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Chapter 8

A Revision of Imageless Thought

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Several years ago I was led by some experiments on voluntary movement to conclude that an act might be thought of without any representative or symbolic image, and further study led me to extend this conclusion to other thoughts. My attention was soon called, in a review of this work by Angell, to previous discussions of the same question, connected with Stout's assertion that there was nothing pyschologically absurd in the conception of imageless thought. Looking into the contemporary experimental literature, I then made the acquaintance of Binet and of Watt, Bühler and others of the Külpe school, and my own work soon fell into insignificance beside these extensive and many-sided contributions. Even the merit of independent confirmation was not specially important in this case, since such confirmation was forthcoming even from those who, like Wundt, were not at all in sympathy with the conclusions of the imageless thought party. It appeared that imageless thought, the mere gross fact of observation, had come to stay, and that the only question was what to do

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with it. Some psychologists have assigned great importance to this fact as a demonstration of non-sensory content, while others have avoided so revolutionary a conclusion by explaining the fact away through one interpretation or another; others again have accepted the fact but minimized its importance, treating it as a mere limiting case; and some, while accepting the *gross* fact, have doubted that it would stand the test of more refined introspection. Meanwhile, my own views have been maturing as the result of continued thought and experiment, and the time is perhaps favorable for resuming the offensive, and endeavoring to uncover the weaknesses of the negative interpretations, and for offering a conception of the matter which may possibly appear superior to those hitherto presented, or at least worthy of some consideration.

Of the interpretations of imageless thought which explain the fact away without allowing it to modify existing systems of psychology, the most important is that of Wundt. It will be recalled that the method employed by the Külpe school in studying the thought processes was drastically criticized by Wundt, who objected to their experiments as being experiments in appearance only, and held that real thinking could not be done to order in the laboratory. He himself preferred to rely on incidental introspections during spontaneous thought, and in fact reports such observations of his own.[1] "In such self-observations," he writes,

> it became perfectly clear to me that the thought was not formed during the process of its verbal expression, but was present as a whole in consciousness before the first word was reached. At first none of the verbal or other images, which subsequently appeared in running through the thought and giving it expression, was present in the focus of consciousness, but these parts of the thought appeared successively as the thought was allowed to develop.

With only this fact in mind, he admits, one might easily be led to regard the thought as a unit with a distinctive elementary character. But quite a different conclusion is reached when other facts are also taken into account, that of the narrowness of the field of attention, that of the existence of dim content in the background of consciousness, and that of the "total feeling," itself a unit, though generated by a complex of images. A thought, in Wundt's view, is essentially a complex of images, but these parts of the thought are too numerous to be present together in the field of attention. They are present at first only in the background and are not introspectively visible; but as the thought is dwelt upon and expressed, its constituent images come successively into view. What then was the apparently unitary thought with which the process started? This, explains Wundt, was a "total feeling," generated by the complex of images in the background, and itself occupying for an instant the center of the stage.

1. *Psychologische Studien*, 1907, 3, 349.

It is obvious that such a position is almost inexpugnably entrenched. The extremely hypothetical nature of the ground renders a direct attack hopeless. So much as this may be ventured, that, if the words expressing a thought are really its constituent parts, it is curious that the same thought can be thought in different words, and even in different languages, and still more curious that the words to fit the thought are not always at hand. Apparently, the same complex may be composed of different elements, and may exist with some of its elements lacking. Further, it is curious to reflect that these verbal images in the background must somehow be present simultaneously and yet in proper sequence, since otherwise they might compose quite a different thought or no thought at all.

But the principal doubt to be raised concerns the "total feeling." This unitary feeling, present without observable images, and "adequate to the thought," would almost meet the demands of the opposing party, except for Wundt's insistence on its being a feeling, to the neglect of its noetic character. Certainly it is not a feeling, in any strict sense, that straightway finds expression in a statement of fact. Wundt's analysis leaves out of account the core of the whole experience, namely, the fact or supposition which was subsequently expressed in a sentence, but which was definitely and clearly present in mind in advance of the words.

Several writers have called attention to the presence of vague or apparently irrelevant imagery in moments that would otherwise appear imageless. The presence of kinesthetic sensations, habitually unattended to, has also been shown in many cases, and thus we have become wary of asserting that a given moment is really devoid of sensory content. Of course, no one has ever supposed that bodily sensation could be absent from the background of any conscious state, but it has been thought possible to distinguish between irrelevant content and content related to the topic of thought. We must, however, recognize the probability that apparently irrelevant sensations and images sometimes enter into the web of thinking. Especially has the attempt been made with some success to extend the James-Lange theory of emotions to cover the so-called "conscious attitudes"; and some would even extend it to cover the imageless awareness of definite facts, contending that every thought has its own peculiar motor expression, and that the sensations generated by the movement furnish the conscious content of the thought; but no one, as far as I know, has found empirical support for this extreme view.

It is worth remarking that the presence of images and sensations in many or most moments of thinking does not disconcert the supporter of imageless thought. He is perfectly willing to admit that such content is often or even usually present; and the only real importance of a few well-attested instances of thought without such content is that they furnish him his most direct evidence of the existence of other content. His main contention is that other content exists, and that it is the most essential and characteristic of all.

