

IMAGERY AND LEARNING - A FURTHER STUDY.

A Thesis presented for  
the Doctor of Philosophy Degree

by

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June 1933.

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## ABSTRACT OF THESIS

### IMAGERY & LEARNING - A FURTHER STUDY

The research was a continuation of a study on the relation of non-verbal imagery to learning, with special reference to the use of visual images in the learning process. The new enquiry was planned to study the relation of the non-verbal imagery to learning when the material used was sense material as opposed to nonsense material.

The subjects, 6 adults and 4 children were required to learn series of 5 variants of the same shape associated with a nonsense name and of 5 examples of the same type of object associated with a sense name.

The learning of each series was tested by immediate recalls of the material on each learning occasion, and by general tests, one at the end of the learning periods and a second five weeks later.

- Findings
1. Words and especially analogy played the greatest part in recall.
  2. Concepts were important factors in learning.
  3. The amount of visual imagery reported was meagre.
  4. The children, in proportion to the number of correct recalls, reported more visual imagery than the adults. Their imagery tended to be of whole objects, and in some cases was of the eidetic type.
  5. The main cause of failure to recall was confusion either between the members of the same set or between the sets.

CONCLUSION. For recall of individual items from visual data which fall into classes visual photographic imagery is of less value than concepts, analogy, verbal description and other forms of words. This is independent of whether the individual items are what is called sense or nonsense material.

IMAGERY AND LEARNING - A FURTHER STUDY.

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## IMAGERY AND LEARNING - A FURTHER STUDY.

### AIM AND PLAN OF THE EXPERIMENTS.

This research was a continuation of a study on the relation of non-verbal imagery <sup>and</sup> learning, with special reference to the use of visual images in the learning process. The new inquiry was planned to study the relation of the non-verbal imagery to learning when the material used was sense material as opposed to nonsense material.

### MATERIAL.

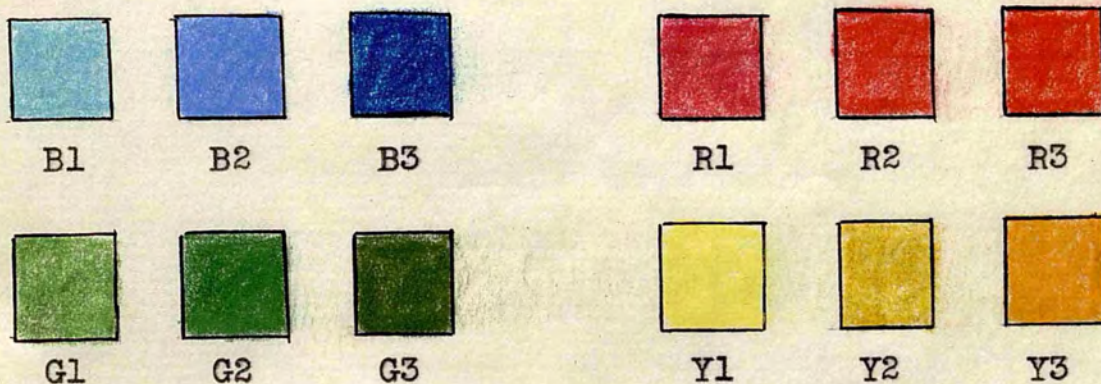
Two types of material were employed in these experiments, nonsense material and sense material. The nonsense material was that used in experiments the results of which were reported in a thesis presented for the Master of Arts degree. This nonsense material was based on that used by Dr Borislav Stevanovic and described in his paper "An Experimental Study of the Mental Processes involved in Judgment". It consisted of 50 drawings arranged in 2 series of 5 sets. Each set was made up of 5 variants of the same shape, obtained by drawing the shadow cast by a cardboard shape, held at different angles.

The sense material consisted of 25 coloured objects drawn on cardboard. They were arranged in 5 sets and the sets were made up of 5 examples of the same kind of object, lamps,



slippers, books, candlesticks, teapots. In both types of material each figure or object was on a white card of ordinary postcard size, had a black Indian ink outline and was coloured with crayon. The crayons used were made up in special boxes, each containing 3 shades of blue, of green, of red and of yellow. The colours are shown in Figure I and the actual one used for each shape and each object is marked on the photographs Figures II, III and IV, by the appropriate letter and number.

Fig. I.



Some of the subjects had difficulty in discriminating between R2 and R3 and therefore all the subjects were told that R2 and R3 would be considered as one shade. On each learning occasion two shades of some one colour were seen and one shade of each of the other colours. Every card had a cover which could be turned back to expose the coloured figure or object.

A nonsense name was given to each set of the nonsense material and a sense name to each set of the sense material the names being:-

Nonsense material. 1st series.	I	Borat
	II	Vineg
	III	Lutaf
	IV	Guber
	V	Feron

2nd "	I	Galef
	II	Zitad
	III	Poril
	IV	Rusep
	V	Benac

Sense material series.	I	Evening
	II	Comfort
	III	Leisure
	IV	Lighting
	V	Refresh.

Roman numerals denote the different sets of the series, while Arabic numerals indicate the number of the set, thus, in the Sense series for instance, the 5 variants of Evening may be denoted as  $I_1$ ,  $I_2$ ,  $I_3$  etc.; those of Comfort as  $II_1$ ,  $II_2$ ,  $II_3$  and so on.

The nonsense series will be termed the Borat series and the Galef series, while the objects will be termed the Sense series. The sets of the series with their respective names are shown below:-

Fig.II. Borat series.



Fig.III. Galef series.

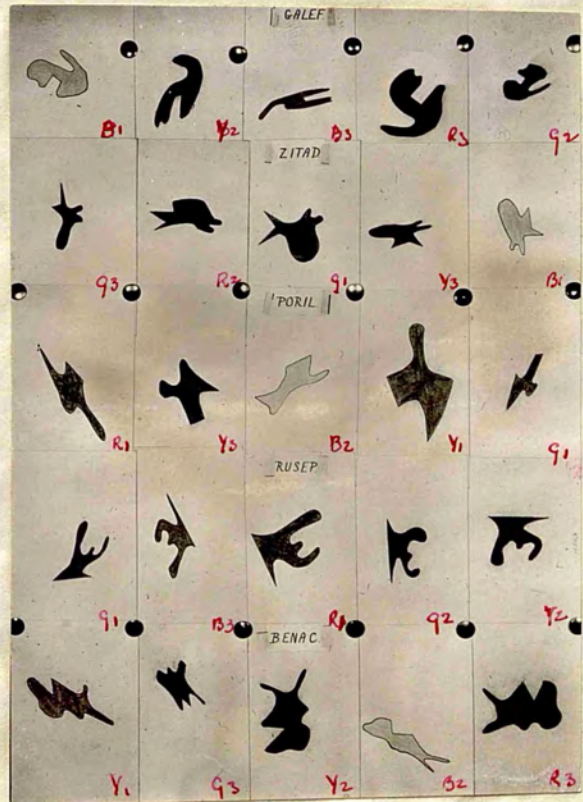
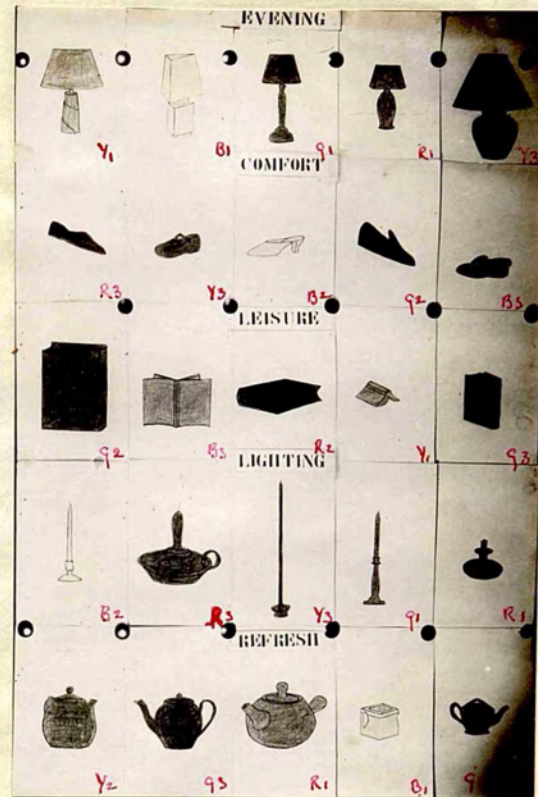
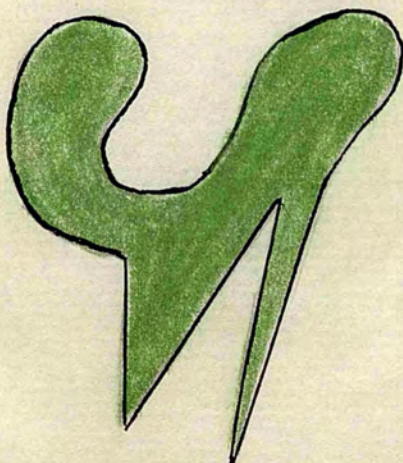


Fig.IV. Sense series.

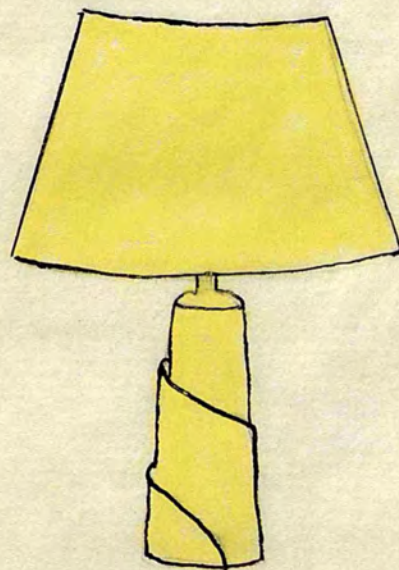


The facsimile of the first Borat and the first Evening appended shows the relative size of the figures given in the photographs.

Fig.V.



1st Borat



1st Evening

## SUBJECTS.

10 subjects took part in the experiments, 6 adults indicated by capitals A, B, C, D, F and I, and 4 children, indicated by small letters q, r, s, and t. The reason the capital letters are not consecutive is that three other adult subjects took part in the nonsense material experiments, which were reported previously but were unable to take part in the sense material experiments. None of the children from the previous experiments were included. As the sense experiments were carried out 3 years after the previous experiments, such a difference in the ages of the children would make a comparison of the sense drawings with their previous nonsense drawings of little value.

The four subjects q, r, s, and t were girls attending the St. Marylebone Central School, and were aged eleven when they began the experiments. They carried out all three series of experiments during 1930 and 1931. They had been selected to take part in the experiments without any knowledge of their abilities, but it soon became apparent that they were all girls of more than average general intelligence. In order to obtain some measure of their general ability they were tested with the Northumberland Standardised Tests, Test III. General Intelligence, 1925 series.

The ages of the girls at the time of the test and the marks obtained respectively therein are given in the

following table:-

TABLE I.

Subject	Age	Marks obtained
q	13 yrs 10 mths	286.5
r	13 " 10 "	297
s	13 " 9 "	298
t	13 " 1 "	289

From the table of norms for the tests these girls had each obtained a score above the norm for sixteen years, which is 282.

The girls were also tested with the Healy Completion Test II. With this test the three eldest obtained superior adult scores, while the youngest, t, was found to have a mental age one year in advance of her chronological age. No analysis of the data obtained from the adult subjects E, G, and H and from the children j, k, l, m, n, o and p is given in this paper, but the results obtained from them are used for purposes of comparison. All tables referring to the nonsense series for the adults make use of selected data from the tables given in the former thesis.

PROCEDURE.

To some extent the procedure was based on that used by

Dr Borislav Stevanović<sup>1</sup>. In all 3 series the plan of learning was that used in the previous experiments, viz:- The subject was seated at a table and the card with the name below it was placed on the table directly in front of her, the card and the name being covered. The instruction to the subject was: "I am going to show you five figures, (or objects, as the case might be). Each one has a name. You are to look at them attentively. At the end you will be shown the names alone in a different order, and will have to try and remember the figure that went with the name shown." The cover was turned back for the required length of exposure, the timing being done with a fifth second stop watch. A variant of each of the five sets was shown in this way. The order in which the figures were shown in successive learning periods was the following:-

TABLE II.

1st learning period			I <sub>1</sub> , II <sub>1</sub> , III <sub>1</sub> , IV <sub>1</sub> , V <sub>1</sub> .
2nd	"	"	I <sub>1</sub> , II <sub>1</sub> , III <sub>1</sub> , IV <sub>1</sub> , V <sub>1</sub> .
3rd	"	"	I <sub>2</sub> , II <sub>2</sub> , III <sub>2</sub> , IV <sub>2</sub> , V <sub>2</sub> .
4th	"	"	I <sub>2</sub> , II <sub>2</sub> , III <sub>2</sub> , IV <sub>2</sub> , V <sub>2</sub> .
5th	"	"	I <sub>3</sub> , II <sub>3</sub> , III <sub>3</sub> , IV <sub>3</sub> , V <sub>3</sub> . etc.

At the end of each learning period the subject's knowledge of the figures or objects shown was tested. Cards

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(1) *ibid.* p.1.

bearing the nonsense names of the shapes or the names of the objects were placed before the subject in irregular order and the subject was required to say "Yes" or to tap the table on obtaining any meaning for the word. This response time was recorded with a fifth second stop watch. The subject was then asked to draw the shape or object and colour it with crayon.

Each subject gave any introspective report she pleased of what took place either during the learning, or on being shown the name. The adults wrote down their own reports, but the children gave such introspections and comments verbally and they were taken down by the experimenter. In some previous group tests of imagery with children, the experimenter had found that the labour of writing descriptions of figures, such difficulties as actual manipulation of pen and paper and of spelling resulted in an inadequate account of the child's knowledge. This was one reason why the form of test chosen was an individual rather than a group test, and also why the children's accounts were written down.

#### Borat Procedure with Adult Subjects.

With the adult subjects the Borat series was the first undertaken. In this series the subjects were shown each figure for 15 seconds, and, after an interval of 3 minutes, were shown each one again for 10 seconds. After an interval of 10 minutes from the last exposure the subjects' knowledge was tested.



### General Procedure.

The sense series followed the Galef procedure of the previous experiments, so that in all the other experiments each figure was shown for 25 consecutive seconds, and the recalls followed immediately after the last exposure. This change in procedure had been introduced in order to make the records during the learning periods more closely dependent upon immediate memory. The tests at the end of the learning periods came to be termed the "immediate memory tests", although in the Borat series with the adults the term is not strictly applicable.

Seven of the subjects had 10 learning periods, i.e. the series was repeated twice. The other 3 subjects B, C and D continued their learning until they had had 15 learning periods in all 3 series.

### General Tests.

Test I. When the subjects had completed the learning of each series a general test was given of the whole material. Ten cards were shown, each card having on it one of the names qualified either by the colour or the position in the series, e.g. in the sense series: The Blue Refresh, The First Evening. As in the immediate memory tests response times were taken, and then the subjects were required to draw the picture and give introspections.

Test II. A similar general test was given after an interval of 5 weeks. No subject proceeded to a new series until after this second general test.

In all cases with the adults the order of the series was the following, the Borat, the Galef, the Sense, but with the children the Sense series came first, then the Galef and lastly the Borat series. This change in order allowed a comparison to be made between a nonsense series which had the Sense series as introduction and a nonsense which had been given without such experience; thus the Galef series of the present group of children could be compared with the results obtained from the same series, in the experiments previously reported.

The whole material for analysis obtained from the 10 subjects consisted of 2165 protocols, 1325 from the adult subjects and 840 from the children. Of the 1325 protocols from the adult subjects 990 were those obtained for the previous study viz. those relating to the Borat and the Galef series.

#### Marking.

A card index for the protocols was made, a card being included for every protocol.

On the cards were recorded the subject's name, the date on which the test was done and the marks gained. One mark

was given for each of the following traits:- colour, shade, shape, orientation of figure or object, size, position in series i.e. whether the first, the second, etc. to be shown, and the "correct identification" of the figure. Each figure or object was judged as either correct or incorrect in respect of each of the above, no fractions being allowed. An item omitted by the subjects was not recorded, but one wrongly given was marked 0.

Also on the cards were noted the images, the analogies, the evidence of confusion and of affect.

A specimen card is given on page 154.

#### Meaning of "correct identification".

The phrase "correct identification" is adopted throughout this paper to stand for the "correct recognition" of the former study, as the term "recognition" used thus was felt to be ambiguous. The meaning remained the same so that correct identification indicated that the experimenter was convinced that the subject, on being presented with the name, had the required figure in mind: thus if the shape and any other one feature were given correctly the figure was considered to be correctly identified. Sometimes in spite of the fact that the figure could not be drawn it was said to be correctly identified, for example, if the figure could be identified from the analogies employed by the subject, or,

if the orientation plus some other features referring to the shape was given by the subject. In all these cases some knowledge of the shape was essential. Examples of tests that were considered to be incorrectly identified and some of tests considered correct are given. The first incorrect and the first correct example are taken from the adults' protocols, the others from those of the children.

Incorrect identification.


"No recollection of shape. Colour  . Word connection which did not come quickly. Ferrara - Association as follows:- Ferrara - Italy - blue skies. Then came "marble" blue-veined marble - could not understand the connection - attention distracted from figure while trying to explain it. Explanation one of assonance between Ferrara and Carrera where marble quarries. Colour in connection with the words has meaning - the shapeless figure has none." (A. 1st Borat learning V.)

Fig. VI.



"All Galefs had a tail like this. Don't know that the 2nd went this way." (q. 1st Galef test II.)

Fig. VII.



"The third one. I don't know how I tried to learn it. I tried to pronounce the words." (r. 1st Galef learning III).

Correct identification.

"Vaguely remember picture, but insufficiently to draw it. Remember colour by its being similar to ferric chloride in colour and ferron reminds me of iron."

Fig. VIII.

(F. 3rd Borat learning. V.)

Fig. IX.

"Saw the colour in my head. I knew this bit of shape all along. Only know the one side. Is like one of those little fireworks." (t. 1st Borat learning. II.)

Fig. X.

"Can remember only the 2 little notches. I took special notice of the notches. The last one." (r. 2nd Borat learning. V.)

Reasons for the adoption of the Tasks set.

When the Borat and the Galef series were devised for the previous experiments it was in the hope of avoiding Professor Pear's criticism "That in many experiments the situations were already half-abstracted, and so might discourage visual imagery even in a visualizer"<sup>1</sup>. Still less will this criticism apply to the Sense material. With this new material, as with the old, the reproduction by coloured drawing was intended to encourage visual images. It was hoped that the procedure adopted would give scope for revealing the influence of photographic imagery; that the children in particular would be able to manifest their knowledge of the name and its associated shape without being handicapped by the inadequate mastery of words. We had found in previous investigations that the labour of writing, the actual manipulation of pen and paper and of spelling was a severe tax on children. Therefore it was decided to let the children tell the experimenter anything they wished about the figure or object meant by a name. Whatever they said was written down by her. Such introspections were always spontaneous. No questions were asked.

