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AN EXPERIMENTAL INQUIRY INTO THE EXISTENCE AND NATURE OF 'INSIGHT'

By MARY ELIZABETH BULBROOK, Cornell University

It was inevitable that the recent occupation with 'learning' should presently lead backward toward the consideration of a rapid, effective and 'intuitional' form of operation. 'Backward' because that had long been a favorite conception of learning, but a conception displaced by the simpler and more manageable forms of the reflex, automatic, psychomotor and ideational varieties which set the experiments of a generation ago. At that time the scientific standards coming into psychology placed a high value upon simple and mechanical concepts and procedures. Sensory processes, simple and direct associations, and the blundering advances of 'trial-and-error' were the popular terms in laboratory studies upon learning in man and in other animals. It was only a matter of time when the limits of these simpler categories of description and explanation should be discovered and when 'higher' processes and modes should be again invoked. Moreover, the recent occupation with the organism, in biology and psychology, as against the analytical inspection of parts, details, and elementary functions, has also contributed to this tendency in the study of learning. Organismal factors, *Gestalten*, the primacy of the general pattern, the influence upon development of the total-body, and the general directiveness of life, have all been facts of this same order tending away from the older and simpler mechanisms. It was natural that 'insight,' 'forecast,' 'purpose,' and even 'intuition' should have been rescued from the commoner and

*Accepted for publication May 1, 1931. From the Psychological Laboratory of Cornell University. The research was directed by Professor Bentley.

less precise employment of them as dictionary terms and turned to psychological account.

To psychologists familiar with current and recent discussions, it will be unnecessary to dwell upon the revival in periodical and textbook of the term 'insight' and to point out the variety of meaning and the resulting ambiguity in its use.¹ Some of these meanings are perceptive apprehension, acute observation, understanding, foresight and forethought, rapid learning, an intuitive flash, sudden grasp or illumination, intelligence, sophisticated skill, cognized relations, the felt basis of an attitude, experienced determination, a new perception of a goal, and a new configuration.

Now there are obvious difficulties in approaching by experiment a topic so uncertain and so variously shaded by theory and point of view. All we have tried to do in this study is to submit to experimental conditions various situations which have been commonly alleged to exhibit experiences and performances characterized by 'insight.' Here it has been our hope that the appearance of a common process, function, or accomplishment might help us to an understanding of this elusive characteristic. In anticipation of our results we may provisionally say that no such common and unique operation of the animal organism has emerged from our quest. Nevertheless, the experiments have thrown considerable light upon a class of performances just now under close scrutiny from many sides.

THE EXPERIMENTS

Most laboratory studies of 'insight' have been of the problem-solving and maze-running kinds and have made use of children, other primates, and white rats. In order to add the very important experimental control which is to be derived from the report of the observer himself, we have used human adults, both individuals trained in psychological reporting and individuals untrained. For both sorts we have added the device of technical *instruction* in order to obtain the actual conditions (commonly left—even in experimental settings—to inference or to speculation) under which the organism is thrown into functional commission. It would seem now to be of less importance to *infer* insight from behavior ('insight' taken, e.g., in one of the above senses) than to *obtain a descriptive account of the*

¹Only here and there has a critical voice been raised. Examples are G. W. Hartmann, The concept and criteria of insight, *Psychol. Rev.*, 38, 1931, 242-253, and S. C. Fisher, A critique of insight in Köhler's 'Gestalt Psychology,' this JOURNAL, 43, 1931, 131-136.

actual modes of organic performance where insight has already been alleged.

We have taken individual observations and also, in the light of results thus derived, have secured observations from small assembled groups. We consider the problems in order, setting down the individual-results first, then the group-results.

Thirteen problems, presently to be given in a natural sequence, were placed before each of 7 *O*s. Five of these *O*s were trained in psychological observation. The other two were without technical training.² For the group-presentations, 110 students were used in congregates of 5-8 from an undergraduate course in general psychology.³ In order to prevent troublesome influences from successive presentations, the following temporal order was adopted: Problems 1, 5, 6, 7, 3, 12, 2, 4, 10, 9, 8, 11, 13. The groups worked through only certain problems.

Procedure. For the individual *O*s, the formal instructions⁴ were placed on a large blank sheet of paper which lay on a table immediately before the *O*. The table was in a corner with blank walls in front and to the right, while on *O*'s left sat the experimenter. Upon the table were usually scattered various objects, some having little or no relation to the problem, others supplying means for various solutions. The arrangement of these objects remained fixed throughout the experiment.

So far as possible, these arrangements were preserved in the group-presentation. Some changes were necessary. For the groups a large rectangular table was equipped with a single set of the same objects in a similar haphazard arrangement. No less than five and no more than eight *O*s at a time were seated on three sides, while the fourth was reserved for *E*. A pencil and mimeographed copies of certain instructions and all questions concerning procedure were

²*Observers.* The trained *O*s were Dr. S. Feldman (*Fe*), Dr. J. G. Jenkins (*Je*), R. B. MacLeod (*Mc*), members of the staff; E. H. Kemp (*Ke*), A. D. Glanville (*Gl*), graduate students in Psychology. The untrained *O*s were H. A. Myers (*My*), and K. M. Simpson (*Si*), graduate students in Philosophy and Physics respectively. C. M. Wiltse (*Wi*), and R. G. Fisher (*Fi*) were occasional observers.

³For the group-presentations, 110 observers from the undergraduate classes in Psychology volunteered. This number observed in all problems presented to the groups except problems 5, 6, and 10, which had 63, 50, and 64 observers respectively. Since the experimental period of each group was limited, it was found necessary to alternate problem 5 with problems 6 and 10.

⁴For the three main forms of *instruction* (formal, occasional and self) see O. F. Weber and M. Bentley, The relation of instruction to the psychosomatic functions, *Psychol. Monog.*, 35, 1926 (no. 163), 1-15; M. Bentley, *The Field of Psychology*, 1924, 389-396.

placed face downward before each *O*, to be turned over and read at a signal from *E*. Other instructions were orally given. All questions were to be answered 'yes' or 'no' except the last one of each set. Emphasis was placed on the fact that the experiment was not an intelligence test of any kind or a competitive trial of capacity. The grouped *O*s were directed not to handle the experimental objects.

At times during the experiment, however, it was found necessary to assure the grouped *O*s that a solution was possible, and this assurance sometimes evoked a self-instruction that 'I am being compared with others and must make a good showing.' These by-products of socialization—while they must never be assumed—must always be looked for in group-operations. They frequently determine output and function in the solo experiment as well. Only careful report will turn them up and estimate their influence. As antecedents and determinants of function they can never be behavioristically inferred from mere physical proximity and isolation.

Problem 1. This problem turned on the significant use of materials which might suggest some form of 'insight.' A string of beads was placed directly before *O*. It consisted of two small white 'pearl' beads alternating with one larger yellow glass bead, except for the middle portion of the string where five white beads separated the yellow. The bore of the white beads was too small to admit of stringing except by a single thread with a moistened and rolled end. The needles supplied were too large.

(a) *Individual Os.* Two sets of instructions were made, the second for presentation in case an *O* failed to obtain the solution under the first.

Instruction 1: Make a single regularly repeated pattern without either unstringing or restringing the beads, and without knotting or breaking the thread. Proceed aloud.

Instruction 2: Make a single regularly repeated pattern without either unstringing or restringing the beads, and without knotting or breaking the thread. Use any of the means supplied on the table. Proceed aloud.

Due to the emphasis of the first set of instructions, attention was primarily centered on the experimental object. Each *O* first sought to get the instruction clear and then carefully examine the beads in order to understand fully the conditions and limits of the situation. Twisting the threads together by some means or other and sliding the beads across was one of the most obvious solutions suggested. It never worked, of course; and the *O* soon realized that instructions stood against it. The superfluous beads could not be unstrung.

Four *O*s (*Fe*, *Si*, *My*, and *Gl*) went through a process of elimination to arrive at the solution. *Fe* solved by a consideration of various means of eliminating the irregularity, "I see nothing to do but twist the threads together. If they

would hold together, the beads could be slipped over." He picked up the beeswax. "It won't do." He picked up the glue. "No, no. That won't do. It is too sticky." He picked up the needle and sought to use it but found that the white beads would not go over it. From the first the various articles and tools available entered into the situation for this *O* as having possible significance. Now he picked up the saw from among the destructive instruments and laughed at using it. But after he had considered all the ways that the superfluous white beads could be eliminated, he suddenly asked, "Can you break the beads? That is the only way of getting them off that I can see," and he picked up the pliers and broke one of them. "Breaking was a last resort. I had tried everything else. I could think of nothing else until that occurred to me as possible."

For *My*, *Si*, and *Gl* the elimination took place without reference to the objects on the table but from the conditions imposed by the instructions and limitations presented by the object itself. "The beads had to be removed. Since all the natural ways were prohibited, that was the only one left. I tried first to crush them with the fingers but they were too hard. I thought of biting them but that was bad. I looked around and saw the tools and I took the pliers and broke them" (*Gl*). It is obvious here that the instruments played a minor part in the solution. They merely furnished excellent, because stronger, substitutes for hands and teeth. The *O* was set for an instrument to break or crush when he looked at the various materials on the table. "If you cannot move any bead over another bead, you cannot possibly change their relative positions on the string, and they are an uneven number, so they cannot be distributed so as to make a regular pattern. Can the thread be passed through any bead twice? But that would be hard to do. Are you allowed to break the beads?" (*Si*). He then counted the beads and said, "That would do. Why I thought of breaking the beads, I do not know. I just did. It was the only way of doing it." Here again it was only after the correct method of solution was obtained that the instrument for its accomplishment was sought.

My, proceeding step by step, commented clearly and logically, "Two-one, two-one is the pattern. There are five extra white beads. If those five were out, it would be a regular pattern. One might make one by distributing the white beads. How can they be distributed? There are five white beads and twenty-one large ones, therefore they cannot be evenly distributed. The directions say not to unstring or restring, etc.; but those beads cannot be distributed without breaking or knotting the thread. I can try arranging the beads on the paper. Thus far I have been thinking of the pattern on a straight line. I can make a circle or a figure like this, but that won't succeed. Is it permissible to break the beads? The instruction does not say anything about not breaking the beads. I can do that. . . . That was the only possible solution because, even if you could break the thread or did break the string, you could not make a regular pattern utilizing the beads."

No reference in these two cases was made to the instruments lying on the table. They were as completely extraneous to the solution of the problem as if they were not there. But in the actual breaking the *O* invariably surveyed the outlay and seized the pliers for the purpose. That this instrument easily became a destructive crusher in this situation is not surprising, when one considers its manifold uses in constructive building where it is often used to break or bend.

Three *O*s (*Wi*, *Je*, and *Mc*) failed to reach the solution. It never occurred to *Je* and *Wi* that the integrity of the beads could be destroyed in any way. The beads were to be removed or redistributed as beads. They never got beyond this assumption, and this assumption was never formally recognized. That all *O*s were inhibited in some measure—although not so completely as with *Je* and *Wi*—against destruction as a means of solution is obvious from the fact that after a consideration of many possible methods of removing or redistributing the intact beads, the *O* either declared it to be impossible or asked if it was not so. At this point he was invariably assured either that “it was not impossible” or that “the irregularity could be eliminated.” This is a clear instance where *the occasion* (occasional instruction) stands directly against the carrying out of a formal instruction.

The most interesting case of inhibited action was that of *Mc* who failed to reach a solution under either instruction. Under the first instruction attention was focussed, as in other cases mentioned, on the beads and the limitations imposed by the conditions of the instruction. After various suggestions in attempting to make a uniform pattern, and after having been told that such a thing was possible, he “does not see how it can be done.” Under the second instruction, he picked up the saw, “May I use this?” Then he picked up the thread, “This is the only thing that might do.” He took up the objects one by one, remarking each time “That won’t do” or “This does not seem to be applicable”; but, except for the saw, he never considered the destructive instruments at all. “I’m still utterly baffled by the situation. I see only one way of making it a pattern and that is barred by the instructions.”

That *Mc* noticed the instruments was evidenced by his handling the saw; but that they were recognized only in their usual contexts and not in any unusual relation to a delicate string of beads was apparent from his behavior as well as from the above account. This is the opposite of what occurred in the case of *Ke*. The mere presence of the instrument within visual range caused him, intent on some means of removing the superfluous beads, to give consideration to any possible relation it might have to the problem in hand. After examining the string and trying to run another string through the beads with the needle and thread on the table, and after the assurance that the solution was possible, he leaned back, looked at the table, and said, “I might break the beads and take them out. . . . The beads could not be moved according to the instructions. The large ones could not be slipped over the small ones. I saw a pair of pliers over here and saw the string of beads over here that could not be moved off. I just re-read the instructions and broke them.” The instrument for *Ke*, as for *Fe*, entered into the situation from the first; but for *Fe* ‘breaking’ suggested the instrument while for *Ke* the instrument suggested ‘breaking’.