But some psychologists, while admitting the occasional occurrence

of imageless thought, deny its evidential importance. It is merely the limiting case, they say, in a continuous gradation from thought in clear images, down through thought in medium and dim images, to thought in images at or near the zero mark. The most attractive form of this interpretation is that which sees in the graded series the progressive automatization of a thought through practise. When the thought is novel, it comes with abundant sensory content, but as it grows familiar and habitual it becomes less sensuous, that is to say, less conscious, until, just as it is about to become automatic and unconscious, it still shows a feeble spark of conscious life; and this feeble spark is pounced upon by the imageless thoughter and rashly heralded forth as proof of some unrecognized species of conscious experience. In reality, imageless thought is imageless because it is all but unconscious. This genetic interpretation has been presented with most force by Titchener[2] and by Book.[3]

The undoubted attractiveness of this conception comes from its following so neatly from the law of practise, and its deficiencies arise from its taking account of only one side of the practise effect. There is much in practise besides the tendency toward automatism. Seldom does the course of training consist of repeating time after time the same performance, only with increasing smoothness and speed. Usually the process begins with varied and tentative reactions, and advances by selection and elimination. Moreover new forms of reaction, made possible by the progress in facility, make their appearance in the course of training. Thus the perfected act omits elements present at the start and contains elements not present at the start, and may be an entirely different means of reaching the same result. If therefore the first thinking on a given topic is fraught with imagery, while the practised thought on the same topic is bare of images, it does not in the least follow that the imageless thought is a condensation of the imaginal. It may be a more economical substitute. The imagery present at the start may have been due to a diffusion of excess energy such as is common in unpractised acts, or it may have furnished a round-about way of dealing with the problem and have given place with practise to the more direct attack represented by the imageless thought.

Practise experiments give little ground for believing that a series of part acts, by simply becoming very easy and swift, blend together into a total act in which the parts are lost to sight. Rather has it been found true that the more inclusive acts, such as dealing with words and phrases as units, in typewriting and telegraphy, arise suddenly as new forms of action, in the progress of training, and themselves make possible a great increase in the speed of the partial or lower-order acts. The partial acts do not blend to produce the inclusive act, but the latter is hit upon and causes the former to blend. Attention deserts the parts, which thus

2. "Experimental Psychology of the Thought Processes," 1909, pp. 173, 183, 187.

3. *Psychological Review*, 1910, *17*, 381.

become automatic; but attention still remains keenly alive, being directed to the more inclusive acts. These higher acts are real units, and not mere blends; they are clearly conscious and yet not in imaginal form; indeed, they seem the very type of an imageless thought.

Observations of new ideas, at their first appearance in an individual, would be of interest in relation to the interpretation of imageless thought as exclusively old and well-drilled thought. In the hope of gathering such observations, I have sought to catch myself at moments when some new idea germinated in my mind. Unfortunately, opportunities have not presented themselves with the frequency that could be desired; but, in the few instances that I have collected the experience could be described as the dawning of some new meaning in things, sometimes with scrappy verbal and visual images, sometimes with none that were observable. When they occurred, the images were promptly forgotten, though the thought was firmly impressed on memory. So far from accepting the view that imageless thought is automatized thought, I should be inclined to believe that a new thought is characteristically imageless, and that it attaches itself secondarily to a word or other convenient symbol, and is more apt to occur with an image when it is somewhat familiar than when it is new.

Still another interpretation of imageless thought, or of the observations that purport to reveal it, presents a serious obstacle to our progress. Frequently such statements as these are contained in the subject's retrospective report: "I thought of such and such an object," or, "I thought that such and such was the case," this being the extent of the subject's description of his experience, except for the purely negative statement that no images were present. The objection has been raised by Dürr,[4] von Aster,[5] and Titchener,[6] that in such reports the subject is not playing the game. He has fallen from psychological description into the commonsense habit of telling what he has been thinking about. He has committed the Kundgabe or expression error: instead of describing his thoughts, he is expressing them. He has committed the stimulus or object error, and, instead of describing consciousness, is mentioning the objects with which consciousness was concerned. Confronted with this objection, the subject is apt to reply that he has done his best, that what was present in his mind was precisely the fact or object mentioned, and that if he is forbidden to refer to the object, all he can do is to hold his peace. Though this reply fails to satisfy the critic, there is something to say in the subject's behalf. Suppose, for the sake of argument, that the specific thought content exists: how would you propose to describe it? You offer the subject his choice of sensory terms, but these he rejects as not fitting the case. If then you exclude reference to objects, you have nothing further to offer him beyond a few vague and negative terms,

4. *Zeitschrift f. Psychol.*, 1908, *49*, 313-340.

5. *Ibid.*, 56-107.

6. *Op. cit.*, p. 147.

such as "imageless," "peculiar, unanalyzable state," etc. In fine, the objection has force only on the assumption that the state should be described in sensory terms, and that non-sensory content is non-existent. It prejudges the case.

It is curious that the presence of the stimulus error in reports of images is not treated with a similar seriousness. Seldom in the literature will you find an image really described. Instead of an analysis of the visual picture as composed of colors and shadings in a certain spatial arrangement, instead of an analysis of the auditory image as consisting of a sequence of elementary sounds, you read of "a visual image of a Massachusetts town," or of "an auditory image of the experimenter saying 'subordinate concept.' " If it is committing the stimulus error to report a "thought of" such and such an object, it is equally committing it to report an "image of" the object. A strictly descriptive regimen would require the subject, one would think, to exclude all reference to the object in the one case as in the other.