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(1) Pear, T.H. Relevance of Visual Imagery to Process of Thinking. Brit. Journ. of Psych. Vol. XVIII, Pt I, p.2. July, 1927.

### THE LEARNING PERIODS.

By means of the tests given after each learning period the different stages of learning could be studied. In this process of learning definite steps could be traced.

The presentation of a name might produce in response any of the following:-

1. The recognition of the name as one of the names seen and nothing more.
2. The recognition of the name as the 1st, 2nd, etc. and nothing more.
3. Some association with the name itself without any memory of the coloured shape or object.
4. With the sense material the recognition of the name as that associated with a certain type of object without any memory of the actual object.
5. Some knowledge about the figure or object of which it is the name.
6. The definite recognition of the name as the name of a certain figure or object.

With 5 and 6 the responses showed great variations both as regards the extent and accuracy of the knowledge and as regards the form in which such knowledge was consciously experienced by the subject.

### THE FIRST LEARNING PERIOD.

The first learning period showed special features of its own. Let us first examine the results obtained from the adults.

Adults. In discussing the first learning period for the adults all 3 series must be considered. With the nonsense material the data obtained during the previous study shows us that the 6 adults who took part in all 3 series correctly identified 47 figures out of 60 possible recalls, the actual figures being as follows:-

TABLE III.

Borat	Vineg	Lutaf	Guber	Feron	Total (Of possible identifications)
6	6	3	5	4	$\frac{24}{30}$
5	5	5	3	5	$\frac{23}{30}$

With the sense material there were no cases of failure to identify the object correctly.

Association between figure and name.

One of the main differences between the adults and the children was shown in the former thesis to be the adult's ability to form auxiliary associations between the figure and the name. This was found to be true of the sense material also.

There were in the first learning periods of the three series taken together 34 cases of such associations given



in the protocols of five of the adult subjects. They were distributed thus:-

TABLE IV.

Subject	Borat series	Galef series	Sense series
A	5	2	2
B	4	1	0
C	2	0	1
D	0	0	0
F	3	3	0
I	5	2	2

The following are typical examples: "Feron made me think of iron. Shape like that of a pistol and might be made of iron. Colour reminded me slightly of iron." (F. 1st Borat learning. V.)

"The first thing the word suggested was Gaul and then I connected the two ideas of Welsh and blue, so that I remembered that Galef was blue." (I. 1st Galef learning I.)

"Pleased with lamp and name. Felt that the colour fitted with evening because it was like stars and moon in a deep blue sky." (A. 1st Sense learning I.) On seeing this object on the second occasion this subject verified the analogy:- "Was pleased to see the colour was lemony like the stars in the evening." (A. 2nd Sense learning I.)

In some cases this association persisted throughout the learning periods, in others, however, the analogy was only used on the first occasion.

Analogies not associated with the name but based on the colour or the shape, were also used and some of these likewise persisted.

#### Direct association between object and name.

The sense material gave rise to a more direct type of association between the name and the object, for example subject C. states:- "Very easy to remember because a pair of men's red morocco slippers were my comfort for years!" (C. 1st Sense learning II.) In some cases this type of association also persisted throughout the series.

#### Verbal Description.

Another feature which had been previously noticed was that during the first learning period the adults showed a tendency to describe the figures to themselves in words. They now proceeded to do likewise with the objects. The following reports give typical illustrations:- "I remember saying "one two right-angled and one curved inlet"." (C. 1st Galef learning I.)

"I can remember that it was long in the direction shown, and that there was a triangular shape over a curved shape as drawn. I remember that it was a complicated shape at either

end but do not remember what they were like." (F. 1st Galef learning. IV.)

"This has many spikes on the left side (3, I believe). It is not curved when taken as a whole. It has two sides to it and a sort of bridge between." (B. 1st Borat learning.II.)

"For detail I verbalised (1) Leaves towards the left, (2) Little overhanging corner. When the word "Leisure" was given the detailed notes came to mind and I knew that it was that book." (C. 1st Sense learning.III.)

With the nonsense material the adults had found this descriptive method of learning useful only on the first occasion. Later it led to confusion, and was rarely used. With the sense material, however, this method occurred throughout the learning periods, the individual characteristics of the objects preventing confusion.

#### Criticism of names.

The names to be associated with the Sense material provoked many criticisms chiefly on the first occasion. Two examples taken from the protocols are given:- "Disliked the name - why 'lighting' when it isn't lighted?" (A. 1st Sense learning. IV.) "I was annoyed that "refresh" was not a noun as the other names had been." (C. 1st Sense learning. V.)

[N.B. This was an unintentional error on the part of the experimenter, who had looked on "comfort" as a verb, and only

realised the ambiguity on the first learning occasion.] Not all the criticisms were adverse, for instance, subject I. says: "This title seems very appropriate for the object." (I. 1st learning period. III.) No such comments were made with regard to the nonsense names.

#### Comments.

With the sense, as had been the case with the nonsense material the subjects talked to themselves about the figures and objects. This talking was evident on the first occasion and was continued throughout the experiments. It took various forms. Besides the forms mentioned above e.g. descriptions, criticisms, etc. there were remarks on preference and comments suggested by the names, the figures and objects or the colours.

#### Children.

In discussing the results for the first learning period it must be borne in mind that with the children the sense series came first and with this material there was only one case of failure to identify the object correctly. In spite of this, as it were, preliminary training, the scores obtained by these children in the first Galef learning period were nearly as low as those obtained by the children who were subjects in the previous experiments, as the following table will show, there being 35 possibilities for the first group and 20 for the second group.

TABLE V.

	Subjects.	Galef	Zitad	Poril	Rusep	Benac	Total (Of possible identifications)
Previous experiments	j-p	2	0	2	1	4	$\frac{9}{35}$
Present experiments	q-t	1	2	1	0	0	$\frac{4}{20}$

In the third series, the Borat series, these children did considerably better, their scores being distributed as follows:

TABLE VI.

	Subjects.	Borat	Vineg	Lutaf	Guber	Feron	Total (Of possible identifications)
	q-t	3	3	1	2	2	$\frac{11}{20}$

On the first occasion in both the nonsense series, subject "s" failed to recall any figure sufficiently for it to be said that she had correctly identified the required figure.

There was no evidence, with either group of children, of a photographic reproduction of the name and the shape in the

original juxtaposition. The reason for this, presumably, was that the children did not regard the name and the figure as one whole, but rather as two separate units.

Although the children q, r, s and t did no better than the children in the previous experiments as far as correct recognition of the figure alone would indicate, they gave considerably more information about the figures in their reports for the Galef series. The information correctly given by each group is shown in the following table, there being here as with the correct identification in each case, 35 possibilities for the first group and 20 for the second group.

TABLE VII.

Subjects		Times Correct				
		Colour	Shade	Shape	Orientation	Position in Series
Previous experi- ments	j-p	8	3	3	2	7
Present experiments	q-t	9	8	2	3	7

An increased amount of information was given for both the Borat and the Sense series, the actual figures being:-

TABLE VIII.

	Colour	Shade	Shape	Orientation	Position in Series
Borat series	16	15	8	11	7
Sense series	16	10	13	13	4

It is probable that in all cases more information was actually known than was given on the first occasions, for example a child may have known the direction in which the figure lay but have been unable to draw it and have failed to indicate the orientation by any other method. As no supplementary questions were asked, only such information as the children volunteered could be recorded. This policy was adopted throughout for fear of suggestionizing the children.

Association between figure and name.

None of the children formed associations of an analogous nature between the nonsense figures and the name. Subject s seemed to be striving to obtain some such association but failed to do so, for instance she says: "Said E in Galef and E in green" (s. 1st Galef learning. I.) "I tried to get something in the name that would go with the colour but I could not." (s. 1st Galef learning.II.)

Direct association between object and name.

The more direct type of association with the sense material mentioned in discussing the adults' results was shown by the children. The following are typical examples from the children's protocols:- "Said a cup of tea is very refreshing." (r. 1st Sense learning. V.)

"Thought it would be useful in the evening." (q. 1st Sense learning. I.)

"The most comfortable things we wear are our shoes." (q. 1st Sense learning. II.)

Verbal description.

Two of the children, like the adults, tended to describe the nonsense figures in words on the first occasion, examples would be:- "Came in 2 points at the bottom and the one on the right-hand side came up into the curve more. It had 2 curves at the top." (q. 1st Borat learning. I.) "I took special notice of the cut square." (r. 1st Galef learning. I.)

Unlike the adults the children continued this mode of learning throughout, examples being found in all the series and with all the subjects.

Comments.

The children, like the adults, made remarks to themselves when learning the figures.



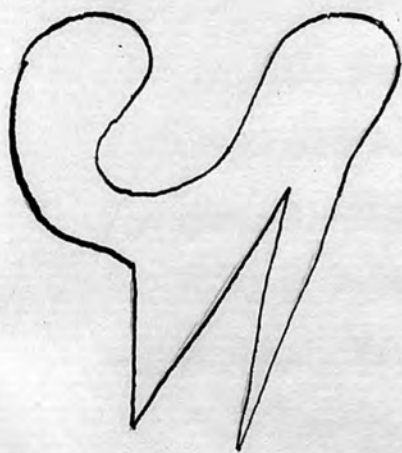
THE SECOND LEARNING PERIOD.

In the second learning period the same figures were seen for the second time.

Adults. In all three series every figure was correctly identified.

The improvement in drawing of the figures and objects was very noticeable. Examples of the drawings on these first two occasions are here given, one set of examples being taken from each of the series.

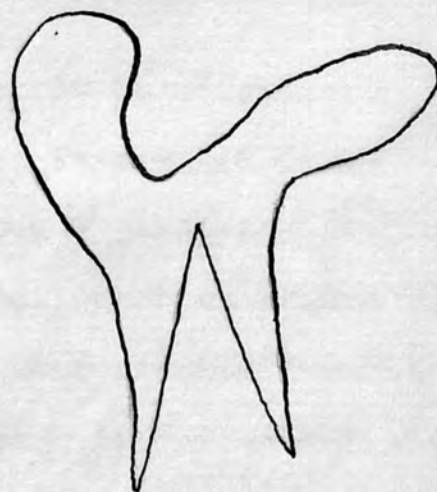
Fig. XI.



Original  
1st Borat



Subject A.  
1st Borat I.



Subject A.  
1st Borat II.



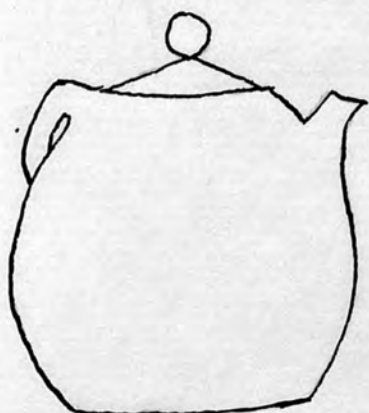
Original  
1st Zitad



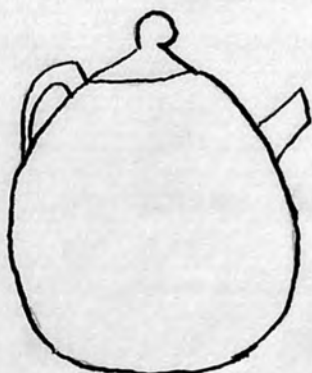
Subject B.  
1st Zitad I.



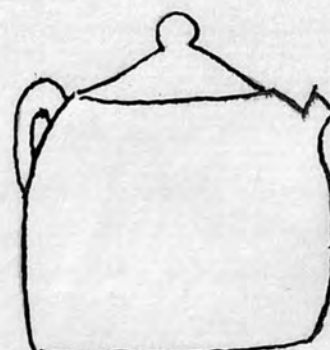
Subject B.  
1st Zitad II.



Original  
1st Refresh



Subject F.  
1st Refresh I.



Subject F.  
1st Refresh II.

### Children.

In the second learning period, with the Galef series, although there was only a slight increase in the number of correct identifications given by the group j-p, 10 as compared with 9, with the group q-t the number went up from 4 to 10, so that half the possible figures were correctly identified.

With both groups there was an increase in the amount of information correctly given as will be seen by comparing the following Table IX with Table VII (p.23), there being as before 35 possibilities in each case for the 1st group, and 20 for the second group.

TABLE IX.

	Subjects	Times Correct				
		Colour	Shade	Shape	Orientation	Position in Series
Previous experiments	j - p	14	10	7	4	14
Present experiments	q - t	12	10	9	7	10

The sense series also showed an increase of knowledge on this second occasion under each heading, but with the Borat series there was a slight decrease with the shade and the shape of the figure. The actual figures are given in Table X.

TABLE X.

	Colour	Shade	Shape	Orientation	Position in Series
Borat series	16	12	6	12	13
Sense series	19	16	20	18	0

It is worthy of note that in the sense series the shape was known in every case and yet the position in the series was

never given. This tended to be true throughout the experiments, the subjects mentioning the order when they experienced doubt or difficulty with the figure or shape. It is obvious that knowledge of the shape will not mean that the position in the series is unknown, but rather that it is considered unnecessary by the subjects.

As with the adults an illustration is given from each of the series to show the noticeable improvement in drawing on the second occasion.

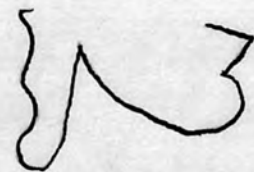
Fig. XII.



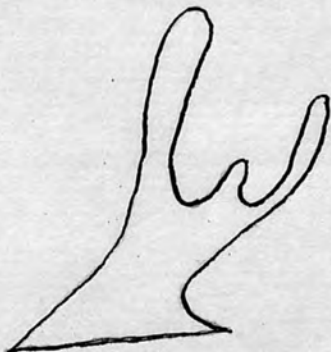
Original  
1st Vineg



Subject q.  
1st Vineg I.



Subject q.  
1st Vineg II.



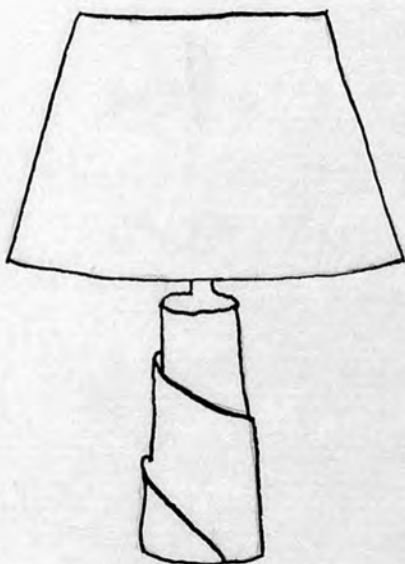
Original  
1st Rusep



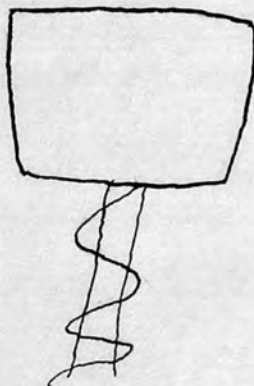
Subject r  
1st Rusep I.



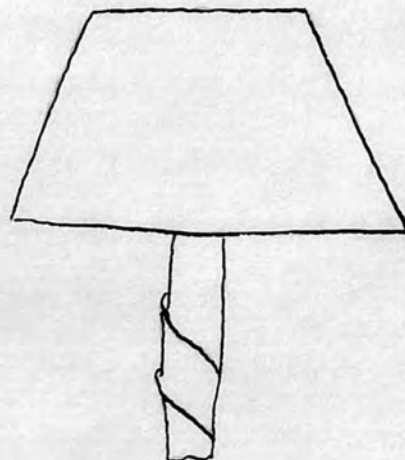
Subject r  
1st Rusep II.



Original  
1st Evening.



Subject q.  
1st Evening I.



Subject q.  
1st Evening II.

For both the adults and the children the main use of the second learning period seemed to be to consolidate the position gained during the previous learning. Subject s, however, in spite of her previous experience of the plan of the experiments in the sense series failed to recognise that she was being given the same nonsense material a second time on the second occasion. She did however show an increased knowledge of the figures in her protocols.

#### THE THIRD LEARNING PERIOD.

At the third learning period the subjects were shown the second figures of each set, I<sub>2</sub>, II<sub>2</sub>, III<sub>2</sub>, etc. and this fact led to special features in the learning processes on this occasion.

Adults.

As was demonstrated in the previous thesis three of the subjects knew the method of obtaining the nonsense series, and two of the remaining three realised immediately that the second Borat figures were variants of the first, the subject F being the only one of these six subjects who failed to do so.

All the five subjects who displayed this recognition tried to pick out the characteristics they had noticed on the previous occasion. Sometimes this searching proved a hindrance rather than a help. This occurred when the subject had concentrated on some feature that was less prominent in the second than in the first figure. The following instances not cited in the previous account of these experiments will serve to illustrate this, the first two being cases in which the remembrance of the former figure proved helpful, and the last two cases in which it constituted a difficulty.

"I remembered that it was like the first Borat figure but turned more upside down, so that the "tail" part is in the air and the two points like tongs lying more horizontally."

(I. 3rd Borat learning. I.) "The portion at (a) I impressed clearly on myself at the time with reference to my correction of the direction between 1 and 2 of green Borat. Then all I had to remember was "It is a blue Borat with (a) (represented by visual image) in that position. (C. 3rd Borat learning. I.)

"Poril is the one I dislike, but it has now a significant shape - orange axe. I recognised the straight edge. Very worried as to how this was the sprawler. I waste time in trying to see old figures." (B. 3rd Galef learning. III.) Subject A. on the 3rd occasion became confused and drew Zitad shape on being shown word Poril. She says: "Shape came which seemed something like the above. Wonder now if this is not Zitad, but do not think it can be, as there seems no connection with the horned animal which was the first Zitad. Find this figure difficult." (A. 3rd Galef learning. III.) At the 4th learning period she drew the figure correctly on being shown the word Zitad, but states:- "Immediately puzzled by this shape as remember some confusion last time that seems to be connected with this shape though not definitely with the name! Thought I had realised the characteristics of this family, but cannot pick them out satisfactorily. 1st Zitad was like a horned animal throwing back its head and laughing. Suppose A was horn and B ear, cannot see why C, which must have been mouth, is where it is. Also cannot recall anything square. Recalled Stevenovic's method of figures by shadows and find it difficult to understand this transformation." (A. 4th Galef learning. II.)