Results. Acting under occasional and self-instructions and anticipatively apprehending the results *O* eliminated one plan after another until the solution either was reached or was blocked by an interfering occasional instruction or by the failure of comment and imaginative apprehension. The elimination of possibilities may take place either with respect to suitability of means or instruments or

with respect to procedure permitted within the limitations imposed by experimental object and formal instruction.

For the *O* there is always a plan or method of approach. When his approaches all fail him, he ceases to try and desires to terminate the experimental period. He never continues, trying at random, in expectation that the solution will simply occur. He always applies a definite method and this method is a contribution of his own under self-instruction. He does not wait for sudden appearance of the solution. He does something that definitely brings about, or causes, or creates that solution. There is always an accompaniment of pleased pride in, and approval of, himself with the accomplishment of the solution. In failure there is frustration combined with impatience and disappointment with himself.

Inability to see an ordinary object in an extraordinary context and a predisposition to respect the integrity of property constituted frustrating moments.

(b) *Group Os*. The instruction was the same as Instruction 1 above, except for the direction "Proceed aloud" which was omitted. The time allotted was 10 minutes. Then the following questions were answered. (The replies are given in percentages.)

	Yes	No
1. Did you look over the table to see what you could use?	14	86
2. Did you consider the string of beads only and what the instructions did and did not allow you to do to it?	93	7
3. Did you solve it?	25	75
4. Did you rearrange the beads to form a different kind of pattern?	42	58
5. Did you break the beads (imaginatively)?	25	75
6. Did you think of breaking the beads first and then look for the proper instrument?	12	88
7. Did the instrument make you think of breaking the beads?	3	97
8. Comment further upon your procedure, telling any way you went about eliminating the extra beads that is left out in the questions.		

Since a quarter of the group (Question 5) reached the 'breaking' solution and only 15% of them (Q. 6 and 7) considered the instruments, it is obvious that a tenth of them who thus solved did not regard the instrumental means. But then, they were not actually called to smash as the individual *Os* were. This is an interesting difference in solution, which is also supported by Questions 1 and 2 (concentration on the beads). Answers to the last question indicate that practically all the methods employed toward solving by this large number were also employed by the smaller number of individual

Os. Pattern arrangement, bead counting, and the consequent deduction that redistribution was impossible were means suggested.

In a few cases the solution came immediately. Those who suggested breaking the beads report substantially as follows: "The instruments had nothing to do with it either before or after getting the solution. I took it for granted that the tools on the table were for another experiment." "I thought of breaking them with my teeth or the eversharp in my pocket." "I never thought of the instruments on the table. When I saw the table, it seemed more like a class in vegetable gardening than an experiment"—another good example of apprehension of an object only in its usual context.

Some, after making several tentative and ineffective suggestions, concluded the solution impossible. Most of them, however, failed to get beyond a stage of search or of comment-and-inspection in the time allotted.

These results substantiate those from the individual *Os*. Inhibited solutions are more plentiful, due, perhaps, to the small amount of time; but the initial steps of the solving process—apprehension, inspection-and-comment, search for method, and procedure under self-instruction until that instruction is perceived as inapplicable, re-apprehension and search for another method—are typical here also.

Problem 2. This problem was intended as a parallel to the foregoing. Small white wooden beads were obtained, and some of them were stained black with India ink. They were then strung with the white, the pattern alternating one white with one black, one white with one black, except toward the center where eight whites separated blacks. The solution lay in converting the ink in the bottle on the table to the uses of a dye. No *O* questioned how the black beads were colored but accepted them as given.

Instruction 1. Make a single regularly repeated pattern without either unstringing or restringing the beads, without knotting or breaking the thread, and without destroying the beads. Proceed aloud.

Instruction 2. Make a single regularly repeated pattern without either unstringing or restringing the beads, without knotting or breaking the thread, and without destroying the beads. Use any of the means supplied on the table. Proceed aloud.

If the *O* failed to solve under the first set of instructions, the second was presented.

The solution involved the use of a medium in unusual contextual relations. In some cases it was obtained more easily than in the preceding bead-experiment. The *O* was memorially instructed from cues gained there. "I got the solution of the present string from a cue from the other beads. As soon as I got away from the rearrangement of the beads on the thread, it was easy to think of doing other things" (*Mc*). "I am looking for possible interpretations of your instructions" (*My*).

Je, *My*, *Gl*, and *Mc*, as in the preceding experiment, set about seeking the solution, not from a consideration of the whole experimental situation, but from

the conditions imposed by the instruction and the experimental object itself. Search for a way of attack, accompanied by a careful inspection and comment upon the situation, was characteristic of the procedure. *Si*, for example, asked about the instructions to make sure he had them accurately and picked up the string and examined it. "There is no catch on the string." He examined the string and beads again carefully. "One thing is obvious; if there are more white than black beads, you must either get rid of some white ones or else get some black ones. There are no black ones. Is this string symmetrically arranged with regard to the center ones? No, it isn't." He read over the instructions again. "For all purposes this is a closed circle and no bead can be moved over another nor can they be broken. Is it unsolvable?" When answered negatively he said: "Well, something must be done to the white beads."

Where the solution was reached, the *O* invariably arrived at it through a consideration of painting the beads. "I did not notice the ink on the table, but I named ink instead of dye or paint because I had had more experience with ink than with either of the other two" (*Mc*). "How about some paint or something? Some black ink if there is any available," he picked up the ink bottle, "Or, better still, the black ink from my fountain pen" (*Si*). "I thought of paint first but then I thought of ink because you would be more liable to have it around" (*My*). Here again the method of solution was obtained before the exact medium for its accomplishment. Since the *O* searched for something he could use in following out his solution, ink easily became, under these circumstances, a dye in spite of the penstaff lying alongside the bottle.

As before, *Fe* and *Ke* derived the solution from the whole experimental situation, taking into account every article on the table and its possible relation to the problem in hand. *Ke* ran his eyes rapidly around the table a few times inspecting and commenting upon all the objects on it. "Suppose I run another string through and pull this one out. . . . But I guess that is unstringing and restringing. Oh well, I can paint them black," and he seized the ink bottle to do so. *Fe* followed much the same procedure, glancing all around the table and then reaching for the ink bottle. Here there was a very definite instruction resulting from the solution in the former experiment.

Gl and *Je* failed to solve the problem, the case of *Je* exactly paralleling that of *Mc* in the former experiment under both instructions. *Gl*, however, solved it under the second instruction, "It said, 'use any of the means on the table.' I had tried all the arrangements of the beads before and they would not work. I thought there might be some chemical here that you could put on them to change the color. I looked around and saw the ink bottle and thought, 'Aha, that will do it.'"

Results. Here each *O* followed the same general procedure as in the preceding experiment. If he had limited himself before to a consideration of the experimental object and the conditions of the instructions, he did so in this case; but if he had taken the instrumental approach in the first, he followed it now. Only one exception occurred. The change from the first instruction to the second in the case of *Gl* induced a change in the set toward the problem.

In some cases *O*s took cues from the former problem. Practically all of the inspection of the experimental object and weighing of the instructions were absent here from those who approached the solution by an instrumental elimination. Self-instructed, the *O* looked around the table, immediately questioning the suitability of the various objects. Cues were of aid, too, in the other approach, where the *O* paid more careful attention to possible implications in the instructions, and where he took account of and guarded against any inhibiting moments similar to those in the former problem.

But in other cases helpful cues were not carried over. The *O* was as strongly inhibited here as before by his custom of seeing a thing in a useful context from apprehending it in another and a newer one. In one case (*Je*) the cue from the previous problem gave him a set toward destruction as the means of obtaining a single uniform pattern, a set that was useless in the solution. Even under the new instructions, this set was carried over.

The same elimination of one self-instructed plan after another, the same methodical procedure of search accompanied by inspection-and-comment to the formulation of the self-instruction, and, when no other plan could be made, the refusal to continue planless characterized this problem as definitely as the first.

Problem 3. A cork in a large bottle with a very narrow neck was presented to *O*.

Instruction. Remove the cork from the bottle without destroying either the cork or the bottle.

The situation here differed from the first two in having the solution by instrumental means suggested. A large corkscrew, the usual means of removing a cork from a bottle, lay among the tools, which also included a small flexible wire. While this suggested the use of an instrument, however, it was always that particular instrument. Only one *O* analyzed the situation to the extent of not applying the corkscrew first. *My* sought to gain a thorough comprehension of all the conditions inherent in the experimental object. Inspecting and commenting minutely upon the cork and bottle, suggesting one means after another without reference to the tools, he finally remarked with characteristic acumen, "Judging by the appearance of the cork, I believe mechanical means have been used on this before," and seized the wire, knotted an end which was too small, made a larger knot, caught the cork on it, and pulled it out. *Ke* picked up the wire first but threw it down without trying it, "I must try the corkscrew."

All the other *O*s, after trying the corkscrew, made a loop of either the wire or the thread, caught the cork at the right angle, and with and without the aid of the corkscrew, pulled the cork out. Here as before a means is employed effectively out of its usual context. No *O* failed in this solution for various reasons; first, because corks inside bottles are a common occurrence, and, secondly, the experi-

mental set-up favored the correct solution. When sharp point and corkscrew were not successful, the *O* invariably seized upon the wire.

Results. When the occasion suggested the correct direction in which solution was brought about, there was a tendency on the part of the *O*s to go in that direction. In most cases, however, the more obvious suggestive factor, the corkscrew, inhibited a consideration of less obvious but equally suggestive factors (e.g., those considered by *My*) until failure brought about a further investigation of the experimental situation with another consequent plan of procedure.

The same inspection-and-comment, the same search with an eye to possible ways of procedure, the same methodical self-instructed plan of procedure and elimination through failure or inapplicability characterized this problem as the others.

Problem 4. This problem consisted of a series of seven cards presented in order bearing seven different arrangements of the line-

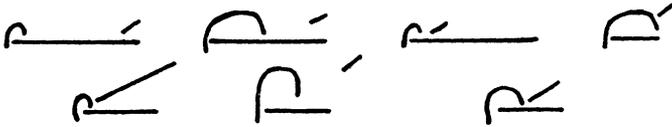


FIG. 1

elements of the letter R lying on its side, but the last arrangement comprising the R as it is ordinarily presented except for its sidewise position (Fig. 1). The principle of this series was suggested by problems in the classification of a new species or variety in taxonomic zoology or botany. The aim was to lead the *O* through a number of steps containing very familiar elements in more or less strange relations to each other to these same elements in their familiar relations. Experimental interest was centered on how soon the *O* saw the familiar relation, and, after seeing it, commented upon the whole series.

Instruction. Identify each member of the series presented to you.

The element of search was quite apparent in most of these observations. "I keep wondering, 'What do you want?' " (*Ke*). "I can name the lines. It seems as if it ought to represent something more definite than that" (*Gl*). "Nothing like sea-lions, is it? Is it a joke or anything of that nature? I try to see something there, but I am not sure of it. It is not supposed to be an ideograph, is it? Is it supposed to be something you can see?" (*Si*).

One thing after another was named by the *O*s as a possible identification; although in practically all of their observations there was an element of uncertainty concerning the object with which it was identified. "It looks like the other figures. It might be two or three objects like tombstones, etc., except for faults"

(*Ke*). "It looks like a P on the side with a long vertical part. What the little oblique line is bothers me. It is also a stream of water in a tile" (*Gl*). "It is a railroad track going into a tunnel. I cannot make out the slanting line" (*My*). "It is a mouse that is only partly there. The tail and head are missing" (*Si*).

In every case but one the *O* sought to give a meaning, though often very unsatisfactory, to the figure—to make it a symbol fitting in with known and recognizable phenomena. Only in the excepted case (*Mc*) very little effort was made to name the figure as some familiar object. In this case the object was too uncertain, too unsatisfactory. He comments: "It does not look like anything to me. It looks like a tunnel, a road here, and a soldier." "That is nothing at all." "Nor that. It requires an awful strain to get the soldier and tunnel."

There was a strong tendency on the part of many of the *O*s to analyze the lines before naming the object with which they might be identified. "It is just a curved line, and a straight one, and a short one" (*Ke*). "One is a straight horizontal line, the other a curved one, and the other oblique. . . . It is again like the other one but this time there is a short horizontal line, with the curved and oblique lines above it" (*Gl*). "I cannot make out the slanting line. The horizontal line is longer" (*My*). "It is a poorly drawn semicircle. It is like the first thing except the curve is longer and the little oblique line higher" (*Fe*). In general, these *O*s, who saw the figure as a group of lines first, tended to make the letter identification long before presentation of the last card; although this identification was, for the most part, as uncertain as the object identifications.