Yet consider the situation of an observer who is forbidden to refer to the object in describing his images. He would have to confine his report to such statements as "a bright, somewhat variegated spot against a dark ground," omitting to state that this was an image of his friend's face. Yet, if the image, whether faint or vivid, schematic or detailed, was for him, at the moment, an image of his friend's face, can he properly describe the consciousness of that moment without reference to his friend? No question of the logic of meaning is here involved, but a mere question of fact: Was or was not a reference to the object present in the momentary consciousness; and, if so, can the state be described without reference to the object?

The same question arises when we have a presented object instead of an image. I hear a noise from the street and say, "There is a horse galloping past." This is a commonsense reaction which makes no pretense of describing consciousness. But suppose I do attempt to describe consciousness. It is then, perhaps, in order for me to tell exactly what auditory sensations I had. If I do this as well as possible, and find nothing further, such as an image, to report—have I then, with my inventory of auditory sensations, fully accomplished my task of describing consciousness? It would seem not, if I actually was conscious of a galloping horse, while my report makes no mention of this object. It is all very well to warn me of the stimulus error if I show a tendency to go beyond my momentary experience and tell something about the horse which may be objectively a fact but was not present in my mind at the moment; but if I stick closely to the momentary experience, reference to the object is quite in order and in fact indispensable; for, as a matter of fact, reference to the object was probably the most prominent part of the experience. This is equally true in the case of an image, and I must conclude that an observer is perfectly justified in reporting an "image of his friend's face," and that he could not omit this reference to the object without badly mutilating the experience. If so, the observer who reports the "thought of such and such an object" is equally within his rights. He

may have omitted something which a complete description should include, but he has, in all probability, reported the most prominent datum of his momentary consciousness.

One further important objection to the doctrine of imageless thought is contained in the teaching of such men as James, Ebbinghaus and Dewey. In speaking of non-sensory content, we have neglected to define sensation, or, worse yet, we have, according to these authors, fallen into the error of excluding relations, forms, patterns, meanings from our concept of sensation, and then being badly put to it to explain how they get into perception and thought. It is impossible, we are told, to draw a line in sense perception between what is sensation and what is perception; and there is therefore no excuse for speaking of non-sensory content in sense perception, nor for speaking of such content as present in thinking, unless we are ready to make the improbable assertion that positive content is vouchsafed us when withdrawn from the world of sense that can never be experienced in the presence of physical objects.

Instead of attempting to meet this objection directly, I propose to go on with a positive interpretation of imageless thought, in the hope that it may avoid the difficulty, and ultimately find a legitimate ground for the distinction between sensory and non-sensory.

To reach a positive interpretation that shall have any real significance, it is essential to turn away from the isolated fact thus far considered, and seek other facts which may be brought into relation to it. A hint as to the most profitable direction in which to seek for related facts is afforded by the following consideration. Thought deals largely with data derived from past experience. New ideas may certainly be generated in the process of thinking, but in very large measure the content of thought is provided by memory; and it is usually this memory content which appears in the imageless form. It may then be profitable to bring our rather extensive knowledge of memory into relation with the phenomenon of imageless thought; and it is in that direction that I propose to search.

On examining the way in which recalled facts present themselves, we are at once struck by something that broadens the outlook considerably. It is not only in thinking, properly so called, that facts come to mind without images, but in the most commonplace acts of memory. I recall, without visual, verbal or other observable images, what I have in my pockets, where I left my umbrella, whether my neighbor is at home today. This imageless recall is with some individuals quite the rule. The facts are clearly enough present in mind, but if there be any image it is so excessively dim as to elude detection. Such imageless recall is indicated though perhaps not fully demonstrated by some of Galton's results; and Miss Martin has recently[7] given a clear demonstration of the existence of memory content that is "unanschaulich."

In imageless thought, then, the imagelessness has nothing particular

7. *Zeitschrift f. Psychol.*, 1912, 65, 417-490.

to do with the thinking process; and we are permitted to drop, with some relief, the elevated tone that has sometimes seemed appropriate to the topic. Thought is imageless because its data are recalled in an imageless form, and not because it does not thrive in a sensory atmosphere. Much effective thinking occurs in the physical presence of its object. The use of the word "thoughts" to denote non-sensory content is unfortunate, for the words "thought" and "thinking" customarily denote a certain mental function or group of functions, and cannot easily be restricted to any particular sort of content. The best word would be one that suggested recall rather than thinking; but I am not at present prepared to suggest a suitable nomenclature.[8]

What, then, is it, in general, that is recalled? An old standard answer is that we recall our past experiences. Objection has several times been raised to this answer within the last two decades; but the following line of criticism is perhaps new. In experiments on testimony, or on "incidental memory," the subject is found to be incapable of recalling much that has been before his eyes, and even within the general scope of his attention. If he could call back his original experience, it would seem that he could give the testimony required of him. A specially instructive experiment, for our present purpose, is that of Thorndike,[9] who asked his subjects to call up an image of a certain scene, as of the front of a familiar building, and then, after they had estimated the vividness of their images, asked them specific questions, as to the number of pillars in the facade and similar details. He found a marked inability to answer the specific questions, even on the part of individuals with very lifelike