With the sense series all the adults on this occasion associated the new variant correctly with the name. Frequent references to the former objects were made. These chiefly took the form of stating a preference for one or the other, for

example: "This was easier than the last somehow. The word "leisure" suggested book first and then I remembered which book." (F. 3rd Sense learning.III.) "It does not seem so appropriate for "comfort" as the red one of the first." (I.3rd Sense learning.II.) "Although the colour suggests light more than the other it is not so pleasing." (I. 3rd Sense learning. IV.) "Colours in this series not nearly so nice as first. In first colours fitted well, e.g. red for comfort - green for leisure etc." (D. 3rd Sense learning. I.)

Further associations with the name and criticisms of the sense names were given during the 3rd learning period. An illustration of the first is given from a protocol of subject F, and one of the second from subject A's. "When I saw the word "lighting" I could only think of the lamp that was attached to evening. I then remembered thinking that this was the one that was useful when lights were out." (F. 3rd Sense learning.IV.) "This time I began to question other titles besides "Lighting". Books do not necessarily suggest leisure - rather the reverse when they are of this bulk." (A. 3rd Sense learning. III.)

#### Children.

None of the children in either group realised as early as the third learning period of the Galef series that the second group of figures were variants of the first. It was hoped that this would be one of the ways in which the influence of their previous experience in learning the sense series would be shown, but it proved not to be the case.



### LATER LEARNING PERIODS.

The later learning periods showed the same features as were noted in the previous thesis, and this holds good of the sense material as well as the nonsense. These later periods showed, as was previously stated, the subjects' individual differences rather than marked features of their own. In all cases the second showing of the same set of figures or objects, i.e., the 2nd, 4th, 6th etc. learning periods, yielded an increase in the knowledge of the figures, both as measured by the amount correctly given and by the shorter reaction times. This was likewise true of the later learning periods as compared with the earlier periods.

The learning of the material in arbitrary association with names involved progressive differentiation of one individual figure or object from another and progressive grouping or classification of individuals into sets.

### ADDITIONAL LEARNING PERIODS FOR B, C AND D.

As previously stated (page 10) subjects B, C and D had 15 learning periods, when variants of the set were gone through for a third time. It was reported in the former thesis that two distinctive characteristics were present during these extra learning periods. Firstly the subjects were conscious of a feeling of familiarity on seeing the figures again, and secondly features which had been noted in later members of

the sets were looked for in the earlier members.

During these extra learning periods with the sense material the feeling of familiarity was only occasionally mentioned, examples may be taken from the protocols:- "This seemed a good old friend." (C. 12th Sense learning. I.) "I was glad to recognise the handle and the knob as familiar." (B. 11th Sense learning. V.) Surprise as well as this feeling of familiarity was expressed, for instance:- "When I saw this one for the second time it surprised me. It seemed thicker and more solid than I had remembered." (C. Sense learning 11th. III.) "I had forgotten about the stand until I saw it again." (B. Sense learning, 11th. I.)

The chief characteristic of these extra learning periods with the sense material is that they give rise to some "affect". This is recorded in the majority of the protocols, typical examples being:- "This book comes as a contrast to the other books. There is the feeling that green was a calm pleasing leisure; blue exciting and a little too aggressive, red heavy, hot and repellent - either a directory or an odd information volume." (C. 13th Sense learning. III.) "Vague image this time but remembered clearly - mainly because I didn't like it." (D. 13th Sense learning II.) "When I saw this I was pleased. I liked this old candlestick and fat candle." (B. 12th Sense learning. IV.) "A horrible book," (B. 14th Sense learning. III.)

### FORMATION OF GENERAL CONCEPTS.

In all three series the subjects built up general meanings for the names. These concepts were formed almost entirely by the use of words. This had been found in the previous experiments and is equally true of this further work, as the following quotations from the children's protocols will show:- "Went like a W and the points were at each end. The others that I thought were like Ws were also Ruseps. One was just like this only sideways." (q. 9th Galef learning. IV.) "Always these have little cuts like shown - one square and one comes round." (r. 5th Borat learning. IV.)

"I thought first, 'now refresh is the teapots' and then I remembered which blue it was and then I got it." (t. 1st Sense test. I.)

### PERSISTENCE OF THE SAME ASSOCIATION.

As stated above (p.19) some associations formed early in a series tended to persist throughout, and when this took place, it helped considerably towards the formation of a class concept of the set. Again this is a point that had been previously noted, and, as in the former thesis an illustration was given from an adult's protocols here an illustration is given from one of the children's papers:- "Thought like the head of a sparrow." (t. 3rd Borat learning. I.) "Like the head of a sparrow." (t. 4th Borat learning. I.) "Like the head of a

stork with long beak." (t. 8th Borat learning.I.) "As soon as I saw it I remembered that the 1st set we had was like a sparrow's head and this is exactly the same but is upside down." (t. 9th Borat learning. I.) "Like a sparrow's head upside down." (t. 10th Borat learning. I.) "I altered this part as when so wide it did not look like the eye of a sparrow." (t. 1st Borat test.II.) "Can't remember the shape very well. It was like a sparrow's head." (t. 2nd Borat test. III.)

All the adults formed such general concepts for all the sets.

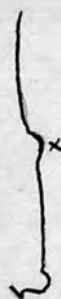
### Children.

Unlike the children who took part in the former experiments, the present subjects q, r, s and t all formed general concepts for most of the sets. Illustrations are given above (pp.36-37). Owing to the superior ability of these girls it becomes extremely difficult to estimate the effect of the sense series as an introduction to the nonsense series. These children formed general concepts while the children in the previous experiments, with the exception of one girl aged 14, failed to do so, and how far this result is due to superior intelligence is impossible to say.

In some cases the children although realising the "sameness" of the figures failed to analyse them, and so were unable to form a concept for the set. For instance, subject s says:

"All the time I have been doing them Borat seems to have been the same shape but a different position." (s. 2nd Borat test. II.) and yet she has been unable to reproduce any Borat.

Cases arose in which one feature only had been differentiated, and thus the child, although having a definite concept, was unable to reproduce an identifiable figure in the general tests. This was especially true of subject r who, early in the series selected for each set one such feature, and was satisfied, on seeing a new variant, to discover this feature and note the orientation from it. Thus the shape of the figure remained unknown. Quotations from the children's protocols follow:- "The Borats had 2 points like this and were the first things but I don't know which way they went in the third one." (q. 1st Borat Test.II.)



"In this always a notch like that."

"They were harder this time - more tricky. Always bits like last ones." (r. 5th Borat learning. V.)



"Always in first ones have a cut like this x." (r. 5th Borat learning. I.V.)

U

"Remember this little bit came somewhere on them all."

(r. 7th Borat learning. IV.)

This is particularly true of the Borat series. Subject r had not formed a general concept for each figure in the Galef series until the ninth learning period, so that in the earlier learning periods of that series she attempted to learn each figure as an individual. All the subjects attempted to memorize the figures individually, until they had formed the general concept. The earliest occasion on which the general characteristics of a given type of figure were differentiated by a child during the Galef series was the fifth learning period.

#### COMPARISON OF BORAT AND GALEF LEARNING PERIODS.

##### Adults.

On the whole the adults remembered the Borat series better than the Galef series during the learning period. The orientation and the size of the figures, however, gained slightly higher marks on the Galef material.

##### Children.

The results for the children were less consistent. On the whole the Borat series may be said to be better remembered. There was a larger number of cases of correct identification

and the colour, the shade, the orientation and the position in the series gained a larger number of marks. The shape of the figures, however, in the Galef series was better known and the figures were more frequently correct in size.

A discussion of the size of the figures will be given later.

#### COMPARISON OF NONSENSE AND SENSE SERIES.

##### Adults.

The sense material was better remembered in all respects throughout the learning periods than either of the nonsense series.

##### Children.

The children remembered the actual objects better than the nonsense figures so that the shape, the orientation, the size and the correct identification marks were higher with the sense series than with either of the nonsense series. The colour and the shade did not gain as many points in the Sense series as in the Borat series, although higher than in the Galef series. This result was owing to subject q, who had particular difficulty with the colours and whose colour reproduction was erratic. The children were tested for colour blindness, and subject q did show some defect of colour vision, although she could not be said to be colour-blind; for example,

when she was tested with the Holmgren's Wool Test, on being given test skein 2 (a bright green), she selected no skein which could not be termed green, but left 5 of the most pronounced greens.

DIFFERENCE IN THE NATURE OF "A SET" IN NONSENSE AND SENSE SERIES RESPECTIVELY.

When learning the nonsense material one subject, A, gave an interesting note on her method of learning the second variant of the figures. This was reported in the previous thesis but is here repeated for comparison with her remarks on the learning of the sense material. She stated:- "In all these pictures the same process was observed, i.e., the colour change was noticed first, then the distinguishing features of the "family" recognised. So far the family colour is the colour of the first shown. It is not a blue Borat I remember, but a green Borat covered over with blue." (A. 3rd Borat learning.)

On seeing the second variants of the sense objects she says:- "When doing "Borat" set I thought of each "Borat" as one object which underwent changes and could be described as the same Borat with modifications of shape and change of colour.... But I cannot change colour and shape of these lamps, there are definitely two lamps, and though both are lamps, just as both would be "Borats" there is not the sense of identity behind them. If I remember the lamps it will be in a row, but the Borats would be like one changing object." (A. 3rd Sense



learning) and again: "When I see the name I at once associate it with the object but never associate the object with the name. Should never think of the name when describing the object. In nonsense shapes the picture was a "borat", but in these the picture is not a comfort, it is and always will be a slipper. The printed names are not the names of classes of objects, whereas the "Borats" were." (A. 3rd Sense learning.)

Subject C. also commented on the difference in the formation of the sense and the nonsense series, and the difference this made to the task:- "With all this series I have quite a different attitude from that of the Borats etc. Even on the first occasion I felt that it was only a case of noting differences from a type not of grasping a whole." (C. 2nd Sense learning.) and on the third occasion she says:- "The feeling that one had simply to note details and not make a great effort to memorise was even stronger on this occasion than previously." (C. 3rd Sense learning.)

This difference in the test was a difficulty we had realised from the first. An attempt to make the sense series on exactly the same plan as the nonsense series, i.e. by cutting a cardboard shape of the object and projecting it at different angles had been made. But this was found to be impractical as the perspective of the variations made the objects exceedingly difficult for the subjects to draw. Indeed it was

thought that the children might fail to realise that the objects were the same, so that the series would become a species of recognition puzzle.

#### STATISTICAL RESULTS FOR THE LEARNING PERIODS.

The same statements must be made with regard to these experiments as for those reported in the previous thesis, viz: that throughout the experiments, the number of subjects taking part being so small, generalisations from the statistics must be merely tentative.

For the same reason averages discussed have been given with the range rather than the mean variation.

#### RESPONSE TIMES.

The response times were taken exactly as in the former experiments, that is, response times were taken for the immediate recalls at the end of each learning period. As has been previously stated the time recorded was from exposure of name card to moment of subject's response. The cards bearing the five names of the series were shown in irregular order, the subject being required to say "yes" or to tap the table when she obtained a meaning for the word. The order of presentation was kept constant for all the subjects, corresponding names being presented in the same order in each series. This order of presentation is given in the following table:-

TABLE XI.

Order of presentation of names in immediate recalls.

Learning periods	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	
Order of presentation	1	I 3	I 2	II 5	II 1	III 2	III 3	IV 5	IV 4	V 1	V 4	I 5	II 2	III 5	IV 4	V 2
	2	I 5	I 4	II 3	II 5	III 3	III 2	IV 1	IV 2	V 4	V 2	I 1	II 1	III 4	IV 3	V 3
	3	I 1	I 1	II 4	II 3	III 5	III 1	IV 3	IV 3	V 2	V 5	I 4	II 5	III 3	IV 5	V 5
	4	I 2	I 5	II 2	II 4	III 1	III 4	IV 2	IV 5	V 5	V 3	I 3	II 3	III 1	IV 2	V 1
	5	I 4	I 3	II 1	II 2	III 4	III 5	IV 4	IV 1	V 3	V 1	I 2	II 4	III 2	IV 1	V 4

Adults.

In the tables following, Tables XII, XIII, XIV, XV, XVI and XVII, the average response time for each learning period for each subject is given correct to the nearest fifth of a second for each of the three series respectively. For the purpose of all the statistical work connected with the learning periods the first ten learning periods only for subjects B, C and D have been considered.

The maximum time for recall was 3 minutes. If no response was given within that time the subject was considered to have failed. No subject was allowed to proceed to the next figure until the 3 minutes had elapsed.

TABLE XII.

Borat. Adults. Average Response Time.

Subject	Learning Period							Period			Total	Average
	1	2	3	4	5	6	7	8	9	10		
	secs	secs	secs	secs	secs	secs	secs	secs	secs	secs		
A.	1.8	1	2.2	1	1	.8	1.4	.8	1.2	1.2	12.4	1.24
B.	1.8	.6	.6	.6	.6	.6	1.2	.6	.8	.8	8.2	.82
C.	1.2	.6	4	1.4	9.8	3.4	4	1.2	5.8	5.8	37.2	3.72
D.	5.4	1.2	1.8	1.4	1.8	1.2	1	.6	.8	.6	15.8	1.58
F.	1.6	1.2	5.6	1.6	1.6	1.2	2.2	1.2	1.2	7.6	85.0	2.50
I.	1.6	1.4	2	1	1.4	1	1	1	.8	.6	11.8	1.18
Total	13.4	6.0	16.2	7.0	16.2	8.2	10.8	5.4	10.6	16.6	110.4	11.04
Average	2.23	1	2.7	1.17	2.7	1.37	1.8	.9	1.77	2.8		

TABLE XIII.

Galef. Adults. Average Response Time.

Subject	Learning							Period			Total	Average
	1	2	3	4	5	6	7	8	9	10		
	secs	secs	secs	secs	secs	secs	secs	secs	secs	secs		
A.	6.2	.8	1	.8	6.2	.8	.8	1	1	.6	19.2	1.92
B.	2.2	1	1	.8	3.4	.8	.8	.6	.8	.8	12.2	1.22
C.	41.2	2.4	3	2.2	9.4	3.6	10	7.2	3.8	4.8	87.6	8.76
D.	1.8	.6	.8	.6	.8	.6	.6	.8	.6	.8	8	.8
F.	3.4	2	4	1.4	2.6	1.6	1.2	1.4	2.2	1.6	21.4	2.14
I.	3.4	1.6	2.2	1.2	1.6	1.2	1.2	1.2	1	.8	15.4	1.54
Total	58.2	8.4	12	7	24	8.6	14.6	12.2	9.4	9.4	163.8	16.38
Average	9.7	1.4	2	1.17	4	1.43	2.43	2.03	1.57	1.57		

TABLE XIV.

Sense. Adults. Average Response Time.

Subject	Learning							Period			Total	Average
	1	2	3	4	5	6	7	8	9	10		
	secs	secs	secs	secs	secs	secs	secs	secs	secs	secs		
A.	.96	.96	.68	.62	.88	.76	.68	.76	.8	.68	6.98	.698
B.	1.04	1	.68	.8	.72	.6	.72	.68	.68	.64	7.56	.756
C.	1.44	1.12	1.04	2.52	.96	1.8	1.88	1.24	1.44	1.96	15.40	1.54
D.	.68	.44	.44	.64	.44	.68	1	1	.96	1.12	7.40	.74
F.	1.28	1.84	1.88	.92	1.72	1.76	.48	.6	.76	.56	11.80	1.18
I.	1.04	.98	.78	1.12	.8	.76	1.08	.84	.88	.72	9.00	.9
Total	6.44	6.34	5.50	6.62	5.52	6.36	5.84	5.12	4.72	5.68	58.14	5.814
Average	1.07	1.06	.92	1.10	.92	1.06	.97	.85	.79	.95		

TABLE XV.

Borat. Children. Average Response Time.

Subject	Learning Period										Total	Average
	1	2	3	4	5	6	7	8	9	10		
	secs	secs	secs	secs	secs	secs	secs	secs	secs	secs	secs	secs
q.	18.96	5.32	33.68	5.84	7.24	2.68	1.56	8.36	2.12	13.16	98.92	9.892
r.	57.72	1.36	2.2	1.32	1.48	1.56	6.44	1.12	.84	1.4	75.44	7.544
s.	1.6	1.72	4	1	2.56	2.72	1.24	.8	.88	.88	17.40	1.74
t.	5.28	16.32	4.72	1.64	6.12	1.32	1.2	.96	.64	.52	38.72	3.872
Total	83.56	24.72	44.60	9.80	17.40	8.28	10.44	11.24	4.48	15.96	230.48	23.048
Average	20.89	6.18	11.15	2.45	4.35	2.07	2.61	2.81	1.12	3.99		



TABLE XVI.

Galef. Children. Average Response Time.

Subject	Learning							Period			Total	Average
	1	2	3	4	5	6	7	8	9	10		
	secs	secs	secs	secs	secs	secs	secs	secs	secs	secs		
q.	33.4	9	56.84	14.36	23.96	23.04	7.44	1.88	2.12	1.04	173.08	17.308
r.	15.36	37.68	.8	.76	.84	.68	.64	.6	.56	.56	58.48	5.848
s.	2.64	34	1.72	2.04	1.48	1.32	1.08	.8	1	1.6	47.68	4.768
t.	26.48	2.08	.88	1.48	1.16	1.12	1.56	1.32	2	.56	38.64	3.864
Total	77.88	82.76	60.24	18.64	27.44	26.16	10.72	4.60	5.68	3.76	317.88	31.788
Average	19.47	20.69	15.06	4.66	6.86	6.54	2.68	1.15	1.42	.94		

TABLE XVII.

Sense. Children. Average Response Time.

Subject	Learning							Period			Total	Average
	1	2	3	4	5	6	7	8	9	10		
	secs	secs	secs	secs	secs	secs	secs	secs	secs	secs		
q.	8.04	23.52	7.16	3.44	1.96	1.76	2.52	1.44	1.24	.8	56.88	5.688
r.	19.34	.84	.8	.8	1	.96	.8	.76	.68	.64	26.62	2.662
s.	1.96	1.2	1.6	1.08	.88	1.2	1.08	.96	.88	1.08	11.92	1.192
t.	4.32	3.24	1.84	2.64	1.08	.88	1.04	.64	.88	1.08	17.64	1.764
Total	33.66	33.80	11.40	7.96	4.92	4.80	5.44	3.80	3.68	3.60	113.06	11.306
Average	8.42	8.45	2.85	1.99	1.23	1.2	1.36	.95	.92	.9		

From these tables it will be seen that on the whole the subjects tended to shorten their reaction times as the series progressed.

### Adults.

With the nonsense material the reaction times for the second showing of the same figures tended to be less, (the only reversal being the tenth learning period of the Borat series). With the sense series no consistent shortening of reaction time is found. The average response times for the sense series were shorter than for the nonsense series.

### Children.

The children answered more quickly on the second showing of the sets than on the first, this holding good for the sense series as well as for the nonsense series.