Fe, *Gl*, *Si*, and *My* suggested a letter early in the presentation. The first figure for *Fe* is "a sort of P lying on its side with a long stroke," and the second is "like the first except the curve is larger and the little oblique line higher. It suggests an incomplete R." For this second one also *Gl* commented "If I look at it sidewise, it suggests an R with part of it missing." For the fourth, "The curve and the horizontal line suggests an incomplete D," but for the sixth he said, "It looks like an uncompleted R. When I take them (the lines) as water in a tile, the oblique line does not fit. When an R, it does fit." *Si*, in the midst of positing several objects which the lines might represent, said, concerning the third figure, "If I turn it around, I can make an R out of it but I guess I'm supposed to keep it upright." He was self-instructed here to avoid the unusual in position. On the fifth figure *My* commented, "The line is longer, the tunnel is smaller. It looks like the letter R. I turned my head sidewise and looked at it like that. Once before it looked like the letter R rather remotely," and, on the sixth, "It still looks like the letter R."

For *Ke*, *Mc*, and *Je* the letter appeared only on the presentation of the last figure. Failure to suggest an R earlier was ascribed primarily to the set. "It is an R—a letter. The elements were so scattered in the others that that must be why I never got it before. I never thought of a letter" (*Ke*). He picked up the cards and went through them: "It is easy to see them all as Rs now." "The whole series is composed of various distortions of the R turned sidewise. I was set for a picture. I did not expect anything tipped over" (*Mc*), and for *Je* the set was strong enough to cause him to continue the pictorial identification to the last figure, "The first flash is a rabbit, the semicircular thing representing an ear. I just decided this when I got a very brilliant flash with an incipient shrug of the shoulders, 'Why, of course, that is the letter R.' There never was in any of the

earlier figures any suggestion of a letter. I have some suspicion that either the card tipped as you put it down, or my head did. You can see that the same motif was carried out throughout" (*Je*).

Care was taken on the part of *E* to prevent tipping the card. This "kinaesthetic pull toward the left," "tipping or turning the head sidewise" was mentioned frequently in the commentary, not only for a letter, but for objects in motion. "There is a kinaesthetic pull in the shoulders toward the left. I have a visual apprehension of the long angular line travelling toward the left" (*Je*).

From the final reports of the various *O*s it was obvious that every member of the series had taken on the characteristic significance of the R symbol. The purpose of every member now was to represent that letter. "We have our R this time. It is a tied image R, too. The R stands out immediately. There was no regular development in the R, but I can see now that that was what it was all along" (*Gl*). "There is the same general character to the whole series. All of them represent an R quite well, although each of them taken individually could have represented any of the other things equally well. But you can see now that it could not have been anything but an R" (*Si*). *My*, who was sure of the letter on the fifth figure, reported, "I think I noticed the R on the third one. There was not a close enough resemblance. I thought I would see a few more before I committed myself."

For the most part, the same general elements were noted from presentation to presentation, but their direction was undetermined. That "one figure is like the preceding one" or that "there is a certain similarity among them all" was reported time and again; but the significance was never fully determined, except in the case of *My*, until the last and most familiar relationship was presented.

Results. The reports from this problem display every stage of advance toward identification from an almost pure perceptive level, accompanied by the vaguest and most indefinite kind of puzzled search, in some cases, to a more concrete, though tentative, symbolization for some familiarly recognized object or objects, in others.

A uniformity among differences was one of the first general conditions noted, but an uncertainty of its significance accompanied the comment of every observer but one until the last member in the series was presented. Then the significance became certain either immediately or secondarily, depending upon the set of the *O*. After once knowing the correct symbol, a recognition of its appropriateness in comparison with any other identification occurred. This reevaluation of the whole series in the light of the last member was characteristic of every *O*.

By a process of finding the most appropriate identification-object, an object which fitted in best with the recognized uniformity, two *O*s named the correct letter midway in the series, the later presentations merely serving to confirm the conjecture.

The disposition on the part of the *O*s to verticality, to apprehending objects in their customary positions, was an inhibiting moment in the identification of the lines as a letter. So also was the predisposition to regard the lines as a picture of something.

Those *O*s who inspected the members as lines first tended to name letters as well as objects for identification early in the presentation. *Ke* was the only exception to this.

Problem 5. This problem was intended to demonstrate a solving procedure combining 'trial and error' with 'insight' (= 'foresight and forethought' or 'new configuration?'). A set of papers, each

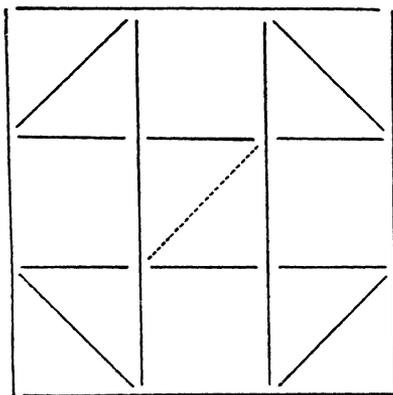


FIG. 2

sheet bearing Fig. 2 (but wanting the dotted diagonal at the centre) was presented to *O*, who was supplied with a red pencil for clear retracing of the lines. Gaps at certain junctions were left to discourage retracing. A clear disjunction of the inscribed figure from the surrounding rectangle was hinted at in the drawing.

Instruction. Here are two figures. Trace continuously (without retracing) every line of both. Use just as small a number of copies as you can. You will be penalized for every wrongly traced set. Comment aloud.

(a) *Individual Os.* Here as elsewhere conditions were considered and no random stumbling trials were made.

Search for the best way of attacking the figure, and inspection of and comment upon its salient characteristics with reference to the most advisable way of beginning marked the procedure. The *O*s had concerted plans before placing pencil on the figure. "I looked to see how the two could be traced independently. I saw that the square could be gone around simply enough. So could the other figure" (*Ke*). "I did it mostly by means of eye-movements. The solution came practically immediately" (*Mc*).

Some *O*s traced the figure first by moving the eyes over it. Others traced it in the air with the pencil held above the figure. Most of them began the actual tracing on the inside figure; but *Gl* and *Wi* began at points on the outside square. The beginning points were based on occasional instruction *plus* inspection-and-comment. "I saw that I must begin at a point here and I saw that, since the figure is symmetrical, it made no particular difference which of the like points I did begin on" (*Si*). "The outside figure must be begun at a point on the inside one" (*Gl*). "The first glance revealed that a gap would have to be left in the corner of the square which would have to be done at the end. Then the inside figure could be drawn immediately" (*Wi*).

After reading the instructions, one *O* had difficulty in seeing the two figures. "At first the gaps and the two-figure idea bothered me. I saw it first as a square and an octagon with other line-figures" (*Mc*). "I am looking to find the two figures" (*Si*). In general the *O* began by seeking to understand the instructions fully in order not to miss any condition which might be of significance in the given problem.

Results. After a mastery of the instructions and after inspecting and commenting upon the experimental object, the *O* approached the solution by a method of action under self-instruction and perception of its results, that is, of starting from some plausible point and proceeding until balked by an unforeseen condition. Thereupon another point was chosen and the same procedure continued, always, however, with this condition taken into account. This method was followed until the solution was reached.

Owing to the threat of penalization, the figure was concretely traced only after the solution was obtained.

(b) *Group Os.* The same figure under the same instruction, but without the direction "Comment aloud," was presented to the group. Five minutes was allotted for actual tracing.

Questions	Yes	No
1. Did you see the two figures as a square and the figure contained in the square?	92	8
2. Did you begin to trace the figures immediately?	14	86
3. Did the threat of penalization in the instructions keep you from immediately tracing the figure?	44	56
4. Did you look it over before you began to trace it to see first how it should be done?	89	11
5. Did you hold your pencil in the air while you went over it?	56	44
6. Did you begin on a corner of the inside figure?	52	48
7. Did you begin on the outer corner of the inside figure in order to get from it to the square?	49	51
8. Did you begin on the square?	52	48
9. Did you begin on the square at a point where the inside figure touched it so that when you had finished the square, you could get inside?	41	59
10. If you used more than one copy, did you decide to quit this first one because you could get no further and would have to start over again in a different place?	2	
11. When you began to trace, did you do so deliberately?	87	13

12. Were you looking ahead to see where your movements were leading you?	83	17
13. Did you trace it swiftly?	21	79
14. Had you already determined the correct procedure so that you could trace it swiftly?	17	83
15. Comment further upon the whole of your procedure, filling in details omitted by the questions.		

Eighty-two percent succeeded in tracing the figure correctly. Except for the last four questions, where some confusion seems to exist with regard to the method actually pursued, the procedure parallels to a large extent that of the individual *O*s. Many *O*s report in answer to the last request that they were "unable to finish the figure because of the time" or else that they "had not time to consider thoroughly, in order to do it correctly." That most of the tracing (trying out some self-instruction) was done, not on the paper, but above it, is obvious from the answers and from such reports as the following. "I mentally traced it." "After looking it over, its simplicity was evident." "The method of determining the procedure was done in my imagination rather than attempting it on copies."

Action, not a blind headlong sort of action, but from a self-instructed initiation, is characteristic of the procedure. A reason of some kind is reported for every attack. "The square could be traced starting from any point." "I first looked over the whole figure and decided that I should start with the inner figure and then trace the square, which is one continuous line no matter where you start from. I planned how to trace the inside figure and to get from it to the square without retracing. Then I traced it."

The general procedure with individuals and groups alike may be said to have been characterized by a period of search and of inspection-and-comment leading to a self-instruction and action under this instruction, followed by perception of the results.

The figure was repeated on fresh sheets with the dotted diagonal of Fig. 2 now added as an unbroken line. The task was therefore considerably changed.

Instruction. A line has been added. Trace all lines again under the same conditions.

(a) *Individual O*s. That the added diagonal was a further complication involving more effort for the solution was immediately recognized by most *O*s.

"This complicates it" (*Si*). "This will take longer" (*My*). "This complicates matters a bit" (*Wi*).

Gl, *My*, and *Si* traced again with the pencil slightly elevated from the sheet, while *Wi* "went over it mentally twice and then drew it."

The reports of no two *O*s were alike and yet a certain uniformity was evident in the procedure leading to the solution. In all cases but one some reason was given for the beginning point and the point of departure from one figure to the other. This one exception reports, "I have decided that I cannot begin where I did before but I will have to begin at the center. The solution seemed to come about naturally" (*Mc*). Most *O*s traced their figures, reporting their procedure afterwards; but one *O* commented while tracing it in air; "If I start on the diagonal, I must take care of the other two lines by crossing. I have to end on one point of the diagonal if I start on the other" (*Si*). Another *O*, who never traced the figure except with his pencil on the sheet, commented: "This has the same figure as the other practically," and, "When I started, I could not swear that the beginning on the middle diagonal would be successful. I knew the square could be traced continuously and that the figure in the previous case could be traced the same way. When I first put the pencil down, I knew that I could get practically all around, but I was doubtful about the corners. When I got to the last corner, I paused and saw that I must do the square and come back to the last line of the inner figure" (*Ke*). "I knew I had to begin on the middle diagonal because I could not reach it without retracing the lines if I began on the outside of the figure. That I would have to leave the inside figure and do the outer one before finishing the inner came because I knew the middle diagonal was substituted for the one I began on in the first sheet" (*My*). "I began at the diagonal because I had just been over the same figure (except for the diagonal), and when the new line was added, the easiest way of getting it in was to begin on it. It was quite obvious that you had to do the square before you finished the middle figure. Otherwise you would never get to the square. If I began on the inside of the middle figure, I would have to end there and there was no way of getting from there to the square" (*Wi*).

The middle diagonal, the new element, commanded primary attention and drew interest away from the outer figure to the inner. Not one *O* attempted to trace the square first, and only one attempted to begin on the inner figure at any point apart from the diagonal. *Gl* held his pencil suspended from the paper, attempting to trace it, "Go from here to here to here, etc.—That won't do.—The square in the middle puzzles me.—I have decided to start at the same point I did on the former sheet." He was supplied with another sheet which he never traced until he had first gone over it in air, "trying to see the whole figure traced before I start. I got stuck because I kept thinking that I ought to arrive at the starting point. The idea of penalization holds one back." Self-instruction is thus an inhibiting factor in the solution as well as an aid.

Results. Apprehension of the object, search, and inspection-and-comment, leading to action under one self-instruction after another were the essential characteristics of the procedure. The instruction of penalization for every wrongly traced sheet caused most of the trials to be carried out either by eye-movement or by tracing in air. In some cases where the solution was not quickly forthcoming, the figures were so traced again and again. As a result, a sureness and

swiftness marked the tracing of those who had solved it to their satisfaction beforehand. Their reasons for this or that movement in order to avoid error were already determined.

On the other hand, those who started to trace before having well in hand the proper way of doing it moved the pencil slowly, glancing ahead to study the whole figure before crossing or turning at some critical point. This looking ahead for possible errors and correct ways of procedure simultaneously with tracing is obvious in the report of *Ke* whose tracing time was 30 seconds,—the longest time except for *Gl*, who, though he traced the figure again and again in air, was still uncertain when he began to trace the actual figure.

(b) *Groups Os*. The same figure was presented to the groups under the same instructions. The time allotted was 7 minutes.