8. Unless the following suggestion can be seriously entertained. It has long appeared to me that we psychologists were on the wrong track in our selection of technical terms. Our custom is to choose some term of common usage that may convey to the uninitiated a suggestion of the technical meaning newly attached to it. The trouble is that the untechnical usage continues alongside of the technical and tends to cause confusion; until finally psychologists are driven to exclude the untechnical use from their discourse, and thus lose a very convenient tool of expression. It is nothing less than a scandal, for example, that the word "feeling" should have been so refined in usage that the psychologist can no longer speak of a "feeling of hesitation," and scarcely of a "feeling of familiarity," without an apology and the dread of being misunderstood by his colleagues. The older sciences, with their greater need for an extensive technical vocabulary, have gone to work in quite a different way. They either take unfamiliar Greek and Latin words and derivatives, or they set apart some proper name to serve the special purpose. Thus they have their watts and volts and ohms and amperes, terms regarding the meaning of which no one need ever be in doubt. Such terms are much better than "thoughts," or than "Bewusstseinslagen," with its doubtful translation of "conscious attitudes." I would propose, accordingly, to follow the lead of physics and chemistry; and since Bewusstseinslagen were first reported and defined in the work of Marbe and his associates, I would suggest calling them "marbs," the term to be defined for all time by reference to the original description by Marbe. Similarly, since the "thoughts" were gradually brought to light by the school of which Külpe was the guiding spirit, I would suggest calling them "kulps," defining this term similarly by reference to the original works. These terms are certainly beautifully compact and euphonious, and those who can bring themselves to use them will find them very convenient.

9. *J. of Philos.*, 1907, *4*, 324.

images; and, in fact, there was little or no correspondence between vividness of image and correctness of report on details. I have frequently repeated this experiment with the same results. I have never found an individual able to read off the number of pillars from his image. Only those could tell the number who had at some time counted them; and other subjects protested that it was not fair to expect them to find the number of pillars in the image, when they had never counted them in the original. All this seemed highly suggestive. It suggested that only that was recalled which had been noted in the original experience; and that even vivid images, described as being fully equal to the actual experience, were in fact something quite different.

I was thus prompted to undertake an examination of images and other content of recall, in order to see how far they could be described as revivals of past experiences, and how far they consisted of facts noted in the past. I set myself to recall events from my past life, and in other cases to recall persons, buildings, towns, and such specific facts as the exact colors of postage stamps, the quality of a friend's voice, the shapes, tastes, odors, etc., of a great variety of objects. What I got was sometimes to be called an image and sometimes not; but in all cases, with a few doubtful exceptions, it consisted of facts previously noted. When I say "facts," I do not mean verbal statements of facts, but a direct consciousness of some thing, quality, relation, action—of something which I had observed in the original experience. I did not get back experiences as concrete totals, but only facts which I had discriminated out of those totals. In the original experiences, those facts had had a concrete setting or background; but this setting was not recalled. The facts were recalled in isolation.

Often, indeed, a rudimentary setting was present, consisting of either a personal reference, or a spatial reference, or both. By "personal reference" is meant that the fact was recalled as my own experience, or that the relation of the fact to me, or my attitude to it, was recalled along with the fact. By "spatial reference" is meant that an object was recalled as being to the right or left, or in a certain town, or in a certain direction from my position at the time of recall. Spatial reference was more frequently present than personal. Neither was universally present; and, aside from them, no setting was recalled. It frequently happened that several facts derived from the same experience, or from different experiences, were recalled almost or quite simultaneously, so that the recall was richer than would be suggested by the expression, "Isolated fact." Nevertheless all of these facts had been previously noted, and they did not bring their concrete setting back with them.

As an example of my results, I will cite the recall of a colleague speaking in faculty meeting. What I got was a certain quality of voice and precise manner of enunciating, rather different from the conversational tone of this individual. There were no words nor particular vowel or consonantal sounds present in recall, but simply the quality of the voice and enunciation. I got also the fact that the speaker was speaking as chairman of a committee, and something of the rather critical attitude

of the faculty towards him, these facts being recalled in the "imageless" way. Besides, I got a spatial reference, in that the speaker was located in a certain position with respect to my position in the meeting; and a vague personal reference amounting to an attitude of support or well-wishing. Beyond this, nothing. No visual background of faces or furniture, no auditory background of words spoken, no somesthetic background of myself sitting.

Among the facts thus recalled in relative isolation and without concrete setting were the following:

Of persons: shape of head or of nose, breadth of face, color of eye, curliness of hair, blotchiness of complexion, facial expression, tone of voice, trick of gesture, "smoothness" of manner, social position, ability, industry, relation to myself, as being friendly or unfriendly, a superior or dependent, agreeable, a bore, etc., or as having been seen recently or long ago.

Of buildings: location, size, color, material, architectural style.

Of towns: location, general topography, old or new style, abundance of shade, holiday atmosphere, quietness, association with certain events.

These facts run the gamut from simple to complex, and from sensory to abstrusely relational. They are so varied as to indicate that any observed fact can be recalled in isolation. Among the striking instances of isolation were recall of the color of an object without its shape, of its shape without its color, of its gloss or shading without either color or shape.

The following interpretation seems scarcely more than a restatement of these results. An actual situation presents an almost unlimited variety of facts or features, of which an observer notes a few, the rest remaining undiscriminated in the background and giving the concrete setting of the features noted. Later, he may "remember" the situation, but this is not to reinstate it in its original multiplicity and continuity. He recalls the features which he observed, or some of them, but not the great mass of material which remained in the background. Lacking this setting or background, he is not in a position to make any fresh observations in recall, and thus arises the weakness of incidental memory.

If generalized to cover all cases in all individuals, this statement does indeed go beyond the evidence at hand. But if the possibility of an occasional recall of the concrete setting is left open, and the assertion simply made that an observed fact is often recalled without its original setting, this conclusion, thought modest, is sufficient to furnish a positive interpretation of imageless recall.