In all three series the children's reaction times were longer than those of the adults. The children, like the adults, answered more quickly during the sense than the nonsense experiments.

### EXTENT OF THE KNOWLEDGE SHOWN IN THE LEARNING PERIODS.

The marks gained during the learning periods are given in the following tables, the maximum possible in each case being 50:-

TABLE XVIII.Learning Periods.

Borat. Adults.

Correct Identification and Features Correctly Given.

Sub- ject	Colour	Shade	Shape	Orienta- tion	Position in Series	Size	Correct Identi- fication	Score
A.	50	49	44	22	0	16	48	229
B.	46	37	43	28	0	11	47	212
C.	50	45	43	26	4	9	49	226
D.	47	40	50	46	5	19	50	257
F.	48	44	43	36	0	18	48	237
I.	48	43	46	39	0	16	50	242
Total	289	258	269	197	9	89	292	1403
Aver- age	48.17	43	44.83	32.83	1.5	14.83	48.67	233.83

TABLE XIX.

Learning Periods.

Galef. Adults.  
Correct Identification and Features Correctly Given.

Sub- ject	Colour	Shade	Shape	Orienta- tion	Position in Series	Size	Correct Identi- fication	Score
A.	48	47	45	23	1	22	48	234
B.	46	41	40	31	4	13	48	223
C.	45	42	44	30	0	10	46	217
D.	49	46	47	42	2	19	47	252
F.	45	40	46	35	0	25	47	238
I.	45	39	43	39	0	22	44	232
Total	278	255	265	200	7	111	280	1396
Aver- age	46·33	42·5	44·17	33·33	1·17	18·5	46·67	232·6

TABLE XX.Learning Periods.

Sense. Adults.  
Correct Identification and Features Correctly Given.

Sub- ject	Colour	Shade	Shape	Orienta- tion	Position in Series	Size	Correct Identi- fication	Score
A.	50	49	46	49	1	23	50	268
B.	47	43	48	44	38	23	48	291
C.	50	45	49	50	0	15	50	259
D.	50	49	50	50	0	21	50	270
F.	49	43	49	47	0	26	50	264
I.	50	49	49	49	0	23	50	270
<b>Total</b>	296	278	291	289	39	131	298	1622
<b>Aver- age</b>	49·33	46·33	48·5	48·17	6·5	21·83	49·67	270·3

TABLE XXI.

Learning Periods.

Borat. Children.  
Correct Identification and Features Correctly Given.

Sub- ject	Colour	Shade	Shape	Orienta- tion	Position in Series	Size	Correct Identi- fication	Score
q.	33	28	16	22	41	11	29	180
r.	48	44	25	40	23	3	42	225
s.	45	36	28	16	31	4	32	192
t.	48	44	38	30	39	15	42	256
Total	174	152	107	108	134	33	145	853
Aver- age	43·5	38	26·75	27	33·5	8·25	36·25	213·25

TABLE XXII.

Learning Periods.

Galef. Children.  
Correct Identification and Features Correctly Given.

Sub- ject	Colour	Shade	Shape	Orienta- tion	Position in Series	Size	Correct Identi- fication	Score
q.	27	20	21	24	34	22	28	176
r.	48	42	39	35	35	5	42	246
s.	22	15	14	15	18	6	19	109
t.	46	38	39	31	32	8	39	233
Total	143	115	113	105	119	41	128	864
Aver- age	35.75	28.75	28.25	26.25	29.75	10.25	32	216



TABLE XXIII.

Learning Periods.

Sense. Children.  
Correct Identification and Features Correctly Given.

Sub- ject	Colour	Shade	Shape	Orienta- tion	Position in Series	Size	Correct Identi- fication	Score
q.	34	28	46	39	0	37	49	233
r.	48	40	46	44	0	20	49	247
s.	42	28	44	44	0	7	46	211
t.	48	38	48	40	0	4	50	228
Total	172	134	184	167	0	68	194	919
Aver- age	43	33.5	46	41.75	0	17	48.5	229.75

As was explained in the previous report of the nonsense experiments what has been styled "correct identification" was the clearest indication that the required figure or object was known, but that failure to identify the figure correctly did not imply that the figure was totally unknown. This will be seen to be true by a comparison of the marks gained for colour in the nonsense series with those gained for correct identification.

The sense material was considerably better known than the nonsense material. The correct identification gains the highest scores in all the series with the exception of the nonsense series with the children, in which the colour takes the first place.

### GENERAL MEMORY TESTS.

As has been previously stated (p.10) general tests of the whole material were given when the learning of a series was completed. These tests, for the nonsense material, were identical with those given in the former experiments, and, as in the learning periods, the tables for the adults are composed from the appropriate parts of the tables given in the previous thesis. The sense tests were similar in kind to the nonsense tests. In both one of the names qualified either by the colour or by the position in the series of the figure or object was shown, and the subjects were required to respond as in the learning periods. Each name appeared twice, once qualified by a colour and once by the position. As 2 tests were given for each series and as the same figure or object was not asked for more than once, the subjects were required to produce 20 out of the 25 figures learnt.

The actual cards shown were:-

Borat Tests.1st Test.

1. The Red Feron.
2. The Third Borat.
3. The Yellow Guber.
4. The Dark Green Lutaf.
5. The First Feron
6. The Fourth Vineg.
7. The Blue Borat.
8. The Last Guber.
9. The Red Vineg.
10. The Second Lutaf.

2nd Test after 5 weeks.

1. The Second Guber.
2. The Red Lutaf.
3. The Fourth Borat.
4. The Pale Blue Feron.
5. The Green Guber.
6. The Last Vineg.
7. The Fourth Feron.
8. The Yellow Borat.
9. The First Lutaf.
10. The Green Vineg.

Galef Tests.1st Test.

1. The Green Benac.
2. The Second Galef.
3. The Yellow Rusep.
4. The Orange Poril.
5. The First Benac.
6. The Third Zitad.
7. The Red Galef.
8. The Fourth Rusep.
9. The Pale Blue Zitad.
10. The Last Poril.

2nd Test after 5 weeks.

1. The Second Rusep.
2. The Red Poril.
3. The Third Galef.
4. The Blue Benac.
5. The Pale Green Rusep.
6. The First Zitad.
7. The Last Benac.
8. The Green Galef.
9. The Fourth Poril.
10. The Orange Zitad.

Sense Tests.

<u>1st Test.</u>	<u>2nd Test after 5 weeks.</u>
1. The Blue Refresh.	1. The Blue Leisure.
2. The First Evening.	2. The Third Comfort.
3. The Second Lighting.	3. The Blue Evening.
4. The Green Comfort.	4. The Fourth Lighting.
5. The Third Refresh.	5. The First Leisure.
6. The Yellow Leisure.	6. The Dark Green Refresh.
7. The Second Comfort.	7. The Red Comfort.
8. The Red Evening.	8. The First Refresh.
9. The Last Leisure.	9. The Yellow Lighting.
10. The Blue Lighting.	10. The Last Evening.

"Correct identification" in these general tests, therefore, meant not only the characteristics of the figures denoted by the nonsense name, or the realisation of the type of object denoted by the sense name, but also the selection of the required member of the set.

The ten learning periods given to 3 of the adults and to the children were not sufficient for the material to be thoroughly known, and yet were sufficient for all the subjects to reproduce correctly some of the figures and objects in the general tests, on seeing the appropriate name with the qualification.

The five extra learning periods for subjects B, C and D gave these subjects a slight advantage in the general tests,

but were not sufficient for a thorough knowledge.

### Adults.

Out of 240 nonsense tests carried out by the adult subjects there were 125 cases of incorrect identification, and out of 120 sense tests 34 cases.

### CAUSES OF FAILURE.

In the former thesis a number of causes of failure were discussed, and some of these same causes will be discussed here, but only in so far as the sense experiments did or did not show the same features.

#### Confusion between members of the same set.

The main cause of failure to identify correctly the figures had been confusion between members of the same set and this held good for the sense series. In all but two cases of failure this confusion, even when not the main cause, was a contributory factor. This confusion took two forms. Firstly cases occurred in which the wrong object was drawn, but the details of the object were correct. Generally this occurred when the qualifying word denoted position, for example, subject I on being asked for the 3rd Comfort drew the 2nd shoe with this comment:- "I am not at all sure of this. I am sure that this colour and shape go together, because I remember

that the shape suggested a child playing and the shape and colour suggested the beach to me." (I. 2nd Sense Test. II.) One case was given in which this happened when the qualifying word was one of colour, the comment then being: "This is the only shaped 'refresh' that I can think of that is not associated with some colour other than green." (F. 2nd Sense Test. VI.)

Secondly there were cases in which different features of members of the same set were incorporated together. Two drawings of this nature are given below. In the first case the subject had been asked for "the Yellow Lighting", in the second for "the Blue Evening".



(A. 2nd Sense Test IX.)



(I. 2nd Sense Test III.)

#### Confusion between sets.

Another cause of incorrect identification in the nonsense series had been shown to be confusion between the sets. When

this had been the case the subjects had usually been unaware the confusion existed, although two cases were reported in which doubt had been shown. Only one case of such confusion was found with the sense series. Subject C on seeing the card "The Blue Leisure" gives the following report:- "When I first saw the words "blue leisure" I thought 'Don't hurry, that's the one that gets confused with another. Then I made quite sure that leisure was the name for the lamp series (by a process of elimination). At once I recalled the shape and shade of blue." (C. 2nd Sense Test I.).

#### Inability to recall.

There were no cases of complete inability to recall the object among the adult subjects in the sense series. Such cases had occurred with the nonsense figures.

#### Partial knowledge and vague and incomplete imagery.

About a quarter of the total number of failures previously reported was due to a partial knowledge which was insufficient for the figure to be said to be identified correctly. This was a frequent cause of failure with the sense material also, as the following quotations will testify. "Image of yellow mist of buttercup shade and one of a candlestick too vague to distinguish details. Until I drew it I was sure the yellow was this shade - not so sure now. Vague idea that candle was burnt down quite a long way but not sure. Made up



handle." (A. 2nd Sense Test. IX.) "I am sure that the candlestick is not right, it looks too plain. The candle itself I am not sure of - tho' by a process of elimination I think that the 4th was the very long one." (I. 2nd Sense Test. IV.) "I have an impression that the 1st Leisure was small and dull and suggested work to me, that is why I have chosen dull green - but the whole thing is very vague."

(I. 2nd Sense Test. V.) "The actual shape of this teapot is very vague in my mind, but I remember that it was rather out of proportion, that the handle was very small and the spout large, and that the whole effect was rather squat. The colour is vague too.... I have no definite impression about the first except that I think I rather disliked it and didn't find it appropriate to the title." (I. 2nd Sense Test. VIII.)

#### Concentration on colour.

In the former experiments there were 3 cases in which the failure appeared to be due to concentration on the colour of the figure. The subjects had formed an association by which the colour was remembered and when it came to the general tests this association was all that was recalled. One such case was found with the sense material. The subject's protocol reads as follows:- "Remembered some association with lamp and goldenish colour of stars in a dark blue sky - evening." (A. 1st Sense Test. II.)

Two causes of failure with the sense material did not occur with the nonsense material.

Confusion with some particular object known to individual.

With the sense material in a number of instances, the subjects compared the objects shown with other objects of the same type with which they were familiar, and in one instance this was the cause of failure in the general test. On being asked for "the First Refresh" subject F drew a pot quite unlike any shown and said: "I seem to remember thinking that the first refresh was something like a tall teapot that we have at home. I have no idea what colour it was." (F. 2nd Sense Test. VIII.)

Multiplicity of images.

The other cause of failure not shown with the nonsense material was a succession of images from which the subject failed to select the required object. Only subject A gave this type of response, but in 3 of her protocols the failure was at least partially due to this cause. Her introspections read as follows: "At first phrase (The Third Refresh) was not only meaningless but irritating. Then sudden effort brought verbal image of 'Teapot' and visual image of 3 or 4 teapots of my acquaintance. Remembered that it was the teapot that went with the child's slipper and the disgusting candlestick." (A. 1st Sense Test. V.) "Thought 'Leisure -

that meant Book'. Immediate image of lots of blue books of nearly every shape I can remember being shown, standing up, lying down, open, shut, but all in the ultramarine blue. Selected this one as being right one owing to vague association that the blue one had a missing line which I put in." (A. 2nd Sense Test. V.) "Refresh = teapot. Thought of several green teapots. Tried to sort them out - the square one wasn't green. Could not remember others at all. Generic image of teapots rather like this - obstinate image of round knob to lid and large spout, so said "yes". In drawing it I feel quite puzzled and keep having images of teapots I have seen recently." (A. 2nd Sense Test. VI.)

### Children.

Out of 160 nonsense tests done by the children there were 127 cases of incorrect identification, and out of 80 sense tests 51 cases. Thus the proportion of failures is much higher among the children than the adults.

### CAUSES OF FAILURE.

In considering the causes of failure with the children all 3 series must be taken into consideration.

### Confusion between members of the same set.

Confusion between members of the same set was for the children, as for the adults, the main cause of error, both with the nonsense and the sense material. Both forms of

confusion (see p.62) were found. Cases of the wrong member of the set being given were accompanied by such comments as:- "Remember that all of these were the same sort of shape, but different ways. Do not know if this is the right way." (s. 1st Galef Test. VIII.) "I thought of the first but could not get it but remembered the second and then remembered two others, the blue one with fur and this. Thought it must be this one as it was easier than the blue one and they got more difficult as they went on. (t. 2nd Sense Test. II.)

The other type of confusion, namely the incorporation of features from one or more members of the set to form the figure or object is best illustrated by the drawings.



(t. 1st Borat Test II).



(s. 2nd Sense Test. X.)

#### Confusion between sets.

Confusion between the sets was a cause of failure to identify correctly when the figures had to be known

individually, because the characteristics of the set were not differentiated. These cases were chiefly between sets in the same series, but subject s gave one case of confusion between sets in the 2 nonsense series.

One case of confusion between the sets in the sense series was responsible for the failure to identify the object correctly, subject s, on being asked for "the Third Refresh" drew the last candlestick, and seemed unaware of the confusion.

Inability to recall any figure or object.

There were 21 cases in the nonsense series, 9 in the Galef and 12 in the Borat, in which no memory was evoked at all, and there were 3 cases of such complete failure with the sense series. "I don't remember an orange one at all." (r. 1st Galef Test. IV.) "Don't know the first Benac at all." (q. 1st Galef Test. V.) "Don't remember any of the first ones." (q. 2nd Sense Test. V.)

Partial knowledge and incomplete imagery.

A recall in which the knowledge was insufficient for the figure or object to be said to be correctly identified was another cause of failure. In frequency the occurrence of this type of failure ranks next to that of confusion.

It occurred in all three series, as the following examples from the children's protocols will show:- "Was this colour and would fit inside this oblong." (q. 1st Borat Test. IX.) "Think it may be the first one. Think had a bit like this



and a round bit at x."

(q. 2nd Borat Test. II.)

"Saw the colour in my head. Seemed to remember that it had a bit that went in and that it was rounded." (s. 1st Galef. Test. II.) "Something with a point like this. Saw it blurred but saw the colour clearly." (t. 2nd Galef Test. VI.) "Might be the long yellow one. Know it is a candle in holder. If the long yellow one is not 2nd it is third or fourth." (r. 1st Sense Test. III.) "Know it is this red. It is the first, I think. It is a lady's slipper. I don't remember the shape." (t. 2nd Sense Test. VII.)

#### Concentration on the colour.

With the children there were no cases in which the failure was due to concentration on the colour.

#### Information known to be incorrect.

In the former account of the nonsense experiments a few instances were given of the words calling up information which was rejected by the subject as incorrect. Such rejection showed that the subjects had definite knowledge about the set to which the required figure or object belonged;

other members of the set would be recollected but be known not to fulfil the conditions. The adults never experienced this rejection in the sense series. With the children, however, cases are to be found in all 3 series, but are most numerous in the sense series. "I know one Zitađ which I think is the last and I know it is the darkest green. Am quite sure it is not the first. Don't remember any of the first things." (q. 2nd Galef Test. VI.) "I can remember the last and the 2nd last so know it is neither of those, but that is all I remember." (t. 1st Borat Test. IX.) "Know what refresh is and can think of the last and the one I have just drawn but don't know the others." (q. 1st Sense Test. V.) Subject r on being asked for "the Red Comfort" knew it was a slipper and went through them telling the experimenter about all of them except the red one.

#### Vague description.

One child, q, used, in all 3 series, a method of learning, which had been used by the adult subject, H, in the nonsense series, viz: she memorized some of the figures and objects in words, and when it came to the general tests although the description was recalled that alone did not lead to correct reproduction. In one case in the nonsense tests this method was the cause of the failure. Her protocol reads:- "All the Porils had an oblong and a point. It would

have gone in this shape (an outlined rectangle). Was the second last Poril we saw." (q. 1st Galef Test. IV.)

#### COMPARISON OF THE BORAT SERIES WITH THE GALEF SERIES.

The comparison of the two nonsense series will only be here considered for the children, a comparison of the adults' results having been given in the previous report, the main point being that the figures were more often correctly identified in the Galef than in the Borat general tests, although during the learning period the Borat series had been better remembered. The reasons for this, it was suggested, were the order in which the series were taken, the subject's knowledge of the type of general test, the actual figures comprising the 2 series, and the date of the work in relation to the Academic year, all the subjects being members of the University.

In the first tests the Borat Test gave better results on the whole than the Galef tests. This was probably due to the fact that, as the Borat series came after the Galef series, the children knew the type of test to expect. The general nonsense tests came as a surprise to the children, in spite of having the previous experience of the sense series.

The second Borat Test on the other hand was not as well done as the second Galef Test. After the interval of five



weeks the two nonsense series had become somewhat confused in the children's minds. Although in only one case could this confusion be called the cause of the failure (see p.69), the confusion made the recalls of all these subjects more difficult. Illustrations of this point follow:- "I remember a shoe and a round bit that I think goes with it. The name is Zitad. I know it is not this one. I also remember the W one that was called Rusep, but I know that came in the other test." (q. 2nd Borat Test. I.) "At first I was going to put Zitad and then remembered the shape." (s. 2nd Borat Test. V.) Subject t thought when doing this second Borat test that there were 4 sets in the series and that the names were Borat, Zitad, Vineg and Guber.

#### COMPARISON OF THE NONSENSE SERIES WITH THE SENSE SERIES.

Both the adults and the children did better on the sense tests than on the nonsense tests. In spite of this fact all the subjects were more critical of their sense protocols. Subject I's comment may be taken as representing the general attitude. "It seems more difficult to remember these than the nonsense ones - perhaps because the objects are familiar." (I. 1st Sense Test. V.)