Questions	Yes	No
1. Did you consider this task more difficult and complicated than the preceding?	93	7
2. Did you begin to trace this figure immediately?	14	86
3. Did you run your eyes over these figures before tracing to see how they could best be traced?	93	7
4. Did you go over the sheet holding your pencil suspended until you got the successful way of doing it?	72	28
5. Did you begin on the inside figure?	78	22
6. Did you begin on the middle diagonal of the inside figure?	53	47
7. Did you begin on one of the outside points of the inside figure?	19	81
8. Did you begin on the square?	26	74
9. Did you begin on the diagonal in order to get it in?	41	59
10. Did you leave the inner figure before finishing it in order to do the square and then come back to the inner figure?	55	45
11. Supply any information that is not covered by the above questions.		

Fifty-seven percent succeeded in tracing this second pattern. Of the others, only two *Os* traced more than one copy. The others either had not time to do so, or else the end of the period found a few of them still searching for a successful way to proceed on the copy first supplied.

The reports in answer to the last request were scanty in this portion of the problem. They were, for the most part, explanations of why the figure was not correctly traced. Too little time given and too much time spent on trying to find the most advantageous starting point are examples. Comments paralleling those in the preceding figure were given. "I did one hurriedly to see how it would work out and I did it wrong. I saw my error and drew the second one correctly by using the lesson I had learned in my first one." "I slowly traced the figure, not having any predetermined course, and was careful not to pass over any intersections that I could not come back to. When about half completed, I saw the way to finish the problem." "I tried it once and got everything but the middle diagonal. It was merely a repetition of the other figure. So I started with the diagonal and got it out of the way."

The results in the main confirm those preceding. That the majority of the *O*s followed the same procedure as the individuals is evident from the comments and from percentages. Many *O*s never got beyond the earlier stages of apprehension, search for a procedure, and inspection-and-comment upon the object. Others, going further, acted under one self-instruction after another until the desired result was obtained.

Problem 6. This problem, based on the method of multiple choice, was designed to show 'insight' (= comprehension, sudden grasp, cognized relations?). Fourteen rectangular pill-boxes were glued side by side to a long narrow board. In one box a bit of cotton was hidden. The board was removed from *O*'s sight each time the location of the cotton was changed.

(a) *Individual Os.*

Instruction. There is a bit of cotton in one of the boxes. Find it with the quickest possible dispatch, giving all your procedure aloud.

This problem afforded a very striking example of one self-instruction replacing another after having been upset by the experimental conditions. At no time, not even to begin with, did the *O* open the boxes with no plan. "The best thing is to open the boxes one by one from left to right" (*Mc*). "There is no way but to go through the thing methodically" (*Fe*). Even in the cases of the unsophisticated *O*s, where the formal instruction was obeyed quite literally at first, a definite system of procedure was followed. One *O* (1) opened all the closed boxes beginning at the left; (2) opened with both hands but began at the opposite end. "If this is going to run on for some time, I am going to begin to look for a system. Now that was in the third from the left. There must be some trick about it, so that if I get the right idea, I can go directly to the correct one" (*Si*). This system, self-instructed, varied from time to time as the occasion favored first one and then another. This is better illustrated in a later stage of the comment. (11th trial) "Last time it was third from that end. This time it is third from this one. That doesn't work every time. Maybe there is no regulation." (12) Opened one but it was not the correct one. Opened another and found it. "I am formulating a theory." (13) "It ought to be in this one by the theory, but it is not, and I hereby discard it." This *O* never worked at random although he recognized the uncertainty of his plan. "I may be on a totally wrong track trying to figure these out from the arrangements but I think it is a sensible way of doing it" (*Si*).

The pattern arrangement was the outstanding method of approach to most *O*s. "It occurs to me that I am getting some kind of pattern-test (like the animals') which I am to learn in the course of the presentation" (*Mc*). "I will begin at the left, examining each box as I go. It is in the third I opened next to three empty boxes" (*Ke*).

Any number of cues were tried—the pattern, marks on the boxes, the total number of boxes from one end, either end, and both ends, the number of closed next to empty boxes from either end, the number of boxes moved farther from either end at successive times according to a scheme, the same box every time,

etc. The experimental period was marked with pauses while the *O* sat looking at the boxes, noting their position and arrangement, and striving to memorize them.

One *O* remarked that he "must look out for the danger of making it more complicated than it was." Nevertheless he reported at the end, "I made it complicated at first. I thought of all sorts of possible methods" (*Gl*). "I looked for something exceedingly difficult" (*Mc*). Self-instruction toward the difficult was not apparent in any of the other *O*s. *O* merely took advantage of what the occasion had to offer whether difficult or simple. *My*, who was in general the quickest and keenest to take note of all possible relevant conditions, commented, "It must be some simple system because it does not take you long to fix it" (*My*).

The process of elimination of one self-instructed method after another as the conditions changed was most obvious and most logically organized in the case of this same *O*.

1. "There it is." (After opening the boxes systematically from left to right.)
2. "I do not see any sense to it at all. I cannot find any order to it. The first time it was near the three thumb tacks, next it was third from the end. The more boxes I open, the less credit I get, I suppose."
3. "This time there are no threes to go by at all unless I go by the number of closed boxes." (Opened the third closed box from the left and found it.)
4. (Opened them by hunting for the pattern of three. Opened nearly all of them.) "I know that it has some connection with three. It was in the center of the only three closed boxes together."
5. (Opened the one near the group of three open boxes. Opened another and found it.) "I have the wrong pattern." (Examined the thing carefully and made a mark on one end of the board.)
6. "I marked it because I thought it might be in the same box every time, but it was not." (He counted three from the other end and got the cotton.)
7. (Opened from a cue from last time.) "Why do you have more lids on the boxes?" (Opened again and again and found it.)
8. (Opened a wrong box. Opened the right one. Counted the number of boxes.) "I wondered if you had moved it over one, but you had not. This time it was in the center of the pattern as it was two times ago, but that does not hold for all times."
9. (Looked where he did last time.) "Did you move it over three? Would it be a certain number of covered lids from either end? But figures do not prove it." (Then he found it.) "It is in the third from the end."
10. (Looked at the boxes.) "You do not move it over a certain number of times nor does the number three have anything to do with it, nor is it the center of a pattern, nor is it in the same one every time." (Tried the same box, but from the other end this time. It was there.)
11. (Opened the correct box.) "It is the third closed box over."
12. "I thought that when it was five from one end one time, it would be at the other end next time in the fifth box. I have never found it in an end one. I am trying to make sense of the arrangement. This time it is the sixth closed box from one end, and the third closed from the other."
13. "It must be some simple system because it does not take you long to fix it."
14. "Why is it never in the end ones?" (Counted the boxes.) "Next time I shall count the number of open ones."
15. "It certainly is no pattern."
16. "And it is not the same design this time. Apparently you do not have any system, but it has been in this one at other times." (He had opened the third closed one from the end and got it.)
17. "It is the third closed box from the end."
18. (Opened the third closed one from the right.)
19. (Opened the third closed box from the left.) "They alternate." (*My*).

This protocol is a fine example of the typical procedure in this particular problem. It is rich in illustrations of apprehension of arrangement and place, of search for some plausible ground on which to base a choice, of inspection-and-comment upon the various experimental conditions, of the formulation of the self-instruction dependent upon the occasion (arranged boxes) and action under it, of re-apprehension followed by another self-instruction and action under that, until, all irrelevant plans eliminated, the solving generalization is reached.

Results. The procedure in this problem, as in the others, was marked by a method, a systematic series of interacting self and occasional instructions. A solution was gained through, first, inspection-and-comment upon all conditions possibly relevant to the end sought, and, next, formulation of one self-instruction after another dependent on some occasional instruction until the generalization was reached. Here, again, there was no evidence of any uninstructed and planless activity. Action was always directed, predetermined, relevant to some intention on the part of the *O*.

(b) *Group Os.* The scheme for group-presentation consisted in placing the cotton always in the second closed box from the right end. It was necessary to make the scheme simpler than the *alternating plan* used above since the number of *Os* was greater and the presentation-time 10 minutes less.

Instruction. I am going to present to you this series of boxes a number of times in succession. In one of them there is a bit of cotton. On the first presentation, I shall open the box in which the cotton lies. After that you are to write on the paper before you the number of the box in which you think it lies, counting from the right. After you have written down the choice each time, I shall open the correct box.

<i>Questions</i>	<i>Yes</i>	<i>No</i>
1. When the boxes were first presented to you, did you consider that the best way of finding the cotton was to open all the boxes to see where it was?	52	48
2. Did you try to remember which box it had been in from time to time?	74	26
3. Did you try counting the number of boxes from an end?	80	20
4. Did you try to remember the pattern arrangement from time to time?	60	40
5. Did you try counting the number of closed boxes from either end?	42	58
6. In naming the box in which you thought it might lie, was your reason for the choice based on some location you had noticed before?	84	16
7. Give any other information which you consider of interest or value concerning your solving process.		

The percentages and the reports again parallel those of the individual *Os*. "I tried to base my solution on some probable numerical sequence, as some multiple of two. This seemed to work, but failed in the last instance. Hence my solution was incorrect." "First I tried to find a difference from the others in the box containing the cotton. When this proved futile, I tried to notice whether the

number of the box had anything to do with the number of empty boxes. At the end I thought it was the number of empty boxes minus one." "When I saw the first time that the right box was the second closed one from the right, I chose that in every succeeding trial, and, finding I was successful, did not try any other method." "My first idea was that there would be a telltale mark on the lid. I found several such marks, but the placement of the cotton did not correspond."

The procedure was obviously the same as above. Self-instructed, the *O* made one choice after another until the instruction was no longer plausible, whereupon another self-instruction dependent upon occasional instruction was formulated. This continued until either the solution was reached or the end of the presentation-period arrived. The results of this group-presentation confirm those obtained from the individual *O*s.

Problem 7. This problem was chosen to show 'insight' (= flash, new configuration?). Six matches were placed on the paper before *O*.

Instruction. You have presented to you six matches. Construct of them four equilateral triangles without breaking the matches. Comment aloud.

All the *O*s went systematically to work on the presentation of the problem constructing plane figures involving triangles. This practice was interspersed with pauses where the *O* was "trying to visualize some large geometrical figure that can be broken up into four equilateral triangles," or "tried to think of all the figures involving four triangles, (some time since my geometry)." Search here was accompanied by inspection-and-comment, "Obviously each match will have to form the side of more than one triangle." "Each side of each triangle must be the length of one match." "The solution seems as if it might lie in utilizing only the half-matches but I can get only three triangles that way."

All the *O*s assumed, without any formal recognition of the fact, that the four triangles were to lie in a plane. Three of them (*Ke*, *Si*, and *My*) solved it by taking advantage of chance positions in their efforts to lay a plane figure. *Ke* made one triangle. Then he started to lay another match from the apex of it to the base. "As I was laying the match one end down and the other up, I got the idea of not having them in the same plane." *Si*, constructing plane figures, laid out two triangles with a common base so that the figure looked like a diamond with a line across the center. Taking the two matches nearest him, he lifted them, added the other, and constructed the tetrahedron. "I saw all at once that it was a tetrahedron required. Taking two of them up together gave me the notion of getting the third dimension." *My*, also constructing plane figures, started moving the matches around again and then paused with one in his hand. He started laying it down slowly, beginning with one end, "Oh, here it is," and constructed the figure.

The solution followed immediately on the chance occurrence which induced a change in the primary assumption. It undoubtedly was obtained more easily in the cases of *Ke* and *Si*, that of the former because he had taught geometry the year before and that of the latter because he was a physicist and accustomed to deal with mathematical media.

The other *O*s (with one exception) concluded it impossible to construct the required triangles. When no other arrangement could be formed under the self-instruction, the *O* sought to terminate the period. He never continued to move the matches aimlessly. On the second and third presentations he acted under a self-instructed plan; but when the instruction ceased his action ceased.

Mc never realized the impossibility of constructing the figure according to his plan. Even when shown the solution, he never saw it as a three-dimensional figure of planes in various relations to each other, but as a solid. "The idea of a solid never struck me at all. Triangle means to me something in a plane."

Results. The solution here consisted in a recognition of the three-dimensional alternative. Perceptive apprehension of a significant condition was prevented by a predisposition to lay figures in a plane. For some this set was so strong as to inhibit a recognition of the implications attendant upon lifting the matches from their two-dimensional arrangement to place them again in another plane arrangement, while for others a self-instruction that there must be something tricky or catchy about the problem created an attitude of search and uncertainty in the attempts to lay a plane figure satisfying the conditions. For these the re-apprehension of the type of figure required entailed a recognition of the predisposition to lay plane figures with the resulting formulation of another self-instruction.

Action under self-instruction, accompanied by search for a method of solution and inspection-and-comment upon the situation characterized the procedure. For those who solved the problem, the occasion brought about a re-apprehension with a consequent recasting of the instruction.