Were it true that a recalled fact always brought with it its original setting, then, indeed, all recall would involve sensory imagery. But if a fact is recalled in isolation, it depends on the nature of the fact whether the recall would be called imaginal or imageless. If the fact lay as it were on the sensory surface of things, such as color or tone, its recall would usually be spoken of as an image. If the fact lay below the sensory surface, as the fact that a speaker was exaggerating, or speaking as chairman of a committee, an isolated recall of this fact would be

unhesitatingly pronounced imageless, unless, to be sure, it were accompanied by a verbal or symbolic image derived perhaps from another source than the original setting of the fact. The definitely imaginal and the definitely imageless are the extremes of a series, between which lie many intermediate facts difficult to place in either class. The expression of a face, the composition of a painting, the style of a building or piece of music, recalled in an isolated way, are difficult to classify.

If you set yourself to discover what are the objects of your attention in a sensory experience, you will usually find that the actual sensations are less prominent than the things signified by them. You are more conscious of the horse galloping past than of the actual noises that you hear. When, therefore, you later recall hearing a horse gallop past, it is not surprising that the thing signified should be recalled more distinctly than the noises; and you are left in doubt whether to class the recall as an image or not. This is a type of numerous cases. An observed feature of a situation often lies partly "on the sensory surface" and partly below, and the observer does not take separate note of the sign and of the thing signified, but perceives them together as a single fact. His recall of the fact may then partake both of the sign and of the thing signified, though the sensory flavor is usually weakened in recall. The distinction between imaginal and imageless, between sensory and non-sensory, is not perfectly sharp, and appears, from our present point of view, to be of minor significance, the main principle being the isolated recall of observed facts.

I ought really to rest content with the conservative statements that precede, and leave imageless recall as an incident to the occasional, or frequent, recall in isolation of previously noted facts. But in the interests of a more clean-cut theory, I am tempted to more radical and general statements. I propose to strike out boldly and formulate a theory, hoping that, whether acceptable or not, it may prove a stimulus to thought and perhaps to experiment.

The first step towards this theory is to generalize the conclusion derived from observations already cited, and to offer the hypothesis that all recall is of facts previously noted, freed from the concrete setting in which they occurred when noted. This generalization I hold to be correct for my own case, and, though the testimony of many individuals regarding their imagery is on its face in flat contradiction with mine, the objective test of incidental memory seems to show that there is something radically wrong with their testimony. My generalization has the advantage of squaring with the facts of recall as objectively tested, and the only difficulty is to explain away the introspective reports of images "fully equivalent to actual experience," and of "living over the past as if it were present."

Without pretending to do full justice to this testimony, I must for the present content myself with a few remarks. Undoubtedly a person may become deeply absorbed in a remembered experience, because of its great interest for him. Now his present interest is probably the same as that which dominated him in the original experience and led him to

observe and react to certain features. If, his interest reviving, he gets back these features and reactions, he has the essentials of the original experience from his own point of view, and satisfactorily lives it over again, even without the concrete background, the absence of which, in his absorption, he would not notice, any more than he noted its presence in the original experience.

As to the vivid image, said to be "in all respects equivalent to the actual scene," we undoubtedly have, in such a case, a revival of personal attitude and emotional value, which alone are enough to create a strong atmosphere of reality. We must also recognize that what an artist might call the general effect of a scene is as much a fact to be observed as any other. The features which can be analyzed out of a situation are not exclusively details, but include broad effects and syntheses and anything that can be the object of attention. If now you recall the emotional value and general effect of a scene, along with some of the colors and other previously noted details, you perhaps have enough to make you testify, rashly, that your image is in all respects equivalent to the actual scene. A test of incidental memory would soon convince you that the "equivalence" is an illusion.

It is also true that a person may observe a scene in such detail as to recall a great number of its features; and he might express the wealth of his recollection by asserting that he revived the entire experience; but, so long as what he recalls is what he previously observed, he offers no exception to the rule that has been formulated.

We have not yet by any means exhausted the relevant information to be derived from studies of memory. Evidently we should be much helped in any study of recall by having at hand a report of the process by which what is now recalled was originally learned. We should be helped in our present inquiry by knowing whether "impressing a thing on the memory" consists in simply standing before the thing and letting it "soak in," or whether it consists in reacting to the thing by observing its characteristic features. It may be said at once that studies of memorizing give little sign of a purely receptive attitude on the part of the learner, and much evidence of a reactive and analytical attitude. Meumann emphasized the importance of the "will to learn." A subject might attentively examine a list of nonsense syllables, and yet make little progress in memorizing it unless his will to learn were excited. Now the "will" can scarcely be conceived as acting without means or tools; and its tools consist of various specific reactions to the matter set for memorizing, the reactions varying with the material and with the test of memory that is to be met. Some of these reactions may properly be called motor; here would be classed the rhythm, accents, pauses and vocal inflections that are read into the list by the learner. But in large measure the reactions are of the perceptual sort, and consist in observing positions, relations, patterns, meanings, in the matter to be learned. The recent studies of Müller throw all these factors into clear relief. Memorizing is very largely a process of observation, of noting those features of the material that will serve to hold it together in the desired way. Some of

these features, such as patterns and relations and the nearer-lying meanings, are, as it were, found in the material itself; while other features, the more far-fetched meanings and associative aids, are imported from without; but this distinction is only one of degree.