## STATISTICAL RESULTS FOR THE GENERAL TESTS.

Subject I was unable to finish the Galef Tests owing to illness, and, therefore, her results are omitted from all tables dealing with the Galef series.

### Response Times.

The response times from the moment of exposing the card to the subject's response, for these tests are given in seconds in the following tables.

N.B. The columns marked C in the tables give the responses when the word was qualified by an adjective of colour.

TABLE XXIV.  
Borot Response Times (Adults).

Subject	Test I.												Test II.											
	I C	II	III C	IV C	V	VI	VIII	IX C	X	Total	Average	I	II C	III	IV C	V C	VI	VII	VIII C	IX	X C	Total	Average	
A	10	13.8	39.4	4.4	1.4	2.6	16.8	1	1.2	15.6	106.2	10.6	180	31	27.2	27.6	6.8	82.4	14.8	36	14.6	24.2	444.6	44.5
B	3.4	24.2	46.2	9	5	12.2	53.8	2.2	1.4	7.2	164.6	16.5	10.2	175.2	180	24.2	2.8	85.6	6	28.2	12.6	47.2	572	57.2
C	37.2	17.6	2.6	9.8	1.8	10.6	3.6	116.4	2.4	12.6	214.6	21.5	22.4	180	13	116.2	5	5.8	34.6	25.2	156.4	24	582.6	58.3
D	11.4	4.8	14.2	4.8	14.2	5.6	1.6	9.8	8.6	5.4	80.4	8.04	3.8	2.2	2.4	2.8	2	1.8	2.8	6	1.6	3.4	28.8	2.9
F	32.2	180	11.2	4	25.2	8	36	3.8	5	81.2	384.6	38.5	18	180	80	5.4	43.2	180	135.2	48.2	180	64	928	92.8
I	155.2	18.4	7.4	3	7.6	17	84	1.6	25.2	29	345.4	34.5	25.6	5.4	5.8	3.2	4	11.6	9.2	4.6	41.8	3.2	114.4	11.4
Total	249.4	258.8	121.0	35.0	53.2	56.0	195.8	134.8	40.8	151.0	1295.8		260.0	573.8	308.4	179.4	63.8	367.2	262.6	142.2	407.0	166.0	2670.4	
Average	41.57	43.13	20.17	5.83	8.87	9.33	32.63	22.47	6.8	25.17			43.33	95.65	51.4	29.9	10.63	61.2	33.77	23.7	67.83	27.67		

TABLE XXV.  
Galat Response Times (Adults).

Subject	Test I														Test II									
	I C	II	III C	IV C	V	VI	VII C	VIII	IX C	X	Total	Average	I	II C	III	IV C	V C	VI	VII	VIII C	IX	X C	Total	Average
A	17.4	6.8	5.6	37.4	17.4	22	63.4	4	2.6	5.2	181.8	18.2	14.4	1	9	12.2	45	6.6	25.4	88.2	15	81	297.8	29.8
B	19.4	2.2	3.8	2.8	1.8	2.2	1.4	1.2	1.2	1.4	37.4	3.7	2.8	1.8	10.2	16.6	2	4.4	180	5.8	3.6	14.6	241.8	24.2
C	7	2.6	53	20	30.4	8.6	1.8	25.2	33.6	2.6	184.8	18.5	34	29	2	5	41	23	5.6	10	1.2	6	156.8	15.7
D	3.8	1.4	1.2	2.2	1.2	2	4.6	2.2	1.8	8	28.4	2.8	7.2	1.8	1.8	2	1.2	1.4	.8	1.4	1.2	.8	19.6	2
F	28	10	50.2	33.4	58.8	18.2	180	8.4	3.4	5.8	396.2	39.6	40.4	45	50	50.2	60	25	110	20.2	25	20	445.8	44.6
I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	75.6	23.0	113.8	95.8	109.6	53.0	251.2	41.0	42.6	23.0	828.6		98.8	78.6	73.0	86.0	149.2	60.4	321.8	125.6	46.0	122.4	1161.8	
Average	15.12	4.6	22.76	19.16	21.92	10.6	50.24	8.2	8.52	4.6			19.76	15.72	14.6	17.2	29.84	12.08	64.36	25.12	9.2	24.48		

TABLE XXVI.  
Sense Response Times (Adults).

Subject	Test I													Test II.										
	I C	II	III	IV C	V	VI C	VII	VIII C	IX	X C	Total	Average	I C	II	III C	IV	V	VI C	VII C	VIII	IX C	X	Total	Average
A	8.4	4.6	11.4	24.6	8	3.2	2.8	3.6	25	2	99.6	9.26	9.8	12.6	4.2	5.2	4.2	41.8	3.8	8.8	2.2	69	161.6	15.26
B	4.6	1.8	3	3.6	8	2.2	3.4	1	1.2	1.2	30	3	4	7.4	7.8	13.4	3.2	4.4	5.4	2.2	2	6	55.8	5.58
C	2.2	1.6	9.4	3.6	12	2	1.8	5.2	1.8	3.2	42.8	4.28	5.6	13	5	13.6	7	3	4	10	2.4	2	65.6	6.56
D	2.2	1	1.2	.8	1.2	1.2	.8	.8	.8	.8	11.2	1.12	.8	2.4	1.6	2	2.6	1.2	.8	1.6	1.2	2.6	16.8	1.68
F	3.8	6.2	4.4	70.8	6	4.2	3.2	5.8	1.8	23	129.2	12.92	6	7	18.4	46.4	31.8	49	15.6	22	5.8	5	207	2.07
I	2.4	4	3.8	2.8	7	2.6	15.6	20.8	21	7.4	87.4	8.74	22	29.4	4.4	24.2	46.2	2.4	2.4	60	18.4	104.2	313.6	31.36
Total	23.6	19.2	33.2	106.2	48.2	15.4	28.0	43.2	51.6	37.6	400.2		48.2	71.8	41.4	104.8	95.0	101.8	32.0	104.6	32	188.8	820.4	
Average	3.93	3.2	5.53	17.7	7.03	2.57	4.67	7.2	8.6	6.27			8.03	11.97	6.9	17.47	15.83	16.97	5.33	17.43	5.33	31.47		

TABLE XXVII.  
Borot Response Times (Children).

Subject	Test I								Test II															
	I C	II	III C	IV C	V	VI	VII C	VIII	IX C	X	Total	Average	I	II C	III	IV C	V C	VI	VII	VIII C	IX	X C	Total	Average
q	180	180	180	180	180	8.2	21.8	180	53	165.4	1328.4	132.84	180	10	180	6.8	7.6	12.8	180	180	74.2	180	1011.4	101.14
r	19.8	180	163.8	4.6	10	6.2	115.4	153.6	.6	180	834	83.4	180	180	180	14	23.8	180	34.8	8.2	4.6	180	985.4	98.54
s	1.6	1.8	1.8	2	1	1.4	1.6	.8	1.8	.8	14.6	1.46	6.2	2.2	3	3.8	4.4	3.2	6	2.8	3.6	1.8	37.0	3.70
t	122.8	75	24.8	2.8	180	69.8	20.6	2.4	180	137.8	816	81.6	35	6.4	24.8	65.8	154	180	140	45	7	2.2	660.2	66.02
<b>Total</b>	<b>324.2</b>	<b>436.8</b>	<b>370.4</b>	<b>189.4</b>	<b>371</b>	<b>85.6</b>	<b>159.4</b>	<b>356.8</b>	<b>235.4</b>	<b>484.0</b>	<b>2995.0</b>		<b>401.2</b>	<b>198.6</b>	<b>387.8</b>	<b>90.4</b>	<b>189.8</b>	<b>376.0</b>	<b>360.8</b>	<b>236.0</b>	<b>89.4</b>	<b>364.0</b>	<b>2694</b>	
<b>Average</b>	<b>81.05</b>	<b>109.2</b>	<b>92.6</b>	<b>47.35</b>	<b>92.75</b>	<b>21.4</b>	<b>39.85</b>	<b>84.2</b>	<b>58.85</b>	<b>121</b>			<b>100.3</b>	<b>49.65</b>	<b>96.95</b>	<b>22.6</b>	<b>47.45</b>	<b>94</b>	<b>90.2</b>	<b>59</b>	<b>22.35</b>	<b>91</b>		

TABLE IXVIII.

Galof Response Times (Children).

Subject	Test I										Test II													
	I C	II	III C	IV C	V	VI	VII C	VIII	IX C	X	Total	Average	I	II C	III	IV C	V C	VI	VII	VIII C	IX	X C	Total	Average
q	180	104	15.2	30.2	180	145	61.2	35.4	3.8	2.8	757.6	75.76	180	180	180	21	180	180	180	28.8	49.6	142.4	1381.8	138.18
r	180	180	180	180	180	180	33.6	180	2.2	5	1300.8	130.08	180	180	180	3.6	180	20.2	180	180	180	.8	1284.6	128.46
s	8.8	5	4	12.6	7.6	3.6	5.4	10.6	4	1.2	62.8	6.28	10	2.4	4.2	9.8	7	2.4	2.4	5	3.6	2	48.8	4.88
t	179	9.4	3.4	180	164.4	90.2	52.4	31.2	1.6	9.4	721	72.1	122.6	180	15	5	59	66.8	18	180	61.8	8.2	716.4	71.64
Total	547.8	296.4	202.6	402.8	532	418.8	152.6	257.2	11.6	18.4	2842.2		492.6	542.4	379.2	39.4	426	269.4	380.4	393.8	295	153.4	3371.6	
Average	136.95	74.6	50.65	100.7	133	104.7	38.15	64.3	2.9	4.6			123.15	135.6	94.8	9.85	106.5	67.35	95.1	98.45	73.75	38.35		

TABLE XXIX.

Sense Response Times (Children).

Subject	Test I												Test II.											
	I C	II	III	IV C	V	VI C	VII	VIII C	IX	X C	Total	Average	I C	II	III C	IV	V	VI C	VII C	VIII	IX C	X	Total	Average
q	67.6	180	180	21	180	5	145	75	180	118	1151.6	115.16	134.8	22.4	13.4	39	180	180	81.2	180	180	5	1015.8	101.58
r	12.8	180	180	2	32	3	22.4	10.8	2.4	180	625.2	62.52	38	58.2	8	32.6	180	3.4	180	180	2.2	80.4	760.8	76.08
s	10	5	1.8	10	4.4	2.6	5.2	10.2	6.2	3	58.4	5.84	4.4	6.2	8.2	10	7.6	3	2	2.6	4.8	5.4	54.2	5.42
t	10	31.4	68.2	2.2	78	3.8	6	56	1.6	17	274.2	27.42	44.8	34.4	48.6	21.2	50	180	45	180	180	3.4	787.4	78.74
Total	100.4	396.4	430	35.2	294.4	14.4	178.6	151.8	190.8	318	2109.4		220.0	121.2	76.2	102.8	417.6	366.4	308.2	542.6	367.0	94.2	2618.2	
Average	25.1	99.1	107.5	8.8	73.6	3.6	44.45	37.95	47.55	79.5			55	30.3	19.05	25.7	104.4	91.6	77.05	135.65	91.75	23.55		



From these tables it will be seen that the average time taken for one test was less for the first tests than for the second tests, with the exception of the Borat tests with the children.

The average response to a single item of the general tests is given in seconds in the following table:-

TABLE XXX.

Average time for 1 Test.

Adults		Children	
Borat I 21.6	Borat II 44.51	Borat I 74.83	Borat II 67.35
Galef I 16.57	Galef II 23.24	Galef I 71.06	Galef II 84.29
Sense I 6.67	Sense II 13.67	Sense I 52.74	Sense II 65.46

The times taken for the responses in the sense series was considerably less than for either of the nonsense series.

The adults took the maximum time for response 9 times during the nonsense experiment. 6 such responses were given during the second Borat Test. No adult took the maximum time during the sense series. The children took the maximum time 46 times during the nonsense experiment, the greatest number, 15, being taken during the second Galef test. With the sense material on 17 occasions the maximum time was taken.

The shortest response time for an adult, both in the nonsense and the sense material, was .8 seconds. With the children .6 seconds was the shortest time taken for a response in the nonsense series, .8 seconds was also given on 3 occasions. The shortest time taken for a sense reaction was 1.6 seconds.

EXTENT OF THE KNOWLEDGE SHOWN IN THE GENERAL TESTS.

The marks gained in the general tests are given in the following tables the maximum in each case being 10:-

TABLE XXXI.

Borat Test I. Adults.

Correct Identification and Features Correctly Given.

Sub- ject	Colour	Shade	Shape	Orienta- tion	Position in Series	Size	Correct Identi- fication	Score
A	7	7	10	5	0	2	8	39
B	7	5	10	3	0	0	5	30
C	10	6	10	4	0	3	9	42
D	8	8	10	3	0	3	4	36
F	5	3	2	2	0	1	3	16
I	7	5	9	3	0	4	5	33
Total	44	34	51	20	0	13	34	196
Average	7.33	5.67	8.5	3.33	0	2.17	5.66	32.67

TABLE XXXII.

Borat Test II. Adults.

Correct Identification and Features Correctly Given.

Sub- ject	Colour	Shade	Shape	Orienta- tion	Position in Series	Size	Correct identi- fication	Score
A	7	3	9	1	0	2	4	26
B	8	4	6	2	0	0	4	24
C	8	4	8	2	0	0	3	25
D	10	7	9	5	0	2	4	37
F	6	1	2	1	0	0	0	10
I	7	3	9	2	0	3	3	27
<b>Total</b>	46	22	43	13	0	7	18	149
<b>Aver- age</b>	7.67	3.67	7.17	2.17	0	1.16	3	24.83

TABLE XXXIII.

Galef Test I. Adults.

Correct Identification and Features Correctly Given.

Sub- ject	Colour	Shade	Shape	Orienta- tion	Position in Series	Size	Correct Identi- fication	Score
A	8	8	8	5	0	4	5	38
B	9	5	7	4	0	5	6	36
C	9	7	10	6	0	3	10	45
D	10	10	10	10	0	5	10	55
F	6	4	8	2	1	2	3	26
I	-	-	-	-	-	-	-	-
Total	42	34	43	27	1	19	34	200
Aver- age	8.4	6.8	8.6	5.4	.2	3.6	6.8	40

TABLE XXXIV.

Galef Test II. Adults.

Correct Identification and Features Correctly Given.

Sub- ject	Colour	Shade	Shape	Orienta- tion	Position in Series	Size	Correct Identi- fication	Score
A	7	4	9	4	0	1	4	29
B	8	6	6	3	0	1	8	32
C	9	7	9	5	0	1	6	37
D	10	9	10	8	0	6	10	53
F	8	3	7	1	1	3	1	24
I	-	-	-	-	-	-	-	-
Total	42	29	41	21	1	12	29	175
Aver- age	8.4	5.8	8.2	4.2	.2	2.4	5.8	35

TABLE XXXV.

Sense Test I. Adults.

Correct Identification and Features Correctly Given.

Sub- ject	Colour	Shade	Shape	Orienta- tion	Position in Series	Size	Correct Identi- fication	Score
A	7	4	5	6	1	3	6	32
B	10	10	9	9	5	3	10	56
C	10	9	9	9	1	3	9	50
D	10	10	10	10	5	2	10	57
F	9	7	7	6	0	1	7	37
I	7	5	4	3	0	3	4	26
<b>Total</b>	<b>53</b>	<b>45</b>	<b>44</b>	<b>43</b>	<b>12</b>	<b>15</b>	<b>46</b>	<b>258</b>
<b>Aver- age</b>	<b>8.83</b>	<b>7.5</b>	<b>7.33</b>	<b>7.16</b>	<b>2</b>	<b>2.5</b>	<b>7.66</b>	<b>43</b>

TABLE XXXVI.

Sense Test II. Adults.

Correct Identification and Features Correctly Given.

Sub- ject	Colour	Shade	Shape	Orienta- tion	Position in Series	Size	Correct Identi- fication	Score
A	7	5	5	4	0	2	3	26
B	9	8	10	8	4	2	10	51
C	10	6	9	9	0	2	9	45
D	10	9	10	9	5	2	10	55
F	5	2	4	4	0	1	3	19
I	6	6	6	6	1	1	5	31
Total	47	36	44	40	10	10	40	227
Aver- age	7.83	6	7.33	6.67	1.67	1.66	6.66	37.83



TABLE XXXVII.

Borat. Test I. Children.

Correct Identification and Features Correctly Given.

Sub- ject	Colour	Shade	Shape	Orienta- tion	Position in Series	Size	Correct Identi- fication	Score
q	5	1	1	0	2	2	0	11
r	8	5	3	2	0	0	4	22
s	9	6	9	2	2	0	4	32
t	7	4	6	4	1	0	4	26
<b>Total</b>	29	16	19	8	5	2	12	91
<b>Aver- age</b>	7.25	4	4.75	2	1.25	.5	3	22.75

TABLE XXXVIII.

Borat. Test II. Children.

Correct Identification and Features Correctly Given.

Sub- ject	Colour	Shade	Shape	Orienta- tion	Position in Series	Size	Correct Identi- fication	Score
q	4	0	0	0	1	1	0	6
r	5	0	0	0	0	0	0	5
s	8	2	2	1	0	0	2	15
t	5	3	3	1	4	0	1	17
<b>Total</b>	<b>22</b>	<b>5</b>	<b>5</b>	<b>2</b>	<b>5</b>	<b>1</b>	<b>3</b>	<b>43</b>
<b>Aver- age</b>	<b>5.5</b>	<b>1.25</b>	<b>1.25</b>	<b>.5</b>	<b>1.25</b>	<b>.25</b>	<b>.75</b>	<b>10.75</b>

TABLE XXXIX.

Galef. Test I. Children.

Correct Identification and Features Correctly Given.

Sub- ject	Colour	Shade	Shape	Orienta- tion	Position in Series	Size	Correct Identi- fication	Score
q	8	4	5	4	3	4	4	32
r	6	3	3	2	0	0	2	16
s	7	6	1	1	0	1	1	17
t	6	3	9	2	2	0	3	25
<b>Total</b>	<b>27</b>	<b>16</b>	<b>18</b>	<b>9</b>	<b>5</b>	<b>5</b>	<b>10</b>	<b>90</b>
<b>Aver- age</b>	<b>6.75</b>	<b>4</b>	<b>4.5</b>	<b>2.25</b>	<b>1.25</b>	<b>1.25</b>	<b>2.5</b>	<b>2.25</b>

TABLE XL.

Galef. Test II. Children.

Correct Identification and Features Correctly Given.

Sub- ject	Colour	Shade	Shape	Orienta- tion	Position in Series	Size	Correct Identi- fication	Score
q	6	2	4	0	1	0	0	13
r	5	3	3	1	4	0	3	19
s	8	6	2	1	0	0	1	18
t	7	3	6	4	3	0	4	27
<b>Total</b>	26	14	15	6	8	0	8	77
<b>Aver- age</b>	6.5	3.5	3.75	1.5	2	0	2	19.25

TABLE XLI.