Problem 8. This problem also was intended to show alleged 'insight' (of the same sort.) The experimental object consisted of a flat steel rectangle with a slot of definite pattern cut in it. The right-left slotted groove was long and had annexed to it above and below 2 shorter T-shaped prolongations. Ten steel buttons, which could be turned or slid in any direction, were permanently fastened in the slot. Each bore a letter of the word 'perplexity,' the letters arranged in haphazard order. Because of the arrangement of the slot, the letter 'p' could not be moved from its position at the right of all the others. The solution lay in turning the puzzle and the letters on the buttons upside down with reference to the obvious top of the puzzle, which was indicated by the imposed name "The perplexing puzzle."

Instruction. Solve this puzzle, commenting aloud.

In every case the *O*s assumed at first that the word was to be spelled according to the words lying above the slot. Under self and occasional instructions, *O* shifted the buttons in every imaginable way. "It is just a matter of moving them around" (*My*).

Search and inspection-and-comment under a misleading occasional instruction characterized the early stages of the solving process. "Where has it got to be when I spell it? Where is the trouble? How do you get the Y over there? The Y is stuck" (*My*). "This takes three, and this takes three, and four have to go there, but they won't" (*Ke*). "You have to get the Y out of there first. You cannot do it. I wonder if any of these are uneven? They are all eccentric; they all roll round" (*Si*). "The Y should go to the end. I see that it is going to be the whole difficulty to get the Y out of there. The P won't let the others pass. There is something fishy here. Is there any possible way of getting them past each other? There are too many letters for this. Now what am I going to do?" (*Gl*).

At times throughout the experimental period the *O*, with an abstracted look on his face, would cease to move the buttons around, or else do so in an aimless, desultory way; but, when asked what he was doing, he reported, "I am trying to see what I can do." "I have got all but one letter in the correct positions, but I do not see how the P can be got in" (*Fe*).

Marking the later stages of the solving process were action under self and occasional instructions and elimination of one plan of action after another, shifting the buttons around until the realization was reached that the letter P could not be moved from its end position. At this point two *O*s declared its solution impossible. "I still have that P down there, and there is no way of getting it out. There must be some way for P to pass some of the others but I cannot see it" (*Ke*). "It is no use forcing the metal; that would not do any good. I cannot get that Y out of there to save me" (*Gl*). One *O* never realized this impossibility because he failed to notice the relative positions of the letters at the beginning of the observational period. "I did not remember whether the P was in that position to begin with or not. I might have got it in that place by moving the buttons around" (*Fe*).

For the others, the impossibility of the removal of the P from the end suggested utilizing that letter as the beginning of the word. "Perplexity is presumably to be spelled in this direction, but I can spell it in the other direction. May I? I can turn it upside down which is not against the directions" (*Mc*). "When I picked it up, I realized that the P was still on the end and there was no way of getting it on the other side. I must be able to spell it with P on that end, then. And it occurred to me that I could turn it upside down, twist the buttons around, and spell it forward" (*Gl*). *My* spelled it backward and turned it bottom-side up. "It was the only way it could be done. I had tried every other way of doing it and was bound to get this way sooner or later" (*My*). "The labelling would indicate that it was to be spelled like it but the P cannot be shifted" (*Si*). He spelled it backwards and then turned the puzzle upside down. "Ho, ho, wait a minute!" and he turned the buttons so that they spelled it forward, and laughed, "I turned it upside down to read it backwards, then I thought of using a mirror, and then I saw the letters could be turned around."

Results. The procedure in this problem, as in others, consisted in apprehension of the object, search for a method by which to spell the word, inspection-and-comment upon the conditions of the situation, action under self and occasional instructions, and re-apprehension due to a further realization of the limiting conditions of the experimental object.

The assumption that the word was to be spelled according to the one paralleling the slot was a misleading instruction from the occasion. Failure to arrive at the solution was due either to no change in this assumption, or to an imperfect apprehension of the experimental material, as in the case of *Fe*.

Problem 9. The following word-series were designed to bring out 'insight' of some kind. The approximate sounds of two famous Shakespearean passages—Macbeth's tragic soliloquy from the Fifth Act and the soliloquy from *Hamlet*—were presented in serial form. The Macbeth was given first because it was the less familiar.

Macbeth's Soliloquy

tomb	this	bull	lie
arrow	pet	of	Ted
and	tee	record	fools
tumor	pays	dead	the
row	from	thyme	weight
in	data	an	too
Tom	day	awl	does
are	tooth	hour	tea
oh	he	yes	death
crypt	lass	today's	
e'en	silly	have	

Hamlet's Soliloquy

two	weather	sling	oar
beer	'tis	sand	toot
knot	know	air	ache
tube	blur	row	arm
bee	inn	sough	sag
thought	them	out	ens
is	end	ray	tea
thick	twos	just	sift
west	offer	four	rub
shun	this	tune	bulls

(a) *Individual Os.* One of the above series was placed on a sheet of paper without the title.

Instruction. Read aloud.

The *Os* began by reading the list once. Then they invariably paused, running their eyes up and down the list while commenting. "It is a group of disconnected words. I did not think of the meanings of the words at all. Several of them are rather unusual" (*Mc*). "I noticed that there were some nicknames and a few

words together tended to make sense, and some I sought to pronounce in a different way like 'row' " (*Gl*). "I looked over it and thought of some catch in pronunciation. I thought only of each separate word. Then I started reading down fairly rapidly for myself. The 'petty pace' part gave me the first inkling" (*Si*). "I thought it might be like James's 'Pas de lieu Rhône que nous.' Then I saw 'tube' and 'bee' which looked like 'to be.' I suspected what it was then and went to reading it systematically" (*Fe*). "These words, 'tomb, arrow, and tumor,' fell together as I read them. I thought the list might be only scattered phrases, therefore I took them separately" (*Ke*). "When I read it, I knew it sounded like something faintly familiar and the first phrase and the last one made sense right off. The rest of it is this" (*My*).

The solution was dependent mainly upon the occasional instruction and only in part on self-instruction. Search is evident in the report where the *Os* ask themselves "what it can be for" or wonder "what you want done with this," or an *O* wishes that he "knew what he was to get out of it;" but in any case the *Os* knew that there was something there, not apparent but to be found.

For *Mc*, who failed to recognize the passages after several readings, the formal instruction was changed twice; first to "Read until learned," and then "Read through quickly." Under the first he got slower and slower in his reading. "They are disconnected words for groups of which I have to manufacture connections to help me learn When I tried to learn it, the slower I went, the more disjointed it became." On reading it quickly he "noticed this last time 'weather 'tis nobler.' I am beginning to get a glimmer that this is a meaningful sentence of some sort."

Gl's complete ignorance of one of the passages in question and his very imperfect acquaintance with the other prevented his getting the meaning. Time and again he struck a leading note: "A few words tended to make sense," and "I wonder if I could make sentences out of it. No, they are too disconnected." Even when the instruction was changed to "Read aloud as quickly as possible" and the report reads, "I could not help noticing the rhythm—there are places in it where a number of words almost make sense," he made no attempt to work it out as had *Ke*, (who was very unfamiliar with the passage first given him), but remained doubtful concerning it. The meaningful phrases suggested by the words were never like those in the original passage, but were like the words of the lists, *e.g.*, 'to be thought,' 'offer this sling.'

Ke, starting from the first phrase which "fell together," methodically worked out the remainder of the passage on paper, repeating phrases aloud and going back to change those already done to fit the meaning. "Two or three of these could be 'tomorrow,' and then there is 'pays from day to day to the last syllable of recorded time.' And 'whole hour yesterday.' He went over it slowly, writing down these phrases. 'Have lighted fools the way to dusty death. Tomorrow and tomorrow and tomorrow,' I see that all right." He looked at the list awhile. 'Creeps—creeps in this petty pace.' He read on slowly, 'and all our yesterdays.' Then he read from the paper the whole passage correctly.

Results. When one passage was identified, the *O* was instructed by the occasion that the other was similar. Therefore the stage of undefined search was absent in the second procedure. In general,

the *O* who recognized the first passage also recognized the other; while for the one who did not recognize the first, the second also was hard of recognition.

The disconnected and strange series of visual words tended to inhibit the recognition of the rhythmical and familiar sequence of verbal sounds.

The procedure was characterized first as perceptive and comprehensive, accompanied by a vague and diffused form of search. Occasional instruction tended to objectify concretely this element and to lead to verbal recognition. Auditory cues from a swift reading aloud led in some cases to identification with the familiar literary passage. Where the passage was not so familiar, the *O* worked out under self-instruction the meaning of the whole in a methodical way.

(b) *Group Os.* The series of words simulating Hamlet's soliloquy was arranged on a white cardboard 3 ft. x 2½ ft. The other series was omitted because of the lesser familiarity of the quotation.

Instruction. I have here a chart on which there is a series of words. I shall present them to you and we shall read them aloud in unison three times, increasing the speed with each reading. After the last reading you may immediately turn over your questions and answer them. Here are the words. Let's begin.

<i>Questions</i>	<i>Yes</i>	<i>No</i>
1. Did you wonder what it was all about when you were asked to read these words?	88	12
2. Did these words remain a group of disjointed words without any connected meaning?	53	47
3. Did you think that they might make sense before you read them?	37	63
4. Did any of the words fall together to make sense as you read them?	77	23
5. Did the whole series make sense only after the second or third reading?	27	73
6. Tell anything about your procedure that these questions have left out.		

From the percentages it is evident that about three-fourths of the *Os* failed to recognize the passage. The causes of this failure may have been either lack of familiarity with the passage or the dominance of the visual over the auditory stimuli.

The reports run parallel to those of the individual *Os*. "The increased speed in reading seemed to make them more meaningful and I left the visual words for the audible." "The unfamiliar word 'sough' was the most definite cue to me that this series was not disconnected." "There seemed enough verbs, nouns, and adjectives to make complete sentences, but there was not time enough." "I thought it was an association-experiment and I tried to memorize the words but only a few of the unusual ones stayed." "Certain words went together like 'thick, west, shun,' and 'toot ache' that could have been 'toothache.' The whole did not make sense."

The dependence of the solution on occasional instruction is quite obvious from these reports where occasional instruction (*e.g.* that it was an association-experiment) often inhibited useful cues. This may be added to those given above as another cause for failure to apprehend the words as familiar and well-known.

Problem 10. This problem was designed to show whether some form of 'insight' was concerned in applying a physical principle to a problematical situation. A deflated toy balloon, a 75-cc. flask, penstaff, pencils, and file were presented to the *O*.

(a) *Individuals.*

Instruction. Blow up this balloon and tie it inside the bottle.

Here the simplest and most obvious performance was to place the balloon in the bottle and blow on it. That was the procedure invariably followed, by all *O*s,—even by *Si*, a physicist. Failure led to the question, Why? "Now, why the deuce won't that blow up in the bottle?" (*Si*).

In the majority of cases the *O* quickly recognized the cause as air-pressure and lack of an escape for it. "I must have something to let the air out" (*Ke*). "I just thought of letting the air escape as I put the balloon in" (*Mc*). "All the air is in there and I have to get it out or the balloon won't blow up" (*Gl*). "I saw that it was air-pressure keeping it from blowing up" (*Si*). *My*, the logician, was the only one to make a correct scientific analysis. "To blow it up would have required compressing the air in the bottle but lungs are not strong enough to do that." An excellent example of employing an object as instrument out of its usual context occurred in this case. After finding that the balloon did not expand, he asked, "Can I use anything else?" He looked over the table and said, "I haven't the right machinery. Oh, yes; I am going to show you something now." He quickly unscrewed his pipe-stem from the bowl, inserted it by the side of the balloon and inflated the balloon, the air escaping through the pipe stem. He reported, "Therefore I put a tube in the neck of the bottle and then the air in the bottle escaped through the tube." The pipe-stem was apprehended no longer as a pipe-stem with its specific application but was generalized into a tube.

Fe, who never solved the difficulty, reported that "the problem never announced itself to me as physical. I knew the air had to get out but I never thought of it as a physical problem." To what extent that prevented a solution on his part is doubtful. In the commentary he formulated the question, "How do you get the air out of the bottle?" and he "does not see how the air can escape." Here is a definite recognition of the difficulty but no instrumental solution is suggested.

The other *O*s used the penstaff and pencil indiscriminately. *Ke* picked up the file and inserted it but decided it might break the balloon.

Results. The procedure consisted of action under self-instruction followed first by a period of search for the cause for failure under the first trial and then by a re-apprehension of the experimental condi-

tions with a consequent new self-instruction followed by action. As a general rule, when the cause for failure to inflate the balloon on the first trial was comprehended as due to air-pressure, the solution by instrumental application followed immediately.

Except for one case, *Fe*, formulation of the difficulty led to a consideration of the means of solution. In this case, however, imperfect comprehension of the laws of air-pressure inhibited the apprehension of a means of solution.

