr>
<tr>
<td>X</td>
<td>Black</td>
</tr>
<tr>
<td>Y</td>
<td>Black</td>
</tr>
<tr>
<td>Z</td>
<td>Black</td>
</tr>
</tbody>
</table>

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### Example of Color Associations 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.

- **Julia**
  - Ochre — but greener.
- **Lizzie**
  - At BBG, in the third line of spectrum colors.
- **Zora**
  - Gobelin blue — but a little lighter and less blue.
- **Charles**
  - Straw — with single tissue.
- **Claud**
  - Margin of the Dictionary, but more yellow.
- **Cornelia**
  - Pearl gray — with single tissue, but a little lighter.
- **Julia**
  - Ochre — but greener.
- **Elizabeth**
  - Turquoise — single tissue over it.
- **Zora**
  - Gobelin blue — but a little lighter and less blue.
- **Lizzie**
  - At BBG, in the third line of spectrum colors.
- **Sarah**
  - At ORO, in the third line of the spectrum colors.
- **Dora**
  - Mauve — with single tissue over it.
- **Samuel**
  - Salmon pink — with single tissue, but a little paler.
- **Thomas**
  - Dove — with single tissue, but not so solid.
- **Mary**
  - Cardinal — single tissue over it.
- **Charles**
  - Fawn — with single tissue, but paler.
- **HeLEN**
  - Turquoise — single tissue, but a little paler.
- **Emma**
  - The color of the margin of the Dictionary.
- **Jack**
  - The color of good black ink.
- **Charles**
  - Margin of the Dictionary, but whiter.
- **Claud**
  - Margin of the Dictionary, but more yellow.
- **Cornelia**
  - Pearl gray — with single tissue, but a little lighter.
- **Julia**
  - Ochre — but greener.
- **Elizabeth**
  - Turquoise — single tissue over it.
- **Zora**
  - Gobelin blue — but a little lighter and less blue.
- **Lizzie**
  - At BBG, in the third line of spectrum colors.
- **Sarah**
  - At ORO, in the third line of the spectrum colors.
- **Dora**
  - Mauve — with single tissue over it.
- **Samuel**
  - Salmon pink — with single tissue, but a little paler.
- **Thomas**
  - Dove — with single tissue, but not so solid.
- **Mary**
  - Cardinal — single tissue over it.
- **Charles**
  - Fawn — with single tissue, but paler.
- **HeLEN**
  - Turquoise — single tissue, but a little paler.
- **Emma**
  - The color of the margin of the Dictionary.
- **Jack**
  - The color of good black ink.
- **Charles**
  - Margin of the Dictionary, but whiter.
- **Claud**
  - Margin of the Dictionary, but more yellow.
- **Cornelia**
  - Pearl gray — with single tissue, but a little lighter.
- **Julia**
  - Ochre — but greener.
- **Elizabeth**
  - Turquoise — single tissue over it.
- **Zora**
  - Gobelin blue — but a little lighter and less blue.
- **Lizzie**
  - At BBG, in the third line of spectrum colors.
- **Sarah**
  - At ORO, in the third line of the spectrum colors.
- **Dora**
  - Mauve — with single tissue over it.
- **Samuel**
  - Salmon pink — with single tissue, but a little paler.
- **Thomas**
  - Dove — with single tissue, but not so solid.
- **Mary**
  - Cardinal — single tissue over it.
- **Charles**
  - Fawn — with single tissue, but paler.
- **HeLEN**
  - Turquoise — single tissue, but a little paler.
- **Emma**
  - The color of the margin of the Dictionary.
- **Jack**
  - The color of good black ink.
- **Charles**
  - Margin of the Dictionary, but whiter.
- **Claud**
  - Margin of the Dictionary, but more yellow.
- **Cornelia**
  - Pearl gray — with single tissue, but a little lighter.
- **Julia**
  - Ochre — but greener.
- **Elizabeth**
  - Turquoise — single tissue over it.
- **Zora**
  - Gobelin blue — but a little lighter and less blue.
- **Lizzie**
  - At BBG, in the third line of spectrum colors.
- **Sarah**
  - At ORO, in the third line of the spectrum colors.
- **Dora**
  - Mauve — with single tissue over it.
- **Samuel**
  - Salmon pink — with single tissue, but a little paler.
- **Thomas**
  - Dove — with single tissue, but not so solid.
- **Mary**
  - Cardinal — single tissue over it.
- **Charles**
  - Fawn — with single tissue, but paler.
- **HeLEN**
  - Turquoise — single tissue, but a little paler.
- **Emma**
  - The color of the margin of the Dictionary.
- **Jack**
  - The color of good black ink.
- **Charles**
  - Margin of the Dictionary, but whiter.
- **Claud**
  - Margin of the Dictionary, but more yellow.
- **Cornelia**
  - Pearl gray — with single tissue, but a little lighter.
- **Julia**
  - Ochre — but greener.
- **Elizabeth**
  - Turquoise — single tissue over it.
- **Zora**
  - Gobelin blue — but a little lighter and less blue.
- **Lizzie**
  - At BBG, in the third line of spectrum colors.
- **Sarah**
  - At ORO, in the third line of the spectrum colors.
- **Dora**
  - Mauve — with single tissue over it.
- **Samuel**
  - Salmon pink — with single tissue, but a little paler.
- **Thomas**
  - Dove — with single tissue, but not so solid.
- **Mary**
  - Cardinal — single tissue over it.
- **Charles**
  - Fawn — with single tissue, but paler.
- **HeLEN**
  - Turquoise — single tissue, but a little paler.
- **Emma**
  - The color of the margin of the Dictionary.
- **Jack**
  - The color of good black ink.
- **Charles**
  - Margin of the Dictionary, but whiter.
- **Claud**
  - Margin of the Dictionary, but more yellow.
- **Cornelia**
  - Pearl gray — with single tissue, but a little lighter.
- **Julia**
  - Ochre — but greener.
- **Elizabeth**
  - Turquoise — single tissue over it.
- **Zora**
  - Gobelin blue — but a little lighter and less blue.
- **Lizzie**
  - At BBG, in the third line of spectrum colors.
- **Sarah**
  - At ORO, in the third line of the spectrum colors.
- **Dora**
  - Mauve — with single tissue over it.
| 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." |
| T. | "Dark like heavy print." | "Black." | "Black like Thomas." | "Like black ink." |
| U. | "Color not clear." | "Something like W." | "Brownish." | |

| 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. |
| S. | "Very light bluish gray; fresh looking." | "Light, almost white." | (No record.) | |
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 aesthetic 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.

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, 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