Sense. Test I. Children.

Correct Identification and Features Correctly Given.

Sub- ject	Colour	Shade	Shape	Orienta- tion	Position in Series	Size	Correct Identi- fication	Score
q	6	4	4	4	0	3	5	26
r	6	5	5	3	1	2	4	26
s	7	3	5	6	0	1	4	26
t	10	4	8	5	0	0	8	35
Total	29	16	22	18	1	6	21	113
Aver- age	7.25	4	5.5	4.5	.25	1.5	5.25	28.25

TABLE XLII.

Sense. Test II. Children.

Correct Identification and Features Correctly Given.

Sub- ject	Colour	Shade	Shape	Orienta- tion	Position in Series	Size	Correct Identi- fication	Score
q	7	2	0	1	0	1	0	11
r	7	4	4	4	0	2	4	25
s	6	2	4	2	0	0	3	17
t	7	3	2	1	1	0	1	15
Total	27	11	10	8	1	3	8	68
Aver- age	6.75	2.75	2.5	2	.25	.75	2	17

In every case the test taken after an interval of five weeks gives a smaller number of cases of correct identification. One adult, F, failed to identify any figure correctly in the second Borat Test. Such failure is recorded of a child once in the first Borat test, twice in the second Borat, once in the second Galef and once in the second Sense.

For the adults the results of the sense tests were considerably better than those of the nonsense tests. This is not so consistently true of the children. The first sense test was the one that gained the highest number of marks, but 2 of the children q and t did better in the second Galef test than in the second sense test.

Taking the tests as a whole, colour gained the highest marks, the total gained for the adults being 274 and for the children 160. Shape ranked next, the adults gaining 266 marks and the children 89.

As in the learning periods the marks gained for size by both the adults and the children were low.

### SIZE OF THE FIGURE OR OBJECT.

In the previous thesis it was pointed out that the number of figures drawn the correct size both by the adults and the children was surprisingly small. It was suggested to the experimenter that this might be due to the fact that the paper on which the subjects were required to reproduce the figures was considerably larger (being 6.5 x 8 ins) than the cards (ordinary postcard size) on which the figures were drawn. Therefore it was decided in these experiments to give the children paper cut to the exact size of the cards. The adults were given the same sized paper for the sense experiments as they had used for the nonsense, it being felt that to introduce a different sized sheet would be an added difficulty in comparing the nonsense and sense data obtained from these subjects.

#### Adults.

All the adult subjects knew that there had been a discussion on the size of the nonsense figures. In spite of this fact the objects were frequently drawn the wrong size, both during the learning periods and in the general tests. The extraordinary variations in the size are illustrated in the following drawings:-





Original  
3rd Refresh.

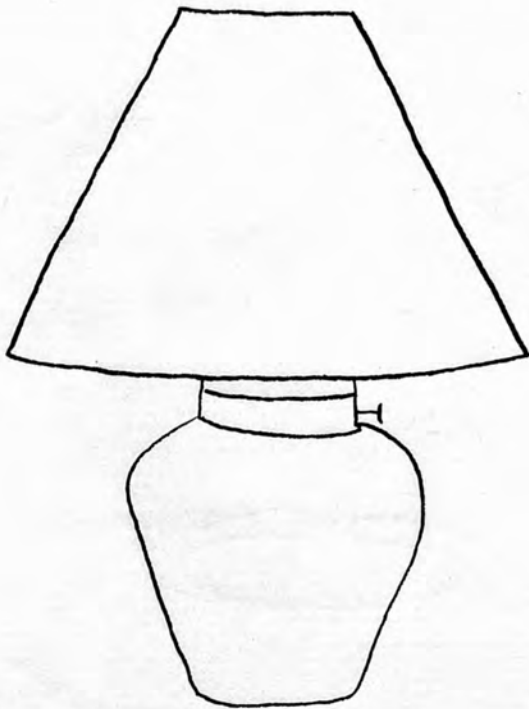


Drawing by B  
of same.



Drawing by D of same.

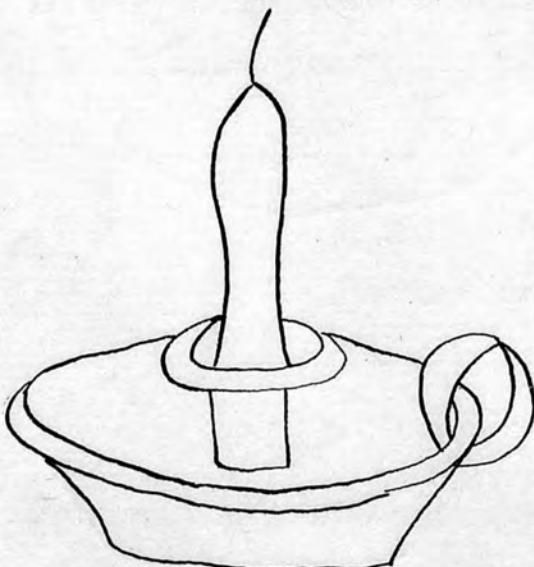
On the whole the adults tended to enlarge the drawings, but all subjects gave drawings that were too big and also drawings that were too small for example:



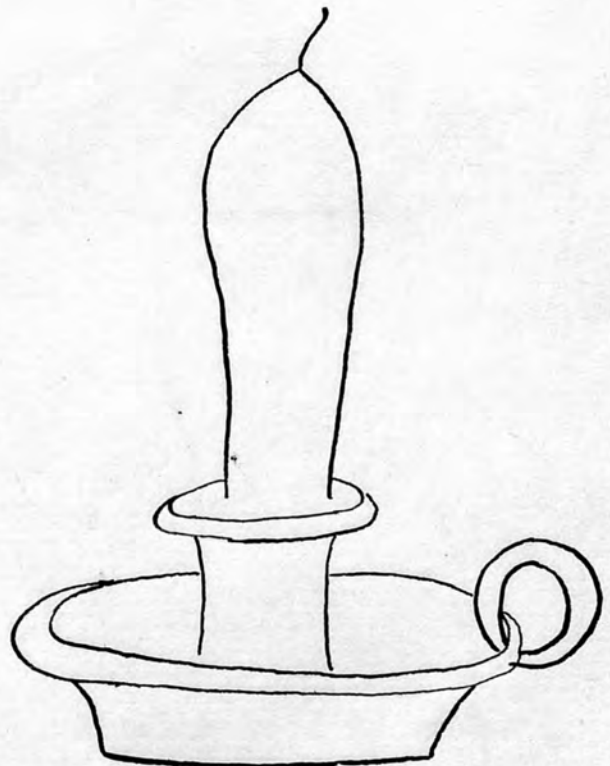
Original 5th Evening.



Drawing by F of same.

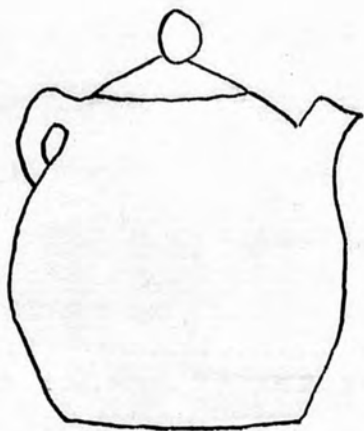


Original 2nd Lighting.



Drawing by F of same.

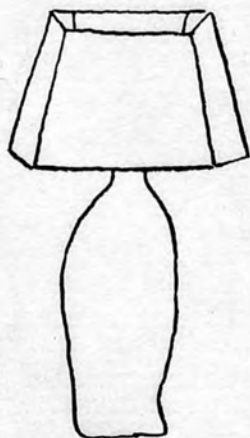
This drawing of the second lighting was accompanied by the following comment. "This candlestick should be rather larger". (F 4th Sense learning. IV.)



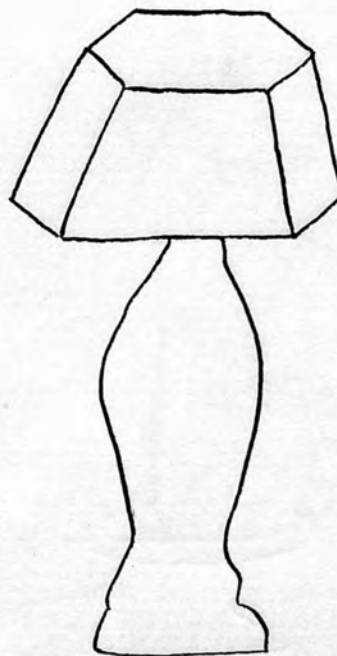
Original 1st Refresh.



Drawing by C of same.



Original 4th Evening.



Drawing by C of same.

Children.

No comment on the size of the drawings was made to the children. Here again the scores for size were very low. The size of the paper given to the children did not allow of drawings as big as those made by the adults and with the larger figures and objects a greatly enlarged drawing was impossible. This probably makes the children's scores, in comparison with the adults, higher than they should be.

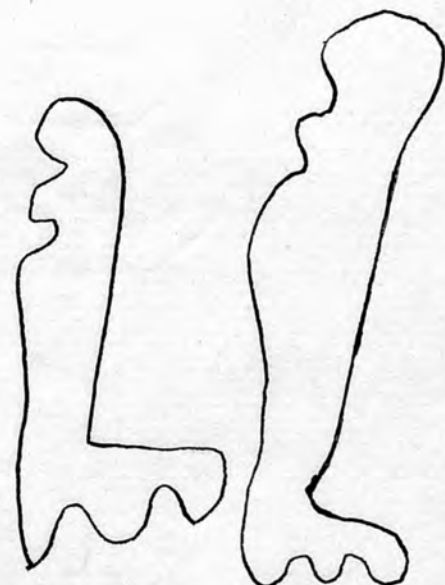
The same type of variation was found in the children's drawings as in the adults'. An illustration is given from each of the series.



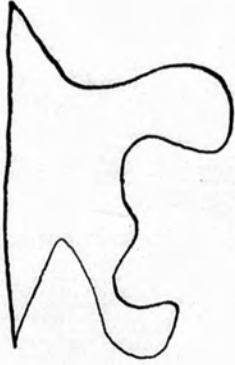
Original 5th  
Vineg.



Drawing by  
r of same.



2 Drawings by  
q of same.



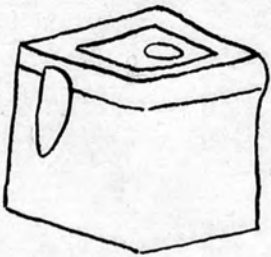
Original  
4th Rusep



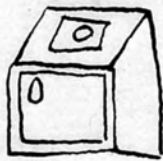
Drawing by  
r of same



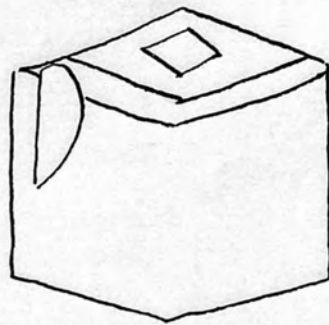
Drawing by  
s of same



Original  
4th Refresh

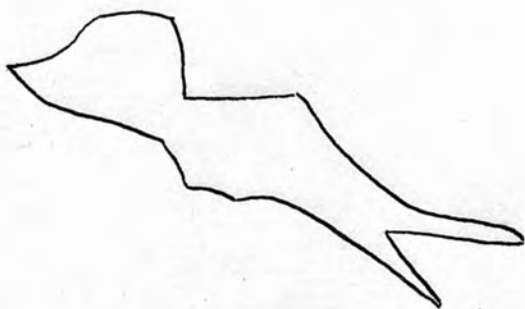


Drawing by  
t of same



Drawing by  
q of same.

The children on the whole drew both the figures and the objects smaller than the adults. The children who took part in the previous nonsense experiments had also drawn the figures smaller than the adults. In several cases the figures and objects were drawn minute by the children, for example:



Original  
4th Benac



Drawing by  
r of same



Original  
5th Poril



Drawing by  
t of same



Original 3rd Comfort



Drawing by s of same



Original 2nd Comfort



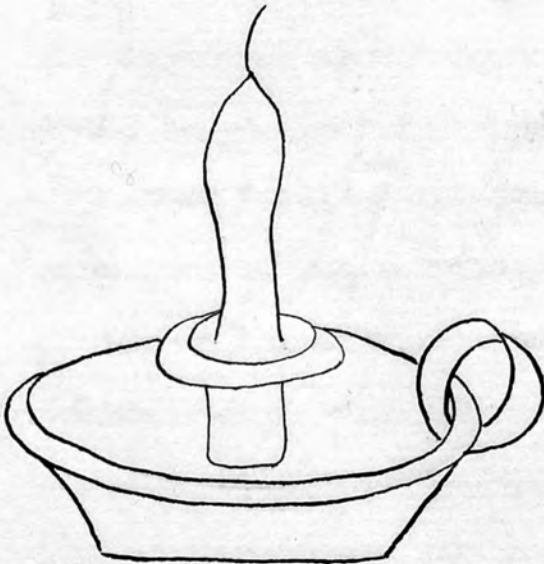
Drawing by t of same



Original 5th Refresh



Drawing by s of same



Original 2nd Lighting



Drawing by s of same

These very small drawings were more frequent with the sense material than with the nonsense. Subject q was the only child who never gave a very tiny drawing, and subject s gave the greatest number.

It will be seen from the children's drawings that the size of the paper is an inadequate explanation of inaccurate size.

Several factors appear to have contributed to this inaccuracy.

Miss Eng states:- "A child emphasizes in its drawings what appears interesting and important to it, frequently by making it particularly large"<sup>1</sup>. This would seem to be the explanation of some of the enlarged drawings given by both the adults and the children, especially those cases in which the drawings show a lack of proportion. A typical example would be subject F's drawing of the candle given on page 99.

With some of the small drawings there appeared to be some form of resistance, owing to the subjects' realisation of the difficulty of drawing, for instance subject t accompanies her drawing of the 2nd shoe (p.104) by the following comment "This is supposed to be the strap but I can't draw it. I know it is the sandel. I can't draw it very well." (t. 1st Sense test. VII.) The very small drawings often seemed to be the outcome of some degree of self-consciousness.

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(1) H.Eng. The Psychology of Children's Drawings, p.163.



The large drawings on the other hand were for the most part more accurate as regards the other details, e.g. orientation, and were given with a more confident air. One such drawing was given with the comment "I had an image of this in which the top was particularly clear. I know I am making them too large again - I hate drawing small." (C. 14th learning period. V.)

Subjects C and D both tended to make their drawings too big and subjects s and t to make them too small.

That this was partly dependent on temperamental differences seems most probable.

This question of the size of the figure or object appears to be one that would repay further investigation.

VISUAL IMAGERY.

The main object of this research was to study the part played by visual imagery in learning. As was mentioned in the previous thesis, all the adult subjects knew that the experiments concerned imagery, so that throughout the adults gave their attention to this aspect of the learning process, and reported even the most vague and fragmentary imagery present. The children had no knowledge of the general aim and object of the experiments nor was the word imagery mentioned to them. All visual images they reported were therefore mentioned spontaneously, and were expressed in different terms to those of the adults. The children reported that they "saw" the colour, the object, etc. whilst the adults more frequently said that they "had an image". It is probable that the children had more imagery than was actually reported. If, as was pointed out in the previous thesis, the investigations of the Marburg school are accepted visual imagery would appear to be so common among school children as not to attract special attention unless vivid or of direct aid to the child in recall. The children studied in these experiments made general statements about always seeing the figures or objects, but their own protocols refute these statements. A typical example may be taken from subject s's 2nd Sense Test, where she says "I have not remembered anything about

any of them. I just see them. I saw this in my head." (s. 2nd Sense test. VII.) but in giving a former item of this same test she reports:- "When I said "yes" I had only remembered the shape. I can not see it in my head at all. I saw a book first in my head but knew it was wrong." (s. 2nd Sense Test. I.). Such general statements can only be taken as an indication that imagery was frequently present.

Amount of visual imagery reported.

Tables giving the amount of imagery reported both during the learning periods and during the tests follow.

The total number given in each column may be considered in relation to the number of figures or objects to be recalled, this number being given at the top of each table.

TABLE XLIII.

Visual Imagery.

Learning Periods. Adults.

Number of possible recalls, 50 for each subject = 300.

Subject	Image of Colour			Image of Shape			Projection of Image		
	Borat	Galef	Sense	Borat	Galef	Sense	Borat	Galef	Sense
A	5	14	12	7	16	42	0	0	0
B	11	12	14	16	18	26	0	0	0
C	4	1	1	12	3	19	0	0	0
D	11	31	0	25	35	44	0	0	0
F	2	2	3	3	5	3	0	0	0
I	0	0	0	0	0	0	0	0	0
Total	33	60	30	63	77	134	0	0	0

TABLE XLIV.

Visual Imagery.

Learning Periods. Children.

Number of possible recalls, 50 for each subject = 200.

Subject	Image of Colour			Image of Shape			Projection of Image		
	Borat	Galef	Sense	Borat	Galef	Sense	Borat	Galef	Sense
q	1	7	8	1	8	20	0	0	3
r	0	0	2	0	0	2	0	0	0
s	33	32	19	38	24	26	6	4	13
t	41	21	2	38	34	8	2	0	0
Total	75	60	31	77	66	56	8	4	16

TABLE XLV.

Visual Imagery.

1st Tests. Adults.

Number of possible recalls, 10 for each subject = 60.\*

Subject	Image of Colour			Image of Shape			Projection of Image		
	Borat	Galef	Sense	Borat	Galef	Sense	Borat	Galef	Sense
A	3	3	4	5	4	9	0	0	0
B	0	2	2	0	6	7	0	0	0
C	0	0	0	2	4	4	0	0	0
D	4	1	1	8	4	1	0	0	0
F	0	0	1	2	0	1	0	0	0
I	0	-	0	0	-	0	0	-	0
Total	7	6	8	17	18	22	0	0	0

\*As subject I did not do the Galef tests the total for the Galef columns - 50.

TABLE XLVI.

Visual Imagery.

2nd Tests. Adults.

Number of possible recalls, 10 for each subject = 60.\*

Subject	Image of Colour			Image of Shape			Projection of Image		
	Borat	Galef	Sense	Borat	Galef	Sense	Borat	Galef	Sense
A	0	2	7	1	4	10	0	0	0
B	0	0	1	0	3	4	0	0	0
C	0	0	2	1	0	4	0	0	0
D	2	2	0	3	7	5	0	0	0
F	1	0	0	3	1	0	0	0	0
I	0	-	0	0	-	0	0	-	0
Total	3	4	10	8	15	23	0	0	0

\*As subject I did not do the Galef tests the total for the Galef columns = 50.

TABLE XLVII.

Visual Imagery.

1st Tests. Children.