(b) *Group Os.*

Instruction. If I place this balloon in this bottle and blow, thus, no matter how hard I, or anyone else, blows, the balloon will not go up. Nevertheless, there is a way by which the balloon can be blown up in this bottle under these present conditions. If I gave you the balloon and asked you to blow it up in the bottle, how would you do it?

Questions	Yes	No
1. Did you find a way of blowing up the balloon in the bottle?	73	27
2. Did you decide that the air in the bottle prevented the balloon from blowing up?	72	28
3. Did you search for some means of allowing the air to escape?	61	39
4. Did you consider any of the objects lying on the table?	69	31
5. Did you think of some absent object as a means?	83	17
6. Did your solution consist in holding some object in the mouth of the bottle parallel to the neck in order to allow the air to escape?	47	53
7. Give any of your attempts at solving which are not covered by these questions.		

Various methods of obtaining the desired result in addition to the one in the sixth question were reported in the answers to the last question. "I thought of pushing the balloon in the bottle, thus allowing the air to escape as the balloon blew up. Of course, this entailed having a tube fastened to the neck of the balloon through which one could blow. I could not find the instrument on the table so considered the problem unsolved." "Wire wrapped round the neck of the balloon (in the neck of the bottle) to keep it smaller than the neck space and allow the air to escape as the balloon got larger." All sorts of other means were offered as impractical as, or more impracticable than, those quoted.

Others reported concerning the sixth question. "The object I should use is a corkscrew with the point away from the balloon because then the balloon could not expand around the object to shut off egress of air." This was another example of an instrument, not only used out of its usual context but assumed to have the generalized character of a tube. "I solved it nearly instantaneously due to my knowledge of physics and air-pressure." "Because of the question in the bead problem, I definitely started by looking over the table." The *O* was self-instructed here from a cue from a preceding experiment.

Results. Great variety in type of solution is evident in the results. Those *Os* who never apprehended the cause of the difficulty naturally failed entirely to reach any solution. Others, self-instructed from past experience, suggested various methods for the most part entirely

unsuited to the experimental conditions. Others apprehended the correct cause of the difficulty but spent the allotted time in search for a method of solution; while still others, apprehending the difficulty, had no trouble in immediately apprehending the best and simplest means of solution under the conditions given.

Inhibiting factors were, first, failure to apprehend the cause of the difficulty due to an imperfect acquaintance with the behavior of gases, and, secondly, self-instruction from past instrumental applications combined with failure to apprehend limiting conditions in the instruction and the experimental situation.

Problem 11. This problem was chosen as parallel to the foregoing. The *O* was presented with a bit of wood about 2 in. long, beveled convexly below and so rocking easily from end to end. The top was channeled out longitudinally with a concave bottom. Two small shot were placed in the groove which was then transparently covered. As the piece sat on its rocking bottom, the shot lay together at the centre, but separated by a wire partition. Small pockets were dug out at the outer ends of the groove. The problem was to cause the two shot to go right and left at the same time and so ride up to the two pockets. The solution consisted in twirling the piece suddenly, thus sending the shot centrifugally to the two pockets.

Instruction. Place a ball in each pocket simultaneously. Comment aloud.

All the *Os* began with the self-instruction that it was a matter of manual dexterity or skill. When that principle failed them, some assumed it a mere matter of chance, which was denied by the experimenter. As a result of that self-instruction the *O* tended to cease in his efforts at solution. "I do not see that there is anything to it but manual dexterity. I do not see anything but that it must go in by chance." (*Fe*). "I think it is a mere matter of skill. . . . It will just be chance if it falls in" (*Ke*). "Is it a trick of dexterity or is it a matter of luck?" (*My*).

Every method that might lead toward a solution was tried with the object in every possible position. Only in extreme impatience did the *O* violently and aimlessly shake the object. Every way of holding the box, of sudden striking and jerking, was tried,—a methodical procedure with a definite basis. "The best bet is to get one in a hole and hold it there while rolling the other along the glass top, but I have not succeeded in doing it yet" (*Mc*). "I am trying to keep one ball in the hole while I quietly and diligently get the other in, but I get it nearly there when the other one moves out" (*Gl*). "I have a better idea, I will put one in and then put another one in by striking the bottom sharply" (*My*).

Gl and *My* noticed the structure of the puzzle. *My*, who solved it, said emphatically, early in the experimental period, "One thing is certain, I suppose that wire in the center (partition) has something to do with it. . . . Why is it

made in a rolling fashion like that? There are no grooves in it any place, it is just semicircular. That wire must mean something—that one is to be on either side of it." *Gl*, who did not solve it, commented in the interrogative, "Why was it made like this? That wire down there is kind of funny. Why do you suppose it is there?"

That there might be some mechanical principle whereby it could be solved occurred to most *Os*. "One could set up an oscillatory motion so that the balls go up and down in opposite directions, I suppose" (*Mc*). "I do not know any principle of mechanics whereby both could be put in together" (*Gl*). *Fe*, when told that the puzzle was obtained from a physicist, commented interrogatively, "I wonder if the inclined plane has anything to do with it?" *My*, who solved the problem, reported that, "If I had a magnet, I believe I could do it. . . . I wonder if it depends on any scientific law. It looks as if the wire should keep them apart. You have to get them in a place where a single motion would put them both in at once. . . . What kind of motion would drive them in? The only thing left after thinking of all possible forces was centrifugal."

When those who desired to cease trying for the solution were told that the secret of it was centrifugal force, various comments were obtained showing that, though centrifugal force as a name was familiar, not one *O* had a clear notion of the significance of the concept. "I have heard of it but it means nothing to me" (*Fe*). "Centrifugal force—force toward the outside? I never would have thought of spinning it. I thought it was a mere matter of skill" (*Ke*). "Centrifugal force? I know what that is" (*Gl*). He got up and whirled around holding the puzzle in his outstretched hand. "All it ever meant to me was a whirling pail of water" (*Gl*). "When you spin a thing around?" (*Mc*). He took it in hand and tried to go around with it as one whirls round with a bucket of water. Even though these latter two now knew the principle of the solution, they never tried the correct way of spinning the object.

Results. The characteristic procedure here for those who came nearest the solution and for the one who attained it was action under self-instruction accompanied by search for a different and possibly more relevant method of solving, and by inspection-and-comment upon the experimental object.

In three cases the first self-instruction of manual dexterity was never changed—a self-instruction inhibiting the apprehension of relevant conditions which would necessitate a reformulation of the plan of procedure. When *O* found that skill of manipulation did not obtain the desired result, he ceased to attempt the solution. When he had no other feasible plan, he never continued to try aimlessly.

In other cases failure to solve could be attributed to the inhibiting effect of a vague and imperfect knowledge of the controlling physical principle.

Problem 12. This problem was designed to examine an 'insight' which might divine the suitable. Two series of numbers were com-

posed. The pattern of the one first presented was as follows. To all odd numbers additions were made; from all even ones, subtractions. The numbers so added and subtracted ranged from 1 to 14. After 12 first appeared, it then appeared in every 4th place. The pattern for the second was a subtraction-and-addition pattern; thus, $-3+2-1, +6-5+4. . . .$

First Pattern		Second Pattern	
13	13	24	26
14	22	21	25
12	12	23	31
9	1	22	26
13	13	28	30
18	26	23	27
12	—	27	—
5		24	

Instruction. Here is a series of numbers with the last one lacking. Supply the correct number. Comment aloud.

The interesting thing about the first series for the *Os* was its pattern arrangement. All gave 12 as the number, basing their choice on this arrangement. The formal instruction was as meager as possible, leaving wide range for self- and occasional instructions. Not one *O* made any initial assumption that the other numbers followed necessarily from the first according to some ruling principle. All read the series first, inspecting its characteristics and generally seizing on what the occasion had to offer.

Various patterns were described but the one leading to the right number was the most obvious and the most generally found. "Beginning with the third number, every fourth number of the series is 12. Therefore the last one would be 12 to fit in the rule. I saw it was a pattern 13, 12—13, 12 all the way" (*Fe*). "I happened to notice that the numbers occurred in groups of four—that the first number of each group was 13, and the third (?) was 12" (*Ke*). "There are three groups with smaller ones separating them. I would say it was 12, just to keep up that sequence" (*Si*). *Mc* read the series and was struck by the regular rhythmical recurrence of certain numbers. "Without analyzing, one would say that 12 is the number because every fourth time it comes in. Just the fact of the rhythm alone would make one think that 12 was the number" (*Mc*).

My was partially self-instructed in the search for the number, "Do they go in pairs, I wonder?" He tried various schemes of adding and multiplying. After finding himself wrong, he re-read the whole series and announced, "According to the pattern the number should be 12." Occasional instruction, here as in the above cases, led to the correct number.

Gl, under self-instruction, commented, "I went through the series getting the difference between 13 and the other numbers. I found a constant relation between it and the third (?) number from it. I therefore judged it to be 12. I simply took 13 as a standard and worked from it."

Greater variety was shown in the second series. Two *Os* obtained the number by working out the scheme according to which it was composed, one because

he had inquired as to the way in which the former group was constructed, "Is that the same business of adding and subtracting?" (*Fe*); the other because systems of additions and subtractions were the simplest and most often used means of forming a series, "I read through the numbers and did not see anything. Then I began by taking the differences. I tried to see if that were the thing here, since most series are made up in that manner" (*Si*). Here the *O* was self-instructed to search for *E*'s method in constructing the series.

The occasion, however, furnished the basis for the other solutions. Self-instruction was less useful. "I have already decided that you are not going to use the same method you used before" (*Ke*). "I suppose you start with a number and the rest follow by rule" (*My*). Such self-instructions were wholly abortive. The pattern gave the correct number except in the case of *Mc*, who, by two pattern schemes, obtained the incorrect number 35, and in the case of *My*, who obtained the correct number but not through working out a pattern. By a process of elimination, counting the numbers and the number of times each occurred, he inferred that the only number in the twenties not occurring at all (*i.e.* 29) was correct.

Results. The progress toward solution consisted in, first, apprehension accompanied by inspection-and-comment upon the series and by a search for any cues likely to be of aid in obtaining the desired number, and, secondly, occasional instruction (in most cases), a self-instruction (in a few), under which the number was supplied.

Strong occasional instruction suppressed the formulation of self-instruction in the majority of cases.

Problem 13. This problem also was designed to explore for 'insight' discerning the suitable. The following stanzas with one word lacking were presented in succession. Care was taken that only one word, and that the author's, could be supplied. The five examples were chosen to bring out differences in literary perception of form and in available vocabulary.

- (1) Yea, in the valley of Death I awoke,
Pallid and strange as a vision.
All of my sorrow is vanished as smoke—
These are the valleys.
- (2) Once where the unentered temple stood, at noon
No sun-ray pierced the dim unwindowed aisle,
And all the flooding whiteness of the moon
Could only bathe the outer.
- (3) Let us go hence; the night is now at hand;
The day is overworn, the birds all flown;
And we have reaped the crops the gods have sown;
Despair and death; deep darkness o'er the land
Broods like an owl; we cannot understand
Laughter or tears, for we have only known
Surpassing vanity: vain things alone
Have driven our perverse and aimless.

Let us go hence, somewhither strange and cold,
 To Hollow Lands where just men and unjust
 Find end of labor, where's rest for the old,
 Freedom to all from love and fear and lust.
 Twine our torn hands! O pray the earth enfold
 Our life-sick hearts and turn them into dust.

- (4) The skies, they are not always raining
 Nor grey the twelvemonth through;
 And I shall meet good days and mirth,
 And range the lovely lands of earth
 With friends no worse than
- (5) Well! wind-dispersed and vain the words will be,
 Yet, Thyrsis, let me give my grief its hour
 In the old haunt, and find our tree-topp'd hill!
 Who, if not I, for questing here hath power?
 I know the wood which hides the daffodil,
 I know the Fyfield tree,
 I know what white, what purple fritillaries
 The grassy harvest of the river-fields,
 Above by Ensham, down by Sanford, yields,
 And what sedged brooks are Thames's

(a) *Individual Os.*

Instruction. Here is a verse with one word lacking. Supply the correct word, doing so aloud.

The first verse is composed of four alternately rhyming lines, one of the most common of rhyme schemes, the last rhyme lacking. A word of three syllables, the word 'Elysian,' which is fairly familiar, was to be supplied. All *Os* followed more or less the same procedure in attempting to supply the word. Some trusted to the feel they had for what was required. "One word to rhyme with 'vision.' 'Elision,' 'provision,' 'incision,' 'ambition.' All right, 'Elysian.' That is the correct word" (*My*). "It seems as if there should be more than one word, 'valleys of something.' I am trying to find something to rhyme with 'vision'" (*Gl*). *Fi* read it again rhythmically, beating her foot to keep time, and supplying 'dum dee dum' in place of the word.