The reactions made in learning, it should once more be said, are specific, and adapted not only to the material learned but also to the kind of memory test that is anticipated. If the subject expects to recite a list of words or syllables throughout, he observes positions, sequences, patterns and relations that will serve to bind the whole list together. If he expects simply to respond to each of the odd-numbered words in the list by giving the following word, as in the method of paired associates, he takes each pair as a unit, and observes characteristics of the pair that bind it together, but neglects the sequence of pairs. If he expects to be called upon to recognize the individual words of the list, he fixes his attention on them singly, observing in each, as far as possible, some character that may serve to impress it. There is no one uniform process of learning, and the will to learn cannot be conceived as a general force or agency. What we find in memorizing is a host of specific reactions, largely of the perceptual sort.

I may be permitted to cite the results of a little experiment designed to test this matter. I read a list of twenty pairs of unrelated words to a group of 16 adult subjects, instructing them beforehand to learn the pairs so as to be able to respond with the second of each pair when the first should be given as stimulus. But, after reading the list three times, I told them that they should, if possible, give also the first word of the following pair on getting the second word of the preceding pair as stimulus. I then read the first word of the list, waited 5 seconds for the subject to recall and write the second word; then read this second word, and waited the same time for them to recall and write the third word, namely, the first word of the second pair; and so on through the list. The results were most definite: the second members of the pairs were correctly recalled in 74% of all the cases, but the first members were recalled in only 7% of the cases. The subjects reported that this great difference was apparently due to the fact that they had examined each pair with the object of finding some character or meaning in it; whereas they had neglected the sequence of pairs as being of no moment.

This result is instructive in several ways. It indicates, first, that the will to learn operates not by favoring a general receptive or memorizing attitude, but by leading to specific reactions of the observational type. It serves, next, to fortify the results of other experiments on "incidental memory." Here the objection cannot be raised that the incidental matter that is not recalled was never attended to; for the first words of the pairs were attended to as well as the second. The experiment also shows the unsatisfactory character of Ward's conception of the process of learning. He has said that associations are formed by the movement of attention from one to the other of the terms associated. But here attention moved from the first to the second member of a pair, and thence to the first member of the next pair; yet the first movement seems to have estab-

lished a strong association, and the second, comparatively speaking, none. Evidently something much more specific than a mere movement of attention has been in play. The members of a pair are associated by the sequence, connection or meaning that is found in the pair. Finally, this experiment serves to strengthen doubts that have often been raised, especially by the work on incidental memory, regarding the adequacy of contiguity in experience as an associating force. Here the contiguity between the members of a pair was scarcely greater, in matter of time, than that between successive pairs; yet the association within pairs was strong, and that between successive pairs almost negligible. Since the associations within pairs gave 10 times as good a score as those between pairs, we may perhaps say that mere contiguity does not contribute more than one tenth of the whole associating force, the remaining nine tenths being contributed by the noting of suitable features in the material. Even the small fraction thus left to contiguity does not necessarily belong to it; for it is not improbable that the sequence and relation of successive pairs were sometimes observed. In fact, of the few correct recalls of first members, practically all occurred at the beginning or end of the list of twenty pairs; and it is quite likely that, in these favored positions, attention was occasionally directed to such incidental matters as the sequence of pairs or their positions in the list. Except at the ends of the list, the score for first members was only 1/85 as good as that for second members of the pairs; and this fraction, rather than 1/10, probably represents the proportion of the total associative force that should be assigned to mere contiguity; though even this is a doubtful concession.

It may be considered superfluous bravery in me to challenge the doctrine of association by contiguity, in addition to all the other enemies already on my hands; but, in reality, I have this doctrine on my hands at any rate. For if contiguity in a momentary experience is a strong and sufficient associative force, then any item that is later recalled will in turn recall its contiguous items and redintegrate the whole experience or a large part of it, and my hypothesis that what is recalled is observed facts without their setting would become untenable.

Now association by contiguity has played a worthy and important part in the development of psychology, and its attempt to absorb into itself all other laws of association has, in my opinion, been a success. Things become associated only when they are contiguous in experience. That is to say that contiguity is a necessary condition of association. But is it a sufficient condition? There is little in the experimental work on memory to indicate that it is sufficient, and much to indicate that it is not usually depended on to accomplish results. The things to be connected must be together, in order to arouse the reaction connecting them; but, unless they arouse some such reaction, they do not become connected, except it be very weakly. The reaction may be described in a general way as a reaction to the two things together; it is perhaps sometimes a purely motor reaction, but most often, I believe, is rather to be called a perceptual reaction, consisting in the observation of some relation between the two things, or some character of the whole com-

posed of the two taken together. In any case, the reaction is specific; and it is this specific reaction, rather than any general factor like contiguity, or the movement of attention, or the will to learn, that does the work of association. To judge from the memory experiments, then, what is recalled is what has been noted—not past experiences in their totality, but definite reactions which occurred in those experiences.