Number of possible recalls, 10 for each subject = 40.

Subject	Image of Colour			Image of Shape			Projection of Image		
	Borat	Galef	Sense	Borat	Galef	Sense	Borat	Galef	Sense
q	0	0	4	0	0	4	0	0	0
r	0	0	0	0	0	0	0	0	0
s	4	4	6	7	6	4	0	0	0
t	5	2	0	5	3	4	0	0	0
Total	9	6	10	12	9	12	0	0	0



TABLE XLVIII.

Visual Imagery.

2nd Tests. Children.

Number of possible recalls, 10 for each subject = 40.

Subject	Image of Colour			Image of Shape			Projection of Image		
	Borat	Galef	Sense	Borat	Galef	Sense	Borat	Galef	Sense
q	0	0	0	2	2	3	0	0	0
r	1	0	0	3	0	0	0	0	0
s	6	3	9	6	3	10	1	0	5
t	0	2	0	0	3	3	0	0	0
Total	7	5	9	11	8	16	1	0	5

It was stated in the previous account of the nonsense experiments that the amount of visual imagery reported was meagre. From these tables it will be seen that the number of images reported remains low. All the subjects reported such imagery with the exception of subject I.

There are more cases of an image of shape than of colour in every table. The difference may be exaggerated, as whenever no reference to the colour was made, the image was regarded as one of shape only. Both the adults and the children gave images in which the colour and shape were combined, in which the shape was seen without the colour and in which the colour was seen minus the shape. Instances of each type are here quoted:- "Image of a "phat-pheet" looking orange shoe" (A. 2nd Sense Test. II.) "I closed my eyes and saw the shape in my head. The colour was with the shape." (q. 4th Galef learning. I.)

"Saw the shape but not clearly in my head. Did not see the colour. Saw it as an outline. Thought like a dog sitting up and its head up barking." (t. 3rd Borat learning. III.)

"I see the spout end with the 2 circles although I am uncertain of colour. I want to use deep blue. This colour is an inference." (B. 1st Sense Test. V.)

"Image of blueness i.e. blue patch with no clearly defined edges, more like a blue mist, and a visual image of word "Leisure" as it was printed in experiments." (A. 2nd Sense,

Test I.) "I can never remember the shape, as I cannot see it at all. Could see the colour clearly." (t. 2nd Borat learning. IV.)

Comparison of imagery reported by adults and by children.

The children reported a greater amount of imagery than the adults. The imagery reported by the children was, generally speaking, vivid imagery of a whole figure or object, for example:- "Saw it in my head just as I have drawn it." (r. 7th Sense learning. I.) "Saw the colour first. Then I saw the shape with the colour. I drew it about the size I saw it. I saw it in my head." (s. 2nd Sense test. V.)

"Can see it better than I can draw it. I can see the colour but it wasn't with the shape, it was apart." (t. 5th Borat learning. III.)

"Saw it quite clearly in my head with the colour." (t. 10th Galef learning. V.)

Cases were given, however, in which the imagery was fragmentary or vague. Examples of such recalls would be:- "Saw the left side in my head but not the right side. I saw the colour." (q. 8th Galef learning. III.)


"I saw the bottom pieces and the two pieces at sight in my head with the colour." (q. 8th Galef learning. V.)

"I remember part of the shape of the first Borat and also the colour. Could see this part in my head. I just remembered the colour." (r. 2nd Borat Test. III.)

"Can't remember the shape very well. Saw the colour clearly in my head and the shape vaguely." (t. 1st Borat learning. III.)

The imagery reported by the adults was chiefly of this nature, for instance:- "I cannot draw this teapot. It is a little like each of the above but I cannot get a clear enough image to say what is wrong or right in them." (C. 10th Sense learning. V.)

"I see the loop of handle on right." (B. 2nd Sense Test. VIII.)

"I had image of the heel and drew (1). As I finished (1) I remembered noting the narrowness and steepness of the arch in the original learning and so drew (2) but this is not right. I know that there were three vertical curved lines in heel  from image." (C. 2nd Sense Test. II.)

Perhaps the main difference between the imagery of the adults and the children is the projection of the images. No adult reported projection, but three out of the four children gave instances, there being altogether 34 cases, of these all but 5 were reported by subject s.

Examples of projection may be taken from the protocols:- "I saw both the colour and the shape on the big bit of paper." (q. 4th Sense learning. IV.) (N.B. The "big bit of paper" was a sheet of white paper used to cover the desk on which

the tests were given. The cards were placed on it and also the paper on which the children drew. All three of the children who gave instances of projection used this sheet as a projection mat.)

"Came clearly into my head with the colour. I can see it on the paper. I feel as if I could see them all this morning." (t. 6th Borat learning. II.)

"The shape was easy but the colour was hard. I looked at the paper and saw this colour." (s. 5th Sense learning. V.)

"I could see the shape and the colour together lying across the name." (s. 6th Borat learning. II.)

This projection combined with the vividness of the imagery would seem to indicate that the children's imagery was of the eidetic type.

#### Part played by imagery in recall.

A certain amount of correct information was given by visual images, examples of such information being:- "Saw the shape in my head and remembered that one had a dark colour. Then I saw yellow in my head, this shade of yellow." (s. 2nd Borat Test. VII.) Here the correct colour was given, but the incorrect shade.

"As soon as I saw the card I saw this clearly in my head with the colour." (t. 1st Borat Test. IV.)

"Mind a complete blank for a moment - then seemed to see pale blue, actual shape came later." (D. 1st Sense Test. I.)

This type of information given correctly by a visual image occurred altogether 38 times in the general tests, 29 times in the adults' protocols and 9 times in those of the children.

The vast majority of the images both during the learning periods and during the tests accompanied the recall, but did not supply the memory knowledge, for instance:- "The first refresh is an orange round dumpy teapot. I see the loop of handle on the right." (B. 2nd Sense Test. VIII.)

"Remembered quite clearly again - clear image too. Came in the 4th Series and very much liked." (D. 1st Sense Test. IV.)

"First thought that one Zitad was like the chair and then remembered that the one that was pale blue was near the end and was not like a chair but something like this. Saw it but not till after I remembered it." (s. 1st Galef Test. IX.)

In some cases the information supplied by the image was incorrect, but was accepted by the subjects as correct. Subject s gave the most instances of this type of failure. It is noteworthy that subject s, who had many more images than any of the other children, yet had the smallest number of correct identifications.

The protocols of this subject illustrate two important aspects of the visualiser's recalls which are emphasised by Professor F.C. Bartlett in his book "Remembering", namely that imagery tends to become a habit<sup>1</sup> and that visualisers are rapid workers and prone to adopt a confident and optimistic attitude about the accuracy of their recalls<sup>2</sup>.

Subject s drew the first 11 objects during the sense learning without having an image but after that reports 26 images in the 39 remaining protocols. In the later series this became the habitual method of recall. It was noticeable in the other subjects' protocols that if an image was reported during the first recall at any learning period the subject tended to give a similar report for the other four recalls, for instance, subject q reports no images during the 7th learning period of the Galef series, but at the 8th learning period one is reported for each recall, but again at the 9th period she only reports one image and that at the last recall.

The reaction times tables show that subject s gave the shortest times of any of the children. Throughout she adopted a confident attitude. She says, for example, "Saw the colour first. Then I saw the shape with the colour. I drew it about the size I saw it. I saw it in my head." (s. 2nd Sense Test. V.) Here the colour, the orientation and the size were all incorrect.

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(1) F.C. Bartlett, Remembering, p.224.  
 (2) " " op.cit. p.111.

Professor Bartlett also points out that a subject who is not naturally of the visualising type on obtaining a visual image, tends to have a feeling of certainty<sup>1</sup>. In these experiments subject r had few images and in her recalls showed a hesitating manner. A typical protocol would be the following:- "I know a pale blue and an orange one. I know for certain that the pale blue is not the third, and I don't think the orange is. At least I am not going to risk it." (r. 1st Galef Test. VI.) On the only occasion on which she had a complete image of the required object she drew it with certainty saying, "Saw it in my head just as I have drawn it." (r. 7th Sense learning. I.)

The fact that an image gives this sense of confidence means that an incorrect image invariably is a hindrance to the correct recall. Occasionally an image was obtained of some figure or object other than the one asked for, and was recognised as such by the subjects. The following instances are typical:- "I can only remember one Vineg which is the 1st. I also remember its colour. I can see it in my head with the colour." (r. 2nd Borat Test. VI.)

"Feel as though I can recall any of the lamps but this - image of fat orange one and horrid modern square blue one! Hope this is right but am not sure. Hate it anyhow." (A. 1st Sense Test. VIII.)

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(1) F.C. Bartlett, op.cit. p.59.



The majority of the images obtained were correct, but were not of direct aid in recall.

Composite Image.

In the sense series subject A constructed composite pictures into which she fitted all five objects seen at the same learning period, and these pictures played a considerable part in her recalls. The first one was given during the first learning period. She says: "This was the third figure and has given me a complete image of a man sitting sideways to me, a yellow lamp is on the corner of the mantelpiece, he is wearing red slippers and reading the book." (A. 1st Sense learning. III.) Later she adds:- "Candlestick a nuisance. Why should he have a blue candlestick as well as a yellow lamp? Disliked it because it would not fit into my picture - put it on mantelpiece at other end from lamp and found it looked idiotic as though someone had brought it from a woman's room and left it in a man's study. Not a man's candlestick and was no use as there was a lamp, nor was it an ornament. Totally unnecessary." (A. 1st Sense learning. IV.) "This teapot bothers me because though the man would have had tea I cannot find a satisfactory place for the teapot in my picture. Saw it first on the mantelpiece then floating vaguely at far left of picture unsupported; in recall I got a low octagonal table at far left, but nothing on it but this silly pot. The man has had, not going to have his tea. Have just remembered why

that teapot bothered me by moving about. In Laurence Housman's play "Possession" five sisters quarrel about a teapot, so in the next world it moves about flapping its lid at the sister who tried (and still tries) to grab it. An irritating pot, which disappears like the Cheshire cat. All the pictures fit so well together in meaning but the candlestick is somehow unnecessary and should not be called "lighting" when there is a lamp in the set." (A. 1st Sense learning. V.)

On the second learning occasion this picture was further elaborated. "Sudden flash gave me association for my picture. Slipper - Sherlock Holmes kept his tobacco in a slipper. See picture of him sitting by fire in the position of my man. Realise now that man wears dressing gown and smokes long pipe. Probably he'll have a violin before long!" (A. 2nd Sense learning. II.) Later she says of the book "Curious to know what book could be - green loose-leaf note book? Pages would be white then - Sherlock Holmes' case book perhaps?" (A. 2nd Sense learning. III.) and of the candlestick: "It is now more irrelevant than last week. Sherlock would never have had an object like that. Not even Watson would have brought it." (A. 2nd Sense learning. IV.)

In the general tests it is this composite picture which comes to mind, for example: "It was the first candlestick, the one which was so unsuitable to Sherlock Holmes' room. Can't

remember it exactly, except that it was boudoir-ish." (A. 1st Sense Test. X.) "Realised at once that I had to recall the first teapot. Could not. Remembered it was elusive and there was no place for it in the room of Sherlock Holmes. Then had image of a pot with a thin unreliable handle and possibly green. This may be right, but I think it's wrong." (A. 2nd Sense Test. VIII.)

A gave a similar composite picture for both the second and the third variants of the objects but not for the last two. In each case this composite image was instrumental in giving information during the general tests.

#### KINAESTHETIC IMAGERY.

The adults reported altogether 39 cases of kinaesthetic imagery, distributed as follows:

Subject	A	B	C	D	F	I
No. of cases	18	2	18	0	1	0

Such imagery was given in all three series. Illustrations follow from the sense series:- "The recall came with a kinaesthetic "image" a sweeping down from left to right with knowledge that in learning I always thought of toe as end and heel as beginning." (C. 1st Sense Test. IV.)

"I know that handle and spout were in positions given

because I have kinaesthetic image of going to lift with left hand." (C. 9th Sense learning. V.)

"Struck by the inadequate handle - the pourer out would get her fingers jammed. Vivid kinaesthetic image of fingers being jammed." (A. 1st Sense learning. V.)

In no case was the recall given entirely by such imagery, but the imagery was a subsidiary aid.

No cases of such imagery are to be found in the children's papers.

#### OTHER TYPES OF IMAGERY.

There is no evidence of other types of imagery being present on any occasion.

### THE USE OF WORDS.

We have seen that imagery played but a small part in recall and in the formation of the concepts. The main medium through which both these tasks were performed was words. This use of words took several different forms, the most frequent being that of analogy.

### ANALOGIES.

In the previous thesis we took the word analogy to be "a name for the fact that, the relation borne to any object by some attribute or circumstance, corresponds to the relation existing between another object and some attribute or circumstance pertaining to it"<sup>1</sup> and more vaguely as "agreement between things, similarity"<sup>2</sup> and it is in this wide sense that we are, in these experiments also, using the word.

Every subject used analogies, there being in all 1040 given in the protocols.

### Extent to which analogies were used.

The following tables show the number of analogies given in the learning periods and in the tests.

N.B. When an analogy was based on more than one of the following, shape, colour or name the analogy has been counted under each heading.

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- (1) Analogy, New English Dictionary. Murray.  
 (2) ibid.

TABLE XLIX.Analogies.

Learning Period. Borat.

Adult Subjects	Based On Shape	On Colour	On Name	Abstract	Concrete	Total
A	49	18	9	6	60	66
B	69	13	26	4	79	83
C	20	6	2	1	20	21
D	21	0	0	0	21	21
F	35	5	8	0	40	40
I	83	34	8	17	95	112
Total	277	76	53	28	315	343

TABLE L.Analogies.

Learning Period. Galef.

Adult Subjects	Based On Shape	On Colour	On Name	Abstract	Concrete	Total
A	40	10	6	2	46	48
B	55	12	0	0	56	56
C	20	2	0	0	20	20
D	26	0	0	0	26	26
F	18	5	0	1	17	18
I	93	33	13	19	99	118
Total	252	62	19	22	264	286

TABLE LI.Analogies.

Learning Period. Sense.

Adult Subjects	Based On Shape	On Colour	On Name	Abstract	Concrete	Total
A	19	7	3	0	22	22
B	10	0	0	0	10	10
C	5	0	0	0	5	5
D	1	0	0	0	1	1
F	7	0	0	1	6	7
I	36	14	0	8	37	45
<b>Total</b>	<b>78</b>	<b>21</b>	<b>3</b>	<b>9</b>	<b>81</b>	<b>90</b>

TABLE LII.Analogies.

Learning Period. Borat.

Children	Based On Shape	On Colour	On Name	Abstract	Concrete	Total
q	5	0	0	0	5	5
r	1	0	0	0	1	1
s	5	1	1	0	6	6
t	31	0	0	0	31	31
Total	42	1	1	0	43	43

TABLE LIII.Analogies.

Learning Period. Galef.

Children	Based On Shape	On Colour	On Name	Abstract	Concrete	Total
q	15	0	0	0	15	15
r	6	0	0	0	6	6
s	4	0	0	0	4	4
t	15	0	0	0	15	15
Total	40	0	0	0	40	40



TABLE LIV.Analogies.

Learning Period. Sense.

Children	Based On Shape	On Colour	On Name	Abstract	Concrete	Total
q	2	0	0	0	2	2
r	1	0	0	0	1	1
s	0	0	0	0	0	0
t	0	0	0	0	0	0
Total	3	0	0	0	3	3

TABLE LV.Analogies.

1st Test. Borat.

Adult Subjects	Based On Shape	On Colour	On Name	Abstract	Concrete	Total
A	7	1	0	0	7	7
B	6	2	1	0	7	7
C	2	1	0	1	2	3
D	6	0	0	0	6	6
F	5	2	0	0	7	7
I	20	8	3	1	27	28
Total	46	14	4	2	56	58

TABLE LVI.Analogies.

2nd Test, Borat.

Adult Subjects	Based On Shape	On Colour	On Name	Abstract	Concrete	Total
A	8	0	1	0	9	9
B	9	1	1	0	10	10
C	3	0	0	0	3	3
D	4	0	0	1	3	4
F	4	0	0	0	4	4
I	13	6	1	4	19	23
Total	41	7	3	5	48	53

TABLE LVII.Analogies.

1st Test. Galef.

Adult Subjects	Based On Shape	On Colour	On Name	Abstract	Concrete	Total
A	3	0	0	0	3	3
B	7	0	0	0	7	7
C	4	1	1	0	4	4
D	3	0	0	1	2	3
F	4	0	0	0	4	4
I	24	6	0	2	22	24
<b>Total</b>	<b>45</b>	<b>7</b>	<b>1</b>	<b>3</b>	<b>42</b>	<b>45</b>

TABLE LVIII.Analogies.

2nd Test. Galef.

Adult Subjects	Based On Shape	On Colour	On Name	Abstract	Concrete	Total
A	4	1	1	0	4	4
B	8	0	0	0	8	8
C	5	1	0	0	5	5
D	7	0	0	1	6	7
F	7	2	0	0	4	4
I	-	-	-	-	-	-
<b>Total</b>	<b>31</b>	<b>4</b>	<b>1</b>	<b>1</b>	<b>27</b>	<b>28</b>

TABLE LIX.Analogies.

1st Test. Sense.

Adult Subjects	Based On Shape	On Colour	On Name	Abstract	Concrete	Total
A	1	1	1	0	2	2
B	4	0	0	0	4	4
C	1	1	0	0	1	1
D	3	0	0	0	3	3
F	0	0	0	0	0	0
I	5	1	0	0	6	6
Total	13	3	1	0	16	16

TABLE LX.Analogies.

2nd Test. Sense.

Adult Subjects	Based On Shape	On Colour	On Name	Abstract	Concrete	Total
A	0	0	0	0	0	0
B	2	0	0	0	2	2
C	1	0	0	0	1	1
D	0	0	0	0	0	0
F	0	0	0	0	0	0
I	2	1	0	0	2	2
Total	5	1	0	0	5	5

TABLE LXI.Analogies.

1st Test. Borat.

Children	Based on Shape	On Colour	On Name	Abstract	Concrete	Total
q	1	0	0	0	1	1
r	0	0	0	0	0	0
s	1	1	1	0	2	2
t	3	0	0	0	3	3
Total	5	1	1	0	6	6

TABLE LXII.Analogies.

2nd Test. Borat.

Children	Based On Shape	On Colour	On Name	Abstract	Concrete	Total
q	2	0	1	0	3	3
r	0	0	0	0	0	0
s	2	1	1	0	2	2
t	3	0	0	0	3	3
Total	7	1	2	0	8	8

TABLE LXIII.Analogies.

1st Test. Galef.