Other *Os* analyzed in greater detail with regard to metre, rhyme, and part of speech. "It needs three syllables, accent on the second to rhyme with 'vision' . . . I thought, 'Why should not an adjective do?'" (*Fe*). "The name may be some foreign proper name. This notion was strengthened by the fact that it goes with a plural noun with only three syllables to supply. There is a posture that it must be an adjective that is needed as I recall the poetic formula of modifier after noun" (*Je*). "The word has three syllables, the last part of a dactyl, and a trochee. 'Decision' fits the rhyme but makes no sense" (*Mc*).

One *O* (*Ke*) read the word immediately into the blank. Otherwise an attitude of search occurred. The others (whether or not the right word was obtained) invariably substituted other rhyming words which had no connection with the sense in attempting to get the correct rhyming word. 'Derision,' 'division,' 'decision,' 'incision,' 'elision,' 'collision,' 'oblivion,' 'provision,' 'ambition,' were variously employed. *Je* was prevented from supplying the correct word obviously because he continually assumed the word to end in 'ision,' identical with the ending of the word 'vision.'

Those to whom the word 'Elysian' occurred were convinced that it was correct if familiar to them. To *Si* the word occurred immediately, " 'Elysian valleys,' something like that is used in classical poetry. I am not sure of the word and I cannot spell it. It begins with a capital E, but I am not sure of the rest. I guess that would be right. . . . Yes, wasn't it the Elysian fields that Greek heroes went to after death?" To *Mc* and *Gl* the word was none too familiar. *Mc* reported, "I knew the word. 'Elysium' was the only thing that meant anything here, however. The adjectives from it simply did not emerge;" and *Gl* reported, "I knew it but I never thought of it. I never use it ordinarily, anyway."

The second verse is also a 4-line alternately rhyming verse with the last word lacking. This last word, 'peristyle,' is semi-technical and ordinarily absent from the vocabulary of common usage.

The search for the word ran parallel to that of the other verse. Words like 'domicile,' 'campanile,' 'mile,' etc., were supplied. Only in one case was this absent. *Ke* read 'peristyle' into it immediately. That the metre was harder here was indicated by the large number of one-syllable words supplied. *My* and *Gl* never realized the fact that more than one syllable was required. "It might be any noun that rhymes with 'aisle'—'style,' 'file,' 'defile,' 'mile,' 'Nile,' etc. The rhythm is so irregular that it might be any syllabled word. It ought to be 'pile,' a one-syllable word. A two-syllable word would be awful" (*My*).

Without formally stating it, *Mc* assumed that the word was at least of more than one syllable. He read 'domicile' into it. "Words like 'pile' spring up but they are too short." *Si* methodically attempted to get the metre, "I do not know whether it would be one syllable or three. I think it could get away with one. I will try 'domicile,' which is not the word for the metre. Three syllables sound better."

Mc, *Gl*, and *Si* tried to obtain the word from the meaning as well as from the rhyme. "It looks as though it would refer to the vestibule or something like that. Is this a technical word connected with a church? I am now visualizing a cathedral with various parts that might be illuminated by the sun. This term might apply to the roof or walls, or to the general outer part of the church" (*Mc*). "It would not be good poetry but you could say the 'outer tile' if it were made of tile" (*Gl*). "What is outer that is bathed by moonlight? So many words have three syllables but that is all. Minaret is not right, of course" (*Si*).

Only one *O* (*Mc*) had no acquaintance with the word. *Gl* and *Si* had heard of it but had no knowledge of its meaning. *Ke* had heard the word until it was familiar enough to read directly into the verse, but he was not clear as to its meaning. "What does 'peristyle' mean? It fits according to the rhyme and metre but I do not know what it means."

The third verse, the Italian sonnet, was selected for its definite and unchangeable rhyme-scheme and metre. Anyone knowing the sonnet form would have no trouble in analyzing the rhyme-ending and the exact number of syllables required. As a matter of fact, no one of the *Os* analyzed the metre to determine the number of syllables lacking. In reading the verse there seemed to be a feel for the correctly syllabled word, probably due to the familiarity, formally recognized or otherwise, of all *Os*, with the sonnet form.

Two *Os*, *Mc* and *My*, inferred the rhyme from the form. "Oh it is 'band.' I have written too many sonnets not to get that, a b b a, a b b a, c d, c d, c d",

(*My*). *Mc* supplied 'band' and said, "It is the sonnet form and I knew it would have one of the 'and' endings," but added that the rhythm or metre puzzled him at first. "The rhythm does not seem to be any good. This tended to upset the rhyme-scheme."

The others without recognizing the sonnet form gave some reason for their choice of a rhyme. "I knew it had to rhyme with 'understand' because before it had been 'hand,' 'flown' 'sown,' 'land,' and 'understand,' 'known,' 'alone;' must be 'band.' It naturally falls into first and last, second and third rhymes. I divided the thing into quatrains, and 'band' just came like that" (*Ke*).

Ke and *My* supplied the proper word from the requirements of the rhyme and metre. The sense was not considered except in so far as it did not contradict the word supplied. The others obtained the word through a consideration of the meaning. "I looked then at the sense and 'band' came" (*Mc*). "Oh, 'us,' that makes it plural. 'Have driven our perverse and aimless band'" (*Gl*). "'Band' is the most reasonable word. 'Land' and 'hand' do not fit so well. A land is not driven generally. The 'us' is not just an editorial 'us' because it says 'our life' and 'sick hearts'" (*Si*).

The fourth verse was chosen for its irregularity of rhyme-scheme. All *Os* read the word 'you' into it, more from a sense of the demands of the verse as a whole than from any one variable, such as the meaning, the determination of the metre, or the feel for the rhyme. This was obvious in the comment of *Ke*, "I do not know why I rhymed it with 'through.' 'You' just came like that and it just happened to rhyme with 'through.' I did not definitely try to rhyme it with anything." "It is the sort of poem addressed to someone, 'friends no worse than some person' and it has to rhyme with 'through'" (*Si*). "It would not look well rhyming with 'earth;' besides, this is the usual way it rhymes. It means something to rhyme it with 'through' and it did not mean anything when I sought for a rhyme for 'raining'" (*My*).

The rhyme played a major part in the search of *Mc* for the correct word. "When I came to the third line I noticed 'mirth' and thought of 'birth' but when I met 'earth' I knew it would not do. It was a closed couplet. Also it would not rhyme with 'raining.' 'You' came and fitted in the sense." Here a very cogent reason was given for not having a consecutive three-line rhyme, but no reason at all was set forth for choosing a rhyme for the second line rather than the first. An aesthetic element, a feeling for what is most pleasing, seemed to enter here; for instance, "I do not know why I think it has to rhyme with 'through,' but it sounds better and brings the poem to a close" (*Si*).

In the last verse the meaning played the leading rôle in obtaining the absent word. "The sense decided me in favor of the 'fritillaries' rhyme" (*Ke*). "The brooks suggested Thames's 'tributaries'" (*Gl*). "I tried to do it by the sound but could not do so. Then I took the sense and sought for the relation of brooks to the Thames" (*Si*). "It filled up the sense of the sentence and rhymed with the unusual word 'fritillaries'" (*My*).

Although the meaning was the surest means of obtaining the correct word, the rhyme was given a fair amount of attention. There was very little uniformity among *Os* on this score, although all of them supplied the correct word. Two of them attempted to rhyme the word otherwise than with 'fritillaries.' "I did not know when I first read it whether the word to supply would rhyme with

'trees' or with 'fritillaries.' . . . I knew it rhymed with that word because no one would use a word like that unless he were using it for a rhyme" (*My*).

Mc was the only one to differ markedly from the other *O*s. Whereas they laid the major emphasis on meaning and only minor emphasis on the rhyme, with none whatsoever on metre, he gave prime importance to the consideration of rhyme-scheme, secondarily considering the metre, and, as a last resort, the meaning. "As I read it, it flashed through that it might be a sonnet. Then the line ending with 'tree' showed it not to be that. 'Tree' rhymed with 'be.' All the other lines are complete couplets and 'fritillaries' stood out alone without a partner." Then he read the line ending in 'fritillaries,' rhythmically beating his fingers on the table. "'Fritillaries,' two trochees." He read the last line also moving his fingers to the rhythm, "Two trochees there, too. 'Tributaries.' I was not sure of the exact word required. What could the Thames have that I might know? 'Capillaries' came but it was not the right one. Then 'tributaries' came in with a click, not logically. I was too much concerned about the structure of the word and too little about the meaning."

Results. Apprehension of the material was followed by a period of search which varied from a general diffused type, where the feeling for what was suitable to the verse as a whole was considered, to a more concretely objectified search as requirements relative to rhyme-scheme, metre, meaning, and part of speech were analyzed and commented upon. Inspection-and-comment was a function much used.

Lack of vocabulary or a faulty apprehension of the literary form were inhibiting factors.

(b) *Group Os.* Copies of the first and fourth examples were presented to members of the groups.

Instruction. Here is a verse with one word lacking. Supply the correct word.

Questions (1st selection)

	<i>Yes</i>	<i>No</i>
1. Are you familiar with the word 'Elysian'?	47	53
2. Did you read the verse as if you were scanning it?	69	31
3. Did you count the number of syllables required?	45	55
4. Did you try to rhyme the word with 'vision'?	96	4
5. Did you try to rhyme it with any other word?	15	85
6. Did the meaning suggest the word?	35	65
7. Did you supply the word and then test it by the meaning?	24	76
8. Did you name words ending in the 'ision' sound which fitted the rhyme but not the meaning in your search for the proper word?	80	20
9. Were you sure of the word which you supplied?	29	
10. Was this certainty due to the fitness or suitability of the word?	28	
11. Make other comments on how you went about supplying the word.		

Twenty-nine percent of the *O*s supplied the correct word, 38% left it blank, while 43% supplied various words with a more or less correct rhyme but, for the most part, lacking in meaning. These words were identical to a great extent with the words named over in the search for the proper word by the individual

Os; for example 'decision,' 'oblivion,' 'elision.' On the other hand, some of the words supplied were imperfect as to rhyme, but the meaning suited the context. Such were 'Stygian,' 'Elysium,' 'eternal,' 'arisen.' The *O*, when he did supply a word, based it on his apprehension of what was required and his inspection of the conditions. It is interesting to note that, whereas 72% of them supplied a word, only the 29% who gave 'Elysian' reported a certainty concerning the word supplied.

The reports from the last question parallel reports from the individual *Os*. "Meaning, rhyme, and number of syllables left no doubt in my mind that 'Elysian' was the correct word." "I could think only of 'eternal,' but I knew it would not fit. I tried to get a rhyme with 'vision.'" "I finally tried 'Stygian' from the river Styx. I did not like it, but could think of no other." "I took all the letters of the alphabet and tried putting them in front of 'ision.'" "I knew it needed an adjective, but I could not think of any that fitted. I did not know the word anyway."

<i>Questions (4th selection)</i>	<i>Yes</i>	<i>No</i>
1. Did you read 'you' into the blank immediately?	78	22
2. Did you try to rhyme the word with any other line than the one ending in 'through'?	26	74
3. In trying to get the word, did you name over other words with the diphthong 'oo' sound?	25	75
4. Did you determine the number of syllables required?	47	53
5. Did the meaning suggest the word?	74	26
6. Did you supply the word and test it by the meaning?	17	83
7. Were you sure of the word you supplied?	71	29
8. Was this sureness due to the suitability of the word as regards rhyme and meaning?	72	28
9. Report anything about your solving process that these questions have omitted.		

Ninety-one percent of the *Os* supplied the word 'you' in the blank; 2% supplied other words obviously unsuited to anything except, perhaps, the rhyme; and 7% left it blank.

It is evident from the reports that the *Os* were self-instructed from cues gleaned from the first verse and the questions concerning it (occasion). "My first step was to look for the rhyme-scheme. There were three possibilities, though only two (rhyme with first or second line) were likely. Then I read the verse for the meaning and 'you' came at once. It was unnecessary to count the syllables. The metre was too obvious." "The solution was very simple. After reading the verse, the word 'you' followed immediately to complete the meaning. Then I tested it for metre and found that it fitted."

The majority read the word directly into the blank. "There was no conscious effort to think about what word was necessary. There was no recognition of the rhyme. It merely was the immediate cognizance that 'you' would rhyme and fit without any other qualification." "I tried to supply a word that coincided with the spirit of the lines." "A decided sense of satisfaction prevailed throughout the process because of the felt fitness of the word immediately supplied at the first reading."

The uncertainty attendant upon some who supplied the correct word was explained as follows: "The word 'you' did not seem to fit my idea of the sense

I would like the verse to have, so I was not sure of it." "No worse than you' sounds quite sarcastic. The word was evidently 'you.' However, I could not see the meaning when used with 'worse'."

