

AN ELEMENTARY LABORATORY COURSE IN PSYCHOLOGY

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INTRODUCTION

It has been our aim in preparing this manual to describe the experiments in such a manner that students who have had only an introductory course in psychology may be able to perform them without further assistance. With this in mind we have tried to give full and minute descriptions even to the point of explaining what may seem obvious to many. We have also given exact directions in regard to the recording of results, even to the extent of supplying models for the tables when necessary, for we consider that training in the systematic arrangement of results is one of the purposes of an experimental course.

The selection of the experiments has been conditioned by the following practical and theoretical requirements: —

1. It should be possible to perform all the experiments in a half-course of five hours a week.
2. It should be possible to perform the experiments with very simple and inexpensive instruments. In most instances when complicated instruments have been employed an additional experiment with simple apparatus has been described. Two or three experiments, owing to their importance, have been included which demand special instruments. These experiments have been starred.
3. It is necessary in most institutions that the experiments be performed by the entire class in one room. It is obvious, therefore, that some experiments in audition, vision, etc., had to be omitted.
4. The experiments should not be too difficult for students beginning psychology. In fact it is hoped that the book may prove useful not only for class work, but for private students who desire an introductory knowledge of experimental psychology.

5. The experiments should present the most essential features in method and the important facts of psychology.
6. It should be possible to obtain clean-cut results and they should be capable of treatment by the student.
7. The experiments should not be too fatiguing as would be a complete verification of Weber's Law, nor disagreeable as are many of the taste and smell experiments.

In order to meet these conditions, compromises had to be made, and for one reason or another some experiments have been omitted which appear in standard textbooks. On the other hand, new experiments, arranged to cover what seemed to us important facts, have been included.

Questions have been appended to each experiment. These have been carefully arranged to direct the student's attention to the main purpose of the experiment, to the reasons for the various stages in the method, to the connection between the results of the various experiments, to the facts and theories, both physiological and psychological, connected with the experiment, and to the practical application of the results. The difficult questions have been starred and may be omitted if deemed advisable.

Most of the experiments are to be performed by the students working in pairs. One student acts as subject, the other as experimenter. A few experiments, entitled "Individual Experiment" are performed by each student upon himself. Some important experiments, however, could not be arranged to be performed by each pair of students separately. These are entitled "Class Experiment." In these the instructor or one of the students acts as experimenter and the class as a whole acts as subject.

It is advisable to tabulate as far as possible the results of all the members of the class for a comparison of the individual records, and also to obtain averages for large groups. Directions for doing this have been given in a number of experiments. If the class is very large, however, this must be omitted, unless the class can be divided into small sections.

We must acknowledge our indebtedness to Professor E. B. Titchener's *Experimental Psychology*. As the influence of this book is felt in every corner of the psychological laboratory of to-day, an attempt to make specific acknowledgments to him would, we fear, involve grave omissions. We have also profited from *An Experimental Study of Sensation*, by Professors E. B. Holt and R. M. Yerkes. We used this book at Harvard for a number of years and have received numerous suggestions from it. One of the experiments on "Attention" was devised by Professor Münsterberg, and we have to thank him for his permission to use it as well as for his valuable advice. We also wish to thank Professor E. B. Holt for his aid in several important decisions, and Professor W. F. Dearborn for suggestions regarding some of the problems of perception.

HERBERT SIDNEY LANGFELD
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FOREWORD TO THE STUDENT

AT the beginning of the course you are to select a congenial partner with whom to work. It is advisable that this partnership remain unchanged throughout the semester. One member of the pair acts as subject and the other as experimenter. These positions must be reversed in the successive experiments, the subject in one experiment being the experimenter in the next. Some experiments, however, are repeated so that each member shall have the experience both of experimenter and of subject. The work is done at small tables, the subject being seated opposite the experimenter.

It is the aim of experimental psychology, as it is of every other science, to be exact. You are therefore to take the greatest care in the arrangement of the experiment, so that the mind of the subject can be studied under known conditions. The observations must also be most conscientiously made and the results accurately recorded.

You must realize the importance of these requirements from the start. Remember that it is an ideal of science that experiments shall be capable of repetition at some future time under the same conditions. If these conditions are not accurately known, there is small possibility of verifying the results, and without such verification the results will have very little if any scientific value.

The experimenter is able to control and describe the outer conditions of the experiment; the subject must control and describe as far as possible his own states of mind. This observation of his mental states is known as 'introspection,' and in all the experiments the subject is called on to report upon these states. The records must contain both the so-called 'subjective' and 'objective' conditions and results, of the experiment.