This conclusion is perhaps even more clearly indicated by experiments in the learning of nonsense drawings than in the more usual work with linguistic materials. An instructive experiment is that of Judd and Cowling,[10] who exposed a rather simple drawing for successive periods of 10 seconds, requiring the subject to reproduce it as well as possible after each exposure. The results, both objective and introspective, showed that the subject usually got first the general character and shape of the figure, and, continuing his analysis, noted one fact after another, until a sufficient number of facts was known to make a satisfactory reproduction possible. There was no evidence of an inner reproduction of the entire sensory experience, from which the subject might read off such information as he required. In a somewhat similar experiment, T. V. Moore[11] called for the learning of a series of simple drawings. He supposed at the outset that a group of figures would be memorized by visual imagery, but experience taught him that there was another factor that was a powerful aid to memory. This was "a more or less complete analysis of the figures, an analysis which it is utterly unnecessary for the subject to put into words." It consisted in noting the parts and composition of the figures and their resemblances to familiar objects. He then undertook to compare the efficiency of memorizing by visualization with analysis excluded, and by analysis without visualization; and found a uniform superiority of the analytic method over the visualizing. But he also found that is was impossible to exclude analysis altogether. "Associations crop up spontaneously," he writes, "and one simply cannot exclude all analysis of the figure. . . . It is much easier to memorize by analysis to the exclusion of imagery than *vice versa*." He believed, however, that learning by visualization, i.e., by forming an image which should be a "more or less perfect replica" of the visual sensation, was a real process. Under the circumstances, it was evidently impossible for him to prove this; for if analysis occurred spontaneously—and one has only to look at a drawing to realize how inevitable it is to note either details or broader characteristics—and if also analysis was a more powerful memorizing agency than visualization, it remains possible that all the learning was accomplished by analysis. The reality of the strictly visualizing or photographic process of learning is, I believe, still open to doubt. It is certainly impossible to avoid perceptual reactions, and to assume the purely receptive attitude of a photographic plate.

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10. "Studies in Perceptual Development," *Psychol. Rev. Monograph 34*, 1907, 349-369.

11. "The Process of Abstraction," *Univ. of California Publications in Psychology*, 1910, *1*, 139-153.

Miss Fernald's data on the memorization of pictures[12] show that even good visualizers depend largely, at least, on specific observations of the features which were later remembered; and her results on the recitation of letter-squares in changed orders[13] showed that even the best visualizers among her subjects were unable to do what it had been supposed was the prerogative of a visualizer to do, namely, "see the whole set of letters at once and simply read them off" in the changed order. She does not doubt the existence of persons able to accomplish this feat, but believes that they must be rare. This matter of visualization evidently requires further study, but the possibility is still open that even the best visualizer does not carry away a photograph of the scene, or replica of his visual sensation, but an image which amounts to a synthesis of specific observations, including observations of broad effects and observations of parts and their relations.

But it is time that I brought my theory out of hiding and placed it squarely before you. I call it, for lack of a better name, the mental reaction theory, or perhaps the perceptual reaction theory. Its basic idea is that a percept is an inner reaction to sensation. I call it a mental reaction to distinguish it from the motor reaction which several psychologists have put forward as being important in attention, perception, association and the like; for it appears to me that these suggestions, while on the right track in insisting that *reaction* is dynamically important, have mistaken the locus of the reaction, and so are unable to account for the conscious content that appears in these mental activities. This mental reaction is not, however, of the nature of an associated sensation, appearing as an image, as if the visual sensation of an orange, to give the percept orange, must reproduce the sensations of handling or tasting the orange. Nor, on the other hand, is the perceptual reaction an emphasis or pattern or meaning residing in the given sensations. It is something new, not present in the sensations, but, theoretically, as distinct from them as the motor reaction is. It adds new content which cannot be analyzed into elementary sensations; so that the sensory elements, which are often held to supply, along with the feelings, all the substance of consciousness, in reality furnish but a fraction of it, and probably a small fraction. Each perceptual reaction is specific, and contributes specific content. In recall, it is these perceptual reactions that are revived, and not sensation; and therefore the content of recall is never, in the strictest sense, sensory. Nevertheless, as was said before, some percepts lie, as it were, nearer to sensation than others, so that the distinction between an image and an imageless recall, while not perfectly sharp, is still legitimate.

It is possible that this theory may appear not so radical after all, and not worth the expenditure of so much breath; for all will perhaps admit that a percept is, in some sense, a reaction. It is therefore my duty to

12. *Psychol. Rev. Monograph 58*, 1912, 81ff.
13. *Ibid.*, p. 71.

show that the theory is worse than it seems, and this I shall attempt to do in the case of patterns or Gestaltqualitäten. It has long been known that the same pattern (for example, a melody) can sometimes be found in different sensory complexes, and it is also true that different patterns can be found in the same sensory complex, as in the case of the dot figure. A rather difficult problem is thus raised, for one would think that the compound would be determined by the elements. But the real crux of the difficulty is to get some conception of a pattern or of a compound, to show what is meant by the togetherness or grouping of the elements. There are three theories that attempt to solve this puzzle, that of synthesis, that of systasis or mere togetherness, and that of synergy, which is none other than the mental reaction theory. The synthesis theory brings in the subject or ego to put the elements together; the systasis theory rejects this deus ex machina, and says that the elements merely are together, or get together and so constitute the compound or pattern; the synergy theory holds that the elements act together, as stimuli, to arouse a further reaction which is the pattern. The synthetic theory occupies a weak position, since, unless the systatic theory succeeds in showing what is meant by the elements being together, there is no advantage in saying that something puts them so.