The procedure here consisted in an apprehension of the meaning of the verses accompanied by search for the word most suitable to the rhyme and meaning or to the stanza as a whole. Individual variations occurred in the bases given for supplying the word. Some, sought for a word to fit the meaning first, others to fit the rhyme while still others supplied it from both rhyme and meaning, or from a sense of fitness to the whole. Lack of an apprehension of the poetic form was an inhibiting factor. To some the occasion was a poetic construction; to others, a non-aesthetic verbal exercise. A wide range of occasional instructions appeared.

INTERPRETATIONS AND CONCLUSIONS

Throughout the course of the experiments we have constantly looked for 'insight' under its various alleged forms. In the first three problems, which encouraged 'insightful' discernment and recognition of available materials (beads and cork-in-bottle), we turned up various forms of the apprehensive functions operating to recognize tools and instruments in an unusual setting. There occurred two approaches toward solution, one involving the perceived applicability of the available instruments to the occasion offered, and the other the applicability of an instrument after reaching an imaginative solution of the problem set by the formal instruction. The first approach involved search together with perceptive apprehension, both extended by inspection-and-comment. All these psychological functions were induced and guided by occasional and self-imposed instructions as well as by a rehearsal of the problem as formally proposed. In those instances (both individual *O*s and group *O*s) where search led to an imaginative apprehension which devised promising instrumental means of solution, the actual application of these means was either itself imaginal (as in the non-executing groups) or actional (as when the individual, having once conjured up means, turned to the table and demonstrated his solution). In both cases, the protocols instanced under Problems 1, 2 and 3 will reveal the very large part usually played by verbal comment in *O*'s progress toward the solution. Just what takes the place of this comment where children, apes, and rats are wanting in linguistic resources is too often covered up by the ambiguous term 'insight.'

These first three problems also reveal some special procedures which are likewise often disposed of in the same way. We may cite the *O* who, after handling the beads of Problem 1, laid them down, leaned back, thus bringing the pliers within his range of vision, and apprehended them as means of solution. If there was 'insight' here, it was obviously an extension of the apprehensive functions *plus* inspection-and-comment. We may approach more closely the actual organic resources of solution in such a case when we observe that the enrichment of the apprehension was obviously due to the preceding search and comment, under appropriate instructions of all our three kinds, formal, self, and occasional. Having determined these essential conditions, the addition of an alleged act of 'insight' would seem to be superfluous.

In Problem 4 were the mutilated and displaced Rs, with a gradual approach from nonsense-forms to the standard letter. The formal instruction to identify each form as it came tended toward configuration, taken in the non-technical sense. The initial perception together with this instruction set up a puzzled search which led first to a family likeness among the forms as they came along, secondly to the perception of figures, animals, and the like, and finally (usually at the seventh and last member) to the symbol R. Thereupon, in retrospect, all the members had become (imperfect) Rs. The successive appearances (which were at times 'sudden') might be called 'insights'; but, more descriptively, perceptive changes under formal and occasional instructions and a puzzling search, the search gradually becoming informed and directed as the series progressed. One moment in the occasion (the prone letter) tended to block understanding (the symbol R) until the letter was practically complete in linear form. The occasional flashing out of the R would be called by some an insight; but with as little justification as the earlier perceptions.

Problem 5 called for the tracing of the rectangle and inscribed figure, with and without a central diagonal (see Fig. 2). *E* had meant to invent a problem in which trial-and-error should be supplemented by something which might be called 'insight.' As a matter of fact, the combination of occasional and formal instruction led chiefly to inspection-and-comment instead of to a headlong tracing of the lines with the red pencil. Our *Os* proved to be neither Thorndikean cats nor *Köhlersche Affen*. Upon comprehending the instructions and perceiving the figure, they set about, under inspection-and-

comment, to solve the problem. Imaginational apprehension played its part and so did search and various simple forms of action. At times a failure to solve led to a new direction of search and to a new plan. As the tracing (actual or imagined lines) proceeded, the occasion was modified, and in turn modified—by its new instructions to the organism—further procedures. This may be called trial-and-error; but it is certainly not the blundering and blind ‘mechanics’ of the older maze-experiments. The addition of the diagonal made the task more difficult and called out more verbal comment and self-instruction; but the general procedure was the same both with individual *O*s and in the groups. The added line decidedly changed the occasion which faced the organism and made new demands upon resources and functional expedients. Where there is an occasional ‘aha!’ in the protocols, it may be set down among many comments upon the course and terminus of a search. It should be noted that the ‘aha!’ and the ‘flash’ (dear to the champions of *closure*) were no more in evidence at the final solution than at various steps along the way. Here that form of the behaviorist’s fallacy which interprets performance out of the experimenter’s own thoughts and fancies is obviously to be discouraged.

In Problem 6 were the pill-boxes and the hidden cotton. The intent of the arrangement was to induce a situation where many possibilities offered. This intent was realized. *O* devised a plan when the boxes were presented and the formal instruction read. Upon the formulation of the plan (“I shall begin from the left,” “I’ll try even numbers,” “I must find hidden markings,” and the like), the search changed from an indefinite thrust “to solve” to “this is my way of hunting.” Failure to find led to comment, to imaginative forecast, and to a new plan. As the cotton was found and replaced, the specification of method made memorial use of past success. The occasion changed, the self-instruction changed, inspection-and-comment grew; but the search went on. It is a good instance in little of scientific observation and the gradual elaboration and correction of a theory. Our commentaries throw much light upon this complex functional procedure. While many functional resources of the organism were called forth by the problem, the most notable and outstanding was comprehension, in the sense of understanding or grasping-the-significance-of. Surrogative means doubtless exist in various animals for problem-solving where plural choices offer

without perceptive cues, but our commentaries make it abundantly evident that comprehension was the central resource in all our human *Os*.

The three-dimensional construction with the matches was called for in Problem 7 and the spelling of "perplexity" in Problem 8. Both exercises are of the 'puzzling' kind. Both involve a certain spatial arrangement where something bars the way to solution. In the first it is the lay-out on the plane surface: in the second, it is the ordinary left-to-right set-up of letters in a word. Under this handicap to success, search and inspection-and-comment go on. The outcome is a manual construction. Where *O* succeeded (there were many failures), some chance change in the situation led to the match-solution, and the discovery that the initial "P" (in "perplexity") could not be moved from the right end of the slot led to the word-solution. Free trials were abundant in these puzzles; but *free trials under comment*, which tended to advance the problem toward solution. This is rather 'trial-and-advance' than 'trial-and-error.' There is nothing new here to suggest a unique operation of 'insight.' It is informing to observe how easily wont, habit, or the accustomed prevents those functional accomplishments which would lead on to invention and discovery. It appears that man's functional resources are much greater than his actual accomplishments.

In Problem 9 again (the burlesqued soliloquies) the organism was misled so far as verbal understanding was concerned. Understanding there was, from the outset, but of individual verbal symbols which did not integrate into a linguistic and aesthetic whole. If the ultimate emergence of such a whole, in a strange context, demands 'insight,' then our *Os* showed that they possessed that gift. Flashes and illuminations were absent, however; and our theories did not lead us toward 'closures.' What little clear perception there was was chiefly buried under a constantly shifted comprehension which first integrated small groups of words, then larger, and finally (in many cases), the entire Shakespearean text. Underlying these progressive comprehensions were self-instructions constantly warring with the occasional instructions and fed by a search which changed its direction when inspection-and-comment brought the hint 'this is a significant passage.' It is a fine case of two conflicting comprehensive functions, one sustained by visual receptors and the other by auditory. The visual is at first dominant; but the auditory gradually gains the ascendancy by virtue of formal and self-instructions which promote

and direct search. The partial successes and the failures (in *E*'s sense!) are quite as instructive as the reports of those *O*s who read in the soliloquies. Here the groups were very informing. They reveal the organism working away under the lead of the various instructions and using one device after another. Especially do they show the effectiveness of the function *search*, a describable operation distantly related to the mechanician's 'drive.'

Problem 10 presented the flask-balloon, and Problem 11 the centrifuged shot in the rocker. Both suggested the initial comment 'puzzle to work!' which set off a fairly simple action-train (inserting the balloon, tipping and rocking the shot). Failure to carry out the formal instruction usually led to long inspection-and-comment with interspersed actions. The special resource demanded by the occasion and the formal instruction was a formulated principle or 'natural law' (air pressure, 'centrifugal force') and the comment 'This is a case of . . .' This is commonly called 'the applying of physical knowledge.' 'Knowledge' in this situation involves the *inclusion* in comprehension of a generalized rule and the *comment* that the rule applies here. The mere grasp of the principle is not enough. Understanding must fit it to the occasion. Occasional and formal instruction are not sufficient for a solution. Our commentaries and our group-questionnaires show in a very striking way the functional modes involved in the solution, wherever the solution actually took place. These problems are probably more difficult for our *O*s than any preceding, in the sense that more functional devices and resources of the organism, combined in more subtle combinations, were called out. We might ignore the whole procedure and simply label the means 'insight'; but that would be to give up the central psychological problem. It is obvious that our problems of this sort only touch the surface of these important human procedures, which call loudly for searching experimental study.

In our last two problems, Problem 12 (discovering and completing a number-pattern) and Problem 13 (completing a poetic stanza), the presented occasion *contains within itself* the means for completion (*i.e.* omitted final number, omitted final word). It contains it, however, only when the occasion is *for the solving observer* a number-pattern (first problem) or a poetic structure (second problem). Here appreciation of pattern or form takes the place of outside physical principle and application in the two problems just now reviewed (10 and 11). Our commentaries and the replies to the group-questions throw a good deal of light upon the means (occasional and self-

instructions, search, comment, understanding and imaginal apprehension) which supply—and also fail to supply—the required solution. Search (for a pattern) and occasional instruction leading to comment were the chief means used in Problem 10. It is obvious that the discovery of pattern in the first series helped to define search in the second series and so led toward the goal.

In Problem 13 the temper and training of *O* were important. Without an appreciation of metrical form and of poetic phantasy, the *O*s usually found it impossible to secure the correct final word. Here we come upon the important distinction between occasion-for-the-observer and the 'stimulus' as set up or assumed by the experimenter. It is only the former, that-which-is-present-for-the-organism, that is of primary significance to the psychologist. Where the *O* poetically understood, the formal instruction set a definite search and led (through the intervention of self and occasional instruction, inspection-and-comment, and imaginal apprehension) to the missing word. A limited vocabulary sometimes defeated the search. Our group-results are of especial importance in this problem because they have helped us to discover by inquisition the relative uses of rhyme, metre, rhythm, vocabulary, poetic appreciation, and other factors, in attempting to solve the problem. Less than one-in-three of the group-members found the missing word 'Elysian' under the restrictions imposed. The fourth selection profited (91% of the group *O*s supplied 'you') from the earlier solutions, and it was also simpler and less dependent upon the appreciative abilities of the individual. Again, this experimental fragment only touches the surface of a large problem, the discovery of the psychological means resorted to by the adult and literate organism in selecting and verifying 'the suitable' in a poetic sense.

We began by listing various ways and contexts in which the term 'insight' has been recently used. Were we to review our own commentaries and the answers to our group-inquiries, we could easily find instances of the following sorts to which we might apply the word without very greatly extending it beyond its present uses. The instances are: (1) perceptive apprehension extended on the side of use and means, (2) perceptive apprehension accompanied by imaginative revaluation, (3) anticipative imagination, (4) comprehension of a solving generalization, (5) sudden drop in learning-time, (6) re-apprehension of experimental material under occasional instruction,

(7) comprehension of a general principle and its applicability in a specific instance, (8) apprehension of a total pattern-arrangement or of particular relevant features in the pattern, and (9) comprehension of a constructive scheme, of the rules or canons of an art, or of the natural relation between presented objects.

The fact is that the further experimental description and functional analysis go in the directions taken, the looser, the more ambiguous, and the less satisfactory the term 'insight' becomes. Its recent revival in psychology has been natural if not inevitable—as we saw in the beginning of our study—; but there would seem to be no longer any sanction for its varied and uncritical connotations. Under arbitrary definition it may serve for some time as a label for certain behaviors in rat-running, primate-manipulation, and school-accomplishment. As a cause and explanation of these behaviors, insight will probably be less and less appealed to in factual and experimental contexts.

Our own procedure in the problematical situation used has been (1) to present a definite and solvable problem, (2) to provide a brief, unambiguous, and constant formal instruction, (3) to employ trained and untrained observers, individually and in groups, (4) to determine by report and interrogatory⁵ a descriptive account of the psychological functions brought into play, together with the instructions (formal, occasional and self) and other antecedents which threw the functions into commission.

The functions most frequently and effectively found in our solutions have been search, the three forms of apprehension (perceptive, memorial and imaginal), inspection-and-comment, and comprehension. In the examination of our descriptive material we have found no characteristic process, operation, form of conditioning or mode of discovery, which we could with propriety distinguish as 'insight.'

⁵The groups were always formed and interrogated after a given problem had been studied through the elaborate reports of trained individual observers. Only in this order could the groups be sensibly and usefully questioned, and only so could the individual and the grouped results be reasonably compared. We found this form of group-observation extremely informing.