

## COMMUNICATIONS AND DISCUSSIONS

### AN APPARATUS FOR THE MIRROR- DRAWING TEST

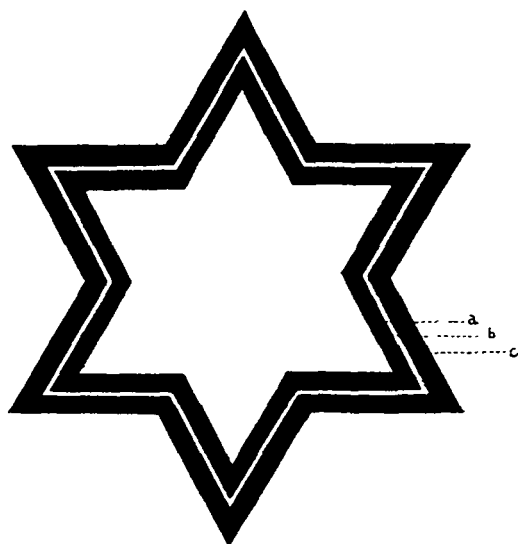
The interesting and valuable results of mirror-drawing tests are often obtained only at the cost of a good deal of labor. The usefulness of this test is much restricted by the fact that so much work is required after the test has been completed to find out how many errors have been made. And just because so much labor of computation is unavoidable in experimental psychology it is worth while to eliminate it wherever possible. The figure in Whipple's *Manual of Mental and Physical Tests*, test 36, page 493, is quite typical. An attempt to determine the number of errors in that figure is sufficient to emphasize the fact that when these errors have to be actually counted on many such figures the expenditure of time and effort required is not small. I have found that it takes really more time for students who are working upon mirror-drawing problems to compute their errors than it does to make the mirror-drawings in the first place.

To obviate this difficulty the following very simple arrangement has been made and is being successfully used in the psychological laboratory of Ohio Wesleyan University.

Two concentric stars of metal are made and so arranged that the outside line of the smaller shall be smaller than the inside line of the larger. Thus when they are arranged concentrically the space between them is itself star shaped. If this space be filled up with some plastic substance which becomes very hard and which differs in color from the metal a clear cut and permanent star will be formed. The metal strips are electrically connected with each other and to an electric counter, arranged in series with some power source, and with a stylus having a sharp metal point. Add the familiar mirror and screen.

The test is performed in exactly the same way as if the printed star outline and pencil were used. The student tested simply attempts to keep the stylus upon the inscribed figure. Any and every time the stylus moves from the inscribed star the counter registers. And at the conclusion of the test it is as easy to determine the number of errors as it is to determine the elapsed time. In each case one simply reads a dial.

A point of importance is that by means of the apparatus a somewhat simple definition of an error is made. An error consists of enough lateral movement of the stylus to move it off of the inscribed star. Thus an error means exactly the same thing to all students, and its definition will not vary from day to day.



a and c are the brass stars, five millimetres in width. b is of non-conducting material, one and a half millimetres in width. a and c are electrically connected to a binding post set in the upright (not shown) at the left rear corner of the cement base.

The apparatus as used in the psychological laboratory of Ohio Wesleyan University consists of a cement base in which are embedded two brass stars, arranged concentrically as described above. The resulting inscribed star measures ten centimetres from point to point, and is one and a half millimetres in width. It is needless to say that the cement is very carefully smoothed so that its surface is exactly level with that of the brass stars. The strips of which the brass stars are made are five millimetres in width. At the back and left of the cement base a metal post is inserted for the support of a mirror which is so pivoted that it can be tilted and fastened at any angle from the perpendicular. From this upright an arm projects to support the small metal screen which intervenes between the eyes

and hand of the one taking the test. The electric connections from the brass stars run under the base to the mirror upright, and a binding post in the upright serves to connect the stars with the batteries.

Obviously the form of figure used may be varied as desired. It is also possible that in later types some more suitable material than cement may be found for the base.

The handiness of this little apparatus may enlarge the usefulness of the test. It has already been suggested that the test is capable of being employed as a test of quickness in learning. If so used this form of apparatus will reduce the amount of work and the time required for performing the test very considerably.

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### PERCENTILE NORMS FOR SCALING DATA

Scales devised upon a basis of percentile differences are bound to be very crude, besides embodying a fundamental fallacy. Measurements of a group may be resolved into quartile, quintile, decile or percentile intervals. A subject measured for a given quality may conveniently be compared with his group to determine his location within the group. Or two individuals measured for the same trait may be compared for relative differences in the light of the percentile grades of the group. We cannot, however, equate, translate, or combine the raw percentile values in various tests, because the significance, for example, of the 80th percentile may vary greatly when we consider the variability and dispersion of the different traits.

But what is perhaps of more fundamental importance is that for testing purposes the unrefined measurements obtained for a test should be first transformed into P. E. (probable error) values, or into sigma (standard deviation) values. These only can give us absolute units necessary in scaled data. Excellent examples of this type of procedure are the studies of Buckingham, Trabue and Woody. In experimental analyses of this sort one is certain that the difference between points 5 and 6 on our scale is equal to the difference between 0 and 1, or 14 and 15, or any other two adjacent units. This, however, is not true for units in a percentile scale. The difference between the 0 and the 10th percentiles is not equal to the difference between the 50th and 60th or between the 70th or