Provide yourself with a notebook containing detachable sheets of cross-section paper divided into one half centimeter squares. Write only on one side. It is suggested that the experiments be arranged in the notebook in the following manner:—

EXPERIMENT I

SENSATION

I. VISION

1. *The Blind Spot*

Date:.....Subject:.....

Experimenter:.....

Materials:.....

Method:.....

Record:.....

Questions:

1.....

2.....

.. etc.

Place the questions on a separate sheet. The method of the experiment should be described in your own language and with such completeness that any one reading your notebook would know how the experiment had been performed. Any peculiar conditions of the experiment, such as a headache of the subject, should be noted. The subject will have to obtain the records for his notebook from the experimenter.

Before starting an experiment, always read the entire description including the questions.

In order the better to understand the methods and results, as well as to obtain knowledge of further experiments, the following books are suggested: E. B. Titchener's *Experimental Psychology*, G. M. Whipple's *Manual of Mental and Physical Tests*, C. E. Seashore's *Elementary Experiments in Psychology*, and E. C. Sanford's *A Course in Experimental Psychology*.

Answer the questions fully, giving them careful thought. You will be well repaid for the time spent upon them by the better insight you will obtain into the purpose and implications of the experiment. The following books will aid you in answering the questions: For the physiological facts, C. J. Herrick's *An Introduction to Neurology*, K. Dunlap's *An Outline of Psychobiology*, E. A. Schaefer's *A Textbook of Physiology*, W. H. Howell's *Textbook of Physiology*; for the facts and theories of psychology, G. T. Ladd and R. S. Woodworth's *Elements of Physiological Psychology*, C. S. Myers's *A Textbook of Experimental Psychology*, E. B. Titchener's *A Textbook of Psychology*, H. Münsterberg's *Psychology, General and Applied*, J. R. Angell's *Psychology*, J. B. Watson's *Psychology from the Standpoint of a Behaviorist*, and H. C. Warren's *Human Psychology*.

MATERIAL AND INSTRUMENTS

REQUIRED

FOR EACH PAIR OF STUDENTS

Ruler with inch and millimeter scale
Small fine-pointed scissors
Paste
Yardstick
Very soft pencil
Colored paper including white, black, and gray
Black, white, and gray cardboard
Small dividers
Milton-Bradley color tops and discs
Pasteboard mailing-tubes
Black burrs no. 3 (washers)
Wooden skewers
Metal rods
Small bottles of
 Tincture of iodine
 Spirits of camphor
 Nitro-benzole
 Oil of camphor
 Eau de cologne
 Oil of turpentine
 Oil of lavender
 Oil of bergamot
 Oil of cloves
Boar bristles
Sealing wax
Tumblers
Needle
Tissue paper

MATERIAL AND INSTRUMENTS

FOR THE CLASS

Measuring tape
Stop watch
Two tuning-forks of equal pitch such as C² or A¹
Rubber hammer
Beeswax
Color wheel
Color discs (large)
Rubber stamp and pad
Balance or letter scale
Metronome
Piece of felt
Set of gummed digits

OPTIONAL

Chronoscope
Telegraph keys
Sound keys
Batteries
Langfeld-Dearborn Tachistoscopes
Perimeters
Pianoforte or organ or set of tuning-forks
Two hammers with rubber tips
Color wheels
Color discs and measuring discs (large)
Stereoscopes
Sound cage
Two telephone receivers
Rheostat

The material can be obtained from C. H. Stoelting Co., 3037-3047 Carroll Ave., Chicago, Ill.

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SENSATION

I. VISION

1. The Blind Spot

(1¹)

(Individual experiment ²)

Materials: Ruler.

Four white cards, $4\frac{1}{2} \times 10$ inches, to be prepared as in figure 1.

The diameter of the colored disc at the right is one inch. The distance between the black dot and the center of the disc is in each card 5 inches. The colored backgrounds in (2) and (3) are $3\frac{1}{2}$ inches square.

Method: This experiment is to be performed separately by each of the students. Hold card no. 1 so that the black dot is in front

¹ Each experiment contains a number in this position which indicates the serial number of the experiment.

² To be performed by each student upon himself.

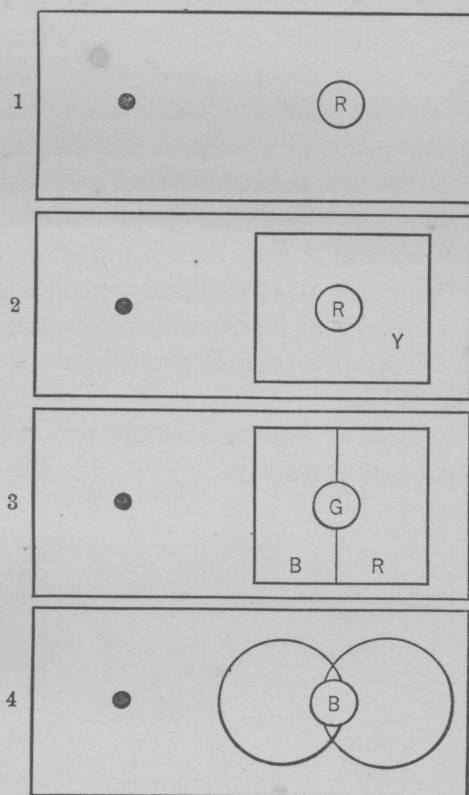


FIG. 1.

The colors red, yellow, green and blue are to be used as indicated by letters in the figures.

of the left eye and the colored disc in front of the right. Close the left eye and fixate the black dot with the right. Move the card toward you and away from you, still keeping the right eye fixated on the black dot, until the colored disc disappears. Note the appearance of the background after the disc has disappeared. Repeat, using each of the other cards.

Record: (1) For card no. 1: State the approximate distance from the eye at which the disc disappears.

(2) For cards nos. 2, 3, and 4: Present drawings and descriptions indicating the appearance of the background with special reference to that part from which the disc has disappeared.

(3) For card no. 2: Describe any change in size which may occur in the yellow background.

(4) State whether the disc can be made to disappear only at a certain point, or whether it remains blotted out during a certain movement of the card toward you and away from you. If the latter, record the extent of this movement in inches.

Be careful to keep the eye fixated on the black dot.

Questions: 1. Describe a method suggested by the results of this experiment for ascertaining the size of the blind spot.

2. Explain a possible method for mapping out the shape of the blind spot.

3. Give at least two reasons why we are not conscious of the blind spot in reading.

3. Retinal Induction (Simultaneous Contrast)

(2)

(Individual experiment)

Materials: Two one-inch squares of the same medium gray paper. Three-inch squares of black, white, red, green, blue, and yellow paper. A six-inch square of white tissue paper.

Method: A. Brightness Induction. — Place the black and the white squares side by side, and on each, one of the gray squares. Cover these with the tissue paper. Note the change in the relative brightness of the two grays.

B. Color Induction. — Place a gray square on the red square and cover with tissue. Note the change which occurs in the gray square. Repeat, using the other colors.

Record: Write a description of the changes which occurred in the gray under the different conditions.

Questions: 1. Give a physiological explanation of retinal induction.

2. How may the phenomenon of retinal induction be made to serve æsthetic purposes?

3. Describe instances of retinal induction which have occurred in your observation of nature.

3. Negative After Images

(3)

Materials: Three pieces of cardboard six inches square: — black, white, and medium gray. A two-inch square of black paper. One-inch squares of the following colors: — white, red, green, blue, yellow, and violet.

Method: The experimenter places the square of black paper on the gray card and the square of white paper on the black paper. The subject fixates the middle of the white square for fifteen seconds. The black and white paper squares are then quickly removed while the subject holds his fixation point constant. He notes the quality of the resulting after image. The after image may not appear at once; the subject should continue to fixate until it appears. With a slight amount of practice it will be readily observed.

Repeat this procedure, using the black and white cards in turn as backgrounds, *i.e.*, in place of the gray card.

Now proceed as before with the red square, placing it in turn on each of the three backgrounds. Treat each of the other colors in the same manner. The large black square of paper is not used in connection with the colors. The subject observes the changes in hue. He notes also the differences in brightness and saturation (amount of color) of the after images on the three backgrounds, expressing the degrees of brightness and saturation separately on an arbitrary scale of one (least) to three (greatest). Temporal aspects such as duration and intermittent appearance of the after image are also to be observed.

Record: (1) For black and white. (a) Give a comparison of the after image obtained in the first procedure, with the original paper squares. (b) Compare also the three after images on the three different backgrounds in regard to differences of brightness. (c) Describe the effect of the movement of the eyes on the after image.

(2) For colors. The results should be tabulated as shown in the table.

Questions: 1. Was there a fringe of color or brightness about the paper squares? If so, describe and explain it.