Children	Based On Shape	On Colour	On Name	Abstract	Concrete	Total
q	5	0	0	0	5	5
r	0	0	0	0	0	0
s	3	0	0	0	3	3
t	2	0	0	0	2	2
Total	10	0	0	0	10	10

TABLE LXIV.Analogies.

2nd Test. Galef.

Children	Based On Shape	On Colour	On Name	Abstract	Concrete	Total
q	1	0	0	0	1	1
r	1	0	0	0	1	1
s	1	0	0	0	1	1
t	3	0	0	0	3	3
Total	6	0	0	0	6	6

The children gave no analogies during the sense tests.

The majority of the analogies in all three series were based on the shape, but some were based on the colour and a few on the name. Examples of all three types may be quoted from the protocols.

#### Shape.

"I tried to fix this by thinking of bent ellipse "a" as an old fashioned painting of the Madonna." (C. 9th Sense learning. II.)

"Like a blue bowl with some bulbs just coming up."  
(t. 10th Borat learning. V.)

"On the left like two ears of a rabbit." (q. 9th Galef learning. V.)

#### Colour.

"'A buttercup yellow teapot'. Said the words to myself."  
(A. 1st Sense learning. V.)

"The colour this time suggests "sage" to my mind." (I. 10th Sense learning. III.)

#### Name.

"When learning said Feron sounded like fire and fire was red." (s. 3rd Sense learning. V.)

"Pleased with the name - suggests "Foot comfort advertisements seen in shoe shops." (A. 1st Sense learning. II.)

Most of the analogies were associations with concrete objects, but the adults gave some instances of abstract analogy, subject D being the only one never to give such an analogy. Only two subjects gave abstract analogies during the sense series. Typical examples would be:- "An unhappy looking book." (F. 7th Sense learning. III.)

"The teapot gives me the impression of something rather 'loud'." (I. 5th Sense learning. V.)

The analogy when remembered proved the most efficacious means of recall. Whenever the information was given by an analogy that information tended to be correct. Again the general test protocols will illustrate this point, the information in each case being correct.

"Shape of stem irritated me - like a badly rolled sheet of stiff paper." (A. 1st Sense Test. I.)

"Like a hat stretcher." (t. 10th Galef learning. II.) and when it came to the general test t says "One was like a hat stand but that was light blue. This is the only other one it might be so think this is right." (t. 2nd Galef Test. X.)

"One of the last lot I had. Remembered it in my head. That is I knew what to put but could not see it. I thought it was like the shape of a head." (s. 1st Borat Test. IV.)

The only exceptions to this rule were cases in which the analogy was of such a general nature that the actual figure or object was not recalled. Here you get a difference between the



nonsense and the sense series. In the nonsense series these general analogies were references to objects which lacked a stabilised shape. Two of the most typical examples were cited in the previous thesis and may be repeated here for comparison with the examples given for the sense material. "I have the conviction that I thought of this Lutaf as like one of the Protozoa, but this does not bring back the shape." (C. 2nd Borat Test. II.) "Like a rather distorted potato." (G 1st Galef Test. I.)

With the sense material these analogies which proved too general for efficient recall were references to classes of objects covering numerous variations in shape, for instance: "Said the bottom part looked like a bottle." (q. 9th Sense learning. I.) "I said the bottom part was like a vase." (r. 8th Sense learning. I.)

A few cases arose in which the subject had learned the figure or object by means of an analogy and then had forgotten the analogy and so failed to recall the figure. A typical example is given by subject q. "Know this was like something but have forgotten what I said it was like." (q. 10th Galef learning. III.)

Subject I, the only subject who never reported a visual image gave by far the greatest number of analogies. The adults gave many more analogies than the children. The distribution is as follows:-

TABLE LXV.

Subject	Number of Analogies given.
A	161
B	187
C	63
D	71
F	84
I	358
q	32
r	9
s	18
t	57

The inadequacy of the children's command of language and use of analogy is probably the main reason why they gave fewer cases of correct identification than the adults.

In spite of the fact that the figures and objects were recalled more effectively by analogies than by any other means, the subjects lacked the confidence inspired by an image.

Not only were the analogies helpful in the recall of the individual members of the sets, but they frequently aided the formation of the concepts. When the same analogy was used for different members of the same set this led directly to a concept. Subject q's learning of Galef was of this nature; as

the following quotations from her papers will testify. "I said when learning it that on the left it was like a tail. It was about the size I have drawn it but I can't get the shape. I really know it better than this but just can't get it. Was the 1st one." (q. 7th Galef learning. I.) "The first one. Remembered what I said about it last time, that this bit was like a tail " (q. 8th Galef learning. I.) "I know it has a tail but I don't know how it goes." (q. 9th Galef learning. I.) "On right went round like a tail and on left bit went in." (q. 10th Galef learning. I.) When it came to the general tests q was clear that the Galefs were the figures that had "tails". "All Galefs had a tail like this. Don't know that the second went this way." (q. 1st Galef Test II.) "One of the ones with a tail this shade of red." (q. 1st Galef Test VII.) "Know all the Galefs had tails and one a red one. I think it was like this. Don't know that this is the third." (q. 2nd Galef Test. III.)

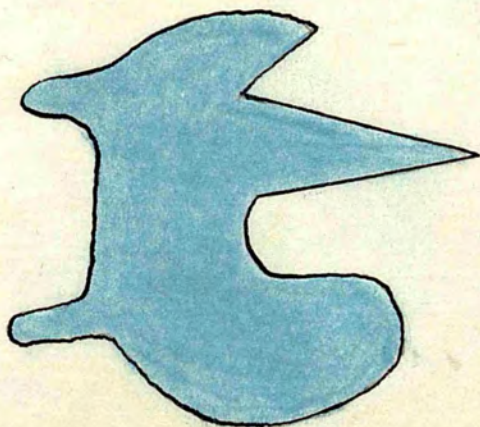
In some cases the analogy underwent a form of adaptation to suit the individual members of the set. For instance r thought the first Galef looked "like a kind of furry animal" (r. 2nd Galef learning. I.) and that the Second Galef "looked like an animal looking back" (r. 4th Galef learning. I.)

In some cases an individual figure was remembered as being an exception to the rule formed, for instance r says at the fifth learning period: "Always have bits like the last

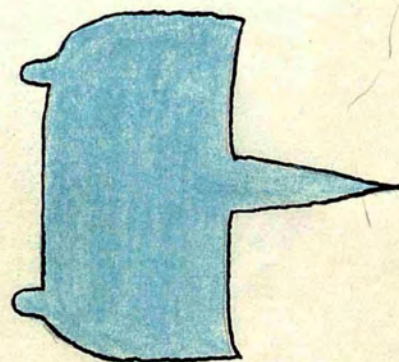
ones. In this always a notch like this" (r. 5th Borat learning. V.) and at the seventh learning says "Noticed did not have the two little notches like last week." (r. 7th Borat learning V.)

Influence of the analogy on the drawing.

In many cases the analogy influenced the drawing of the figure, the figure tending to become more like the object to which it was likened than the original. This tendency is clearly illustrated in the following drawings from the children's papers:-



Original 5th Feron.



Drawing by t of same.

"Think it is like a bowl with a flower or better a leaf coming out. I pretend it is the other way round."  
(t. 9th Borat learning. V.)

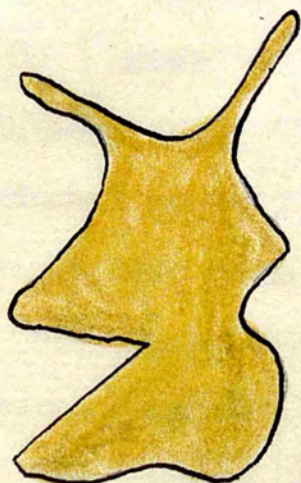


Original 4th Feron.



Drawing by t of same.

"Remembered it but did not see it. Like one of those things butchers carry meat on." (t. 9th Borat learning. V.)



Original 3rd Benac.



Drawing by s of same.

"Like the head of a horse." (s. 5th learning period. V.)

Differences in the use of analogy in the Nonsense and the Sense Series.

The number of analogies given with the sense series was considerably smaller for every subject. All the subjects used analogies in both the nonsense series, but two of the children made no use of analogy in the sense series. Not only were there fewer analogies used, but those employed played a far less important part than in the nonsense series. In no case during the sense series was the recall entirely by analogy. The analogy was simply a subsidiary aid

AFFECT.

With the adults a statement as to the affective tone set up by the figures and objects ranked next to analogy as the most frequent form of words employed. The amount of feeling tone aroused was very considerable especially with the sense material no less than 97 such reports being given in this series. Not only were there many cases of affect reported, but the subjects felt very strongly about the objects, as will be seen from the following quotations:- "This candlestick is revolting. The candle is not really a candle but a polony. It is suggestive of all the most unpleasant parts of butchers' shops. Its shape and colour are unnatural. The stick without the candle might be tolerable, though blood red ones are not usually seen in this shape. The whole thing is as unnatural

as a hunchback - an abortion of a candlestick. The other blue one now appears quite attractive. Mere irrelevancy is nothing besides vulgarity and ugliness. Do not think drawing is right. Am more conscious of affective tone than of image though that is there. (A. 3rd Sense learning. IV.)

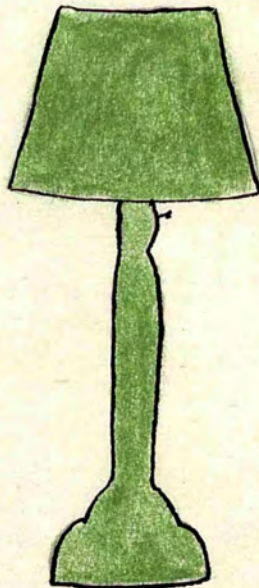
"When I saw this I was pleased. I liked this old candlestick and fat candle." (B. 12th Sense learning. IV.) It will be noticed that both these refer to the same object. The subjects showed great individual differences in this respect. Again for instance B says "A horrible teapot" (B. 7th Sense learning. V.) but F says: "A decidedly nicer teapot than the last one." (F. 7th Sense learning. V.)

All the adult subjects gave such decided opinions but none of the children expressed a preference for any object or figure. It seems unlikely that the children had no feeling tone of this nature, but they expressed none, possibly owing to shyness, or to a feeling that such remarks would be rude.

This affect proved an aid to recall of individual objects, for instance: "Remembered quite clearly because so strongly disliked but no image." (D. 7th Sense learning. III.) The affect also helped in the formation of the concepts, this being particularly true of the nonsense series.

Criticism.

Closely allied to this affect was criticism of the objects. Slight defects in the drawings of the objects ~~was~~<sup>were</sup> commented on, for example in the object drawn below every adult drew attention to the irregularity of the drawing of the two sides.



Also many criticisms were given of parts of the drawing, for example "Think the handle will soon snap" (D. 3rd Sense learning. V.) "This seems to have a ridiculously thick spout with a very small hole for the tea to come out." (F. 5th Sense learning. V.)

The children made no such criticisms and whether they noticed defects in the drawings is not known.

Attention was drawn before (p.20) to criticism of the names.

In no case was there a criticism of the nonsense shapes, or names. The subjects having no standards by which to judge



them considered them all satisfactory. This applies not only to the original drawings but to the subjects' own drawings. The subjects, both adults and children, criticised their own drawings of objects severely, but not their nonsense figures. Occasionally these were criticised in relation to the analogy used, for example: "I thought the top bit looked like a face on yours but it does not look like that on mine." (t. 10th Galef learning. I.)

This criticism also was an aid to recall of individual objects, but played little or no part in the formation of concepts.

#### Verbal Description.

The part played by verbal description during the learning periods has already been discussed. This verbal description played a part in the formation of the general concepts for subject q, but in no case was a concept formed by this description alone.

#### Comments.

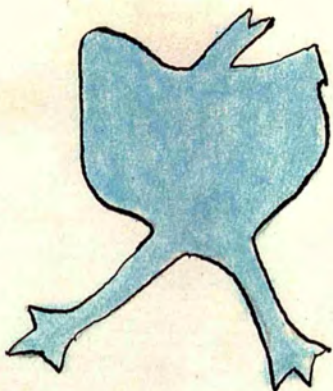
Throughout the learning and the general tests the subjects made comments to themselves. They talked about the figures and objects, and to them, and gave exhortations to themselves. In the general tests such comments would be remembered, but appeared to play no part in the formation of the concepts.

DIFFERENCE BETWEEN NONSENSE AND SENSE MATERIAL.

Throughout the text various minor differences between the 2 types of material and the ways in which they were learned have been discussed.

The main difference has yet to be mentioned. With the nonsense material concepts were formed and this task dominated the learning throughout. The ways in which the concept came to be formed has been discussed previously. Unless the subject possessed such a concept failure in the general tests was almost invariable, the only exceptions being figures or objects learned as individuals.

To test whether a general idea of the set was present a supplementary investigation took place, each subject being asked to draw a 6th member of one set at the completion of the experiments in any one series. Unless a concept had been formed for the set in a nonsense series the 6th member drawn would lack the essential characteristics. The subjects frequently had formed concepts based on a single feature or a few features only (cf. subject q's protocols quoted on page 139). The sixth member in such cases showed merely the characteristics analysed out. Examples of such drawings may be taken from the children's papers.



t's drawing of a 6th Zitad.

This drawing may appear totally unlike the Zitads but that the child has some idea of the concept is to be seen from her comment "I put the points because I always used to remember that Zitad had points like that." (t.)



s's drawing of a 6th Feron.

S had a clear concept that Feron were the figures like "flames".

This same subject on being asked to draw a 6th Rusep said: "All yours were something the same. Am I to make it like yours or different?" (s). On being told to make one she thought suitable to be used with the experimenter's as a Rusep she drew the following:-



s's drawing of a 6th Rusep.

Here again it may appear difficult to recognise this as having the Rusep characteristics but if considered in relation to s's immediate recalls during the learning periods it will be seen that she has the correct idea in her mind and that it is largely lack of drawing ability that makes the characteristics so blurred.



s's drawing of 4th Rusep.



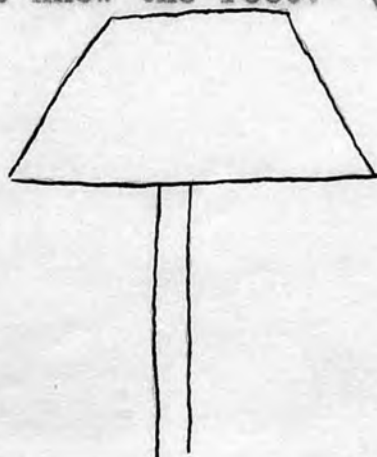
s's drawing of 5th Rusep.

All the subjects were able to produce a 6th figure for one at least of the sets, in the nonsense series.

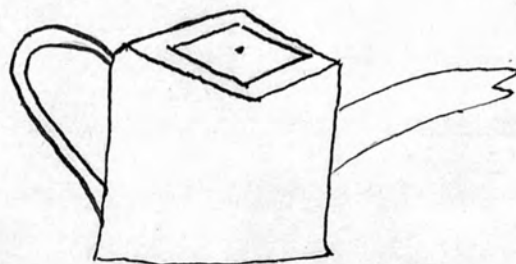
As the subjects formed concepts for the nonsense words those words became increasingly meaningful, and the figures became more clearly differentiated.

With the sense objects and names the processes were entirely different. The subjects all had knowledge of the objects. They started with concepts both for the words and

for the objects and these concepts were hedged round with many associations. This meant that the subjects' attitude was entirely different. This at one and the same time made the task easier and constituted a difficulty. Subject F voices the greater ease. "Much easier to remember these as they are well known shapes themselves, and known shapes do not have to be attached to parts of the drawing to remember it by as for the others." (F. 1st Sense learning. III) and subject C in the passages quoted on page 42 sums up this difference in attitude. The subjects' feeling that they knew the objects led to a difference in learning. They compared the objects one to another and they tried to link them up with other objects of the same type known to them (cf. p.67). In the recalls the subjects tended to draw complete objects. No adult gave a drawing of an object that was not complete as to the essential details so that, for instance, all teapots were given spouts and handles and all the lamps shades. In the case of the children objects were given incomplete, but even in their case the object would be divided into definite parts to which the children could give names, for example q drew the following, saying:- "Don't know the foot." (q. 5th Sense learning, I.)



The children in some cases supplied parts from their general knowledge. Again an example may be taken from q's protocols:-



(q. 1st Sense Test. I.)

Each sense object could be divided into parts and those parts assigned names for which the subjects had adequate meaning and the objects were learned and recalled by these parts.

THE SENSE SERIES AS AN INTRODUCTION TO THE NONSENSE SERIES.

The fact that the children in these experiments did better than the children in the former experiments and also that this result may have been due to the children's superior ability has been mentioned previously (p.37). The children, however, in spite of the previous experience of the sense series had failed to realise the second figures in the Galef series as variants of the first. (cf. p.33). The children had in the sense series had an example of the rule that the same type of object went with the same name, so that they had been given what Mr H.L.Fowler in his paper "The Development of Concepts" has termed the "formulation of the law"<sup>1</sup>. They had not however had its application pointed out and, therefore, when the nonsense series was given the law alone was insufficient to enable the children to profit by this previous knowledge. Thus these children were in the position of the children taught by Mr Fowler's second method, namely that they had been given the formulation of the law but had to apply it for themselves. Mr Fowler also found that the formulation of the law alone was insufficient.

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(1) H.L. Fowler, The Development of Concepts. British Journal of Educational Psychology. Vol.I. Part I.

FINDINGS.

1. Words were the main medium by which concepts were formed and words were the medium wherein the figures and objects were recalled.
2. Analogies were the main form of words used.
3. Visual imagery played but a small part in the recalls.
4. The children, in proportion to the number of correct recalls, gave more instances of visual imagery. Their imagery was of whole figures or objects, and was sometimes of the eidetic type.
5. The only other form of imagery recorded was kinaesthetic.
6. The sense material was better remembered by all subjects than the nonsense material.
7. With the nonsense material the formation of new concepts played an important part in the recalls, but with the sense material the subjects' previous concepts were utilized and a concept of the set was a modification of a pre-existing idea.
8. With both the sense and the nonsense material the main cause of failure to identify the figures or objects correctly was confusion either between members of the same set or between the sets.



CONCLUSION.

For recall of individual items from series of visual data which fall into classes photographic visual imagery is of less importance than concepts, analogy, verbal description and other forms of words. This is independent of whether the individual items are what is called sense or nonsense material.

t. 26/11/1931 Galef 4<sup>th</sup> V

col	col	shd	shp	pos	i of col	i of shp	pr of i	p in	s	a.	G.R.	affec	o.in	score
-	-	-	-	-	-	-	0	1	0		1			8
					Saw it in head with the colour as soon as I saw the same one.	my	It was the 5 <sup>th</sup> one.	top small					last time I did not draw it right at the bottom. When I saw it today I noticed it was more pointed	

Specimen card of card index.

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