Now it is difficult to understand what can be meant by the elements being together or getting together so as to produce the group and pattern. If the group included the whole momentary content of consciousness, we could say that being together meant simply being simultaneously present, and speak of the pattern as a character of the whole conscious moment. But the group does not include the whole of consciousness, but—as in the case of three dots among a larger number, seen for an instant as a triangle—may occupy but a small part of the conscious field. The pattern is not the pattern of consciousness, but a pattern within consciousness. Nor will it help matters much to substitute for consciousness the field of attention; for the extent of a group may be either greater or smaller than that of this field; and, besides, a familiar pattern, such as a melody or arrangement of lines or dots, may come to consciousness quite outside the field of attention. Apperception, then, in the Wundtian sense, does not explain groups and patterns nor give them any intelligible meaning. But if we lay aside apperception and try to describe groups and patterns in terms of their constituent elements, we are in no better case. What is it that changes when the pattern changes, the elements remaining constant in quality, intensity and spatial position? This question is as serious for the synthetic theory as for the systatic. The synergy theory cuts the Gordian knot by admitting at once that there is no change in the elements. In fact, there is no real grouping or pattern of the elements; they neither get together nor are put together by some higher agency; but some of them simply act together, as a complex of stimuli, to arouse a perceptual reaction which constitutes the grouping and pattern. The pattern is numerically distinct from the elements, as a motor reaction is distinct from the complex of stimuli that arouses it. What pattern shall be aroused at any moment depends on the

readiness of different perceptual reactions to be aroused, and thus on such factors as frequency and recency of past exercise, fatigue and present interest and control. In short, the synergy theory proposes to extend to patterns, and to all percepts, the same explanation that is accepted for such admittedly mental reactions as the sequence of one idea after another. No one doubts that one idea may represent a stimulus for the arousal of another idea, nor denies that the aroused idea is numerically distinct from the stimulus idea and adds new content to it. It is the same with sensation and perception, except that the reaction is usually very prompt and the perceptual content intimately fused with the sensational. The fusion is so complete that the pattern seems to lie right in or among the dots, as the galloping horse of an earlier illustration seemed to be actually heard in the series of noises.

But now, finally, I suspect that the party, which allowed me to proceed some time ago without coming to terms with their demand for a definition of sensation, will no longer be restrained. They will insist on taking the floor and addressing you as follows:

> The speaker is certainly right in calling a percept a reaction; that is too obvious a fact to need discussion. But we ask, A reaction to what? And our answer is, To the physical stimulus. This "sensation" that the speaker has interpolated between the physical stimulus and the percept is pure gratuitous assumption. There is no warrant for it in introspection, for he himself admits that the sensation and the percept content are intimately fused. We regret that he has fallen into this obsolescent way of speaking, and would suggest that, in reviewing his remarks, you use the blue pencil of the censor wherever the word "sensation" occurs.

This objection is almost too serious to be dealt with in brief. I should freely admit that sensation and percept cannot be distinguished by direct introspection. Yet there are introspective facts that make the distinction appear legitimate. When we hear the galloping horse, we are not only aware of the horse, but we are able to state that we hear him. It is not quite correct to say that we get only the meaning, for we know also the sense by which we get the meaning. So, again, when we have changing percepts of the same stimulus, as in the case of the dot figure, the change of pattern does not amount to a complete change of the figure, but there is a constant substratum underlying the changes; and it seems appropriate to speak of this as sensation. In recall, even the best images lack something when compared with actual sensory experience. They lack body and incisiveness; and it appears probable that this lack is nothing more nor less than a lack of sensation, or, in other words, that the real sensory process is not resuscitated in the image.

But the concept of sensation might never have arisen in a purely introspective psychology. At bottom it is a physiological or psychophysical concept. Sensation is that conscious content which is in closest relation to the physical stimulus. It is the primary response to the

stimulus, and may be followed by secondary responses. Neurology gives good ground for such a distinction, in tracing the sensory nerves to certain limited areas of the cortex, and finding the rest of the cortex to be only indirectly connected with the sense organs. Destruction of the cortical receiving station for any sense abolishes all conscious use of that sense, while destruction of neighboring areas, without making a person blind, for example, abolishes his power of reading, or his power of recognizing seen objects, or his power of orienting himself in visual space. Such perceptions are apparently secondary reactions, while the primary reaction, corresponding to the activity of the receiving station, is precisely that which distinguishes a person who is word-blind and object blind, from one who is totally blind. Here is a person who sees without perceiving, and here is one who does not see at all. The difference I would like to call sensation. Sensation, accordingly, would be the consciousness attending the activity of the sensory receiving stations of the brain, while percept-content would be the consciousness attending the activity of neighboring areas. Besides these secondary reactions, there are undoubtedly tertiary and further reactions, less and less directly connected with the incoming sensory impulses. They need not have a sharply limited localization in the cortex, yet they must be neurologically distinct, and it may well be that every distinct cerebral reaction is attended by its peculiar conscious content. I know of no reason in neurology or psychology for supposing that the elements of conscious content are contributed solely by the sensory receiving centers.

According to this theory, the sensation aroused by a physical stimulus must precede the secondary or perceptual reaction; but the interval need not be supposed to exceed a hundredth of a second, and could not be introspectively detected. The fusion of the primary and secondary reactions in consciousness is a fact which I cannot attempt to explain, since fusion is one of the fundamental peculiarities of consciousness as contrasted with its cerebral correlates. But I may perhaps make the whole conception a little more tangible by reverting to the similitude of photography.

A certain photographer found himself without sensitive plates, though with his camera, in the presence of a scene which he much desired to preserve. He therefore focused on the ground glass at the back of his instrument, and, stretching transparent paper over the glass, traced some of the outlines of the optical image. He thus created patterns, which lay really in his drawing and not in the optical image, but which were blended with the image as long as the image remained. He preserved his tracing, and found it to differ from a photograph in containing only the facts to which he had definitely reacted.

In this parable, the optical image is sensation, which is gone forever when the physical stimulus ceases. The tracing is perception, which may be preserved, though subject to decay. But the fusion of the two, depending in the case of the camera on the presence of the photographer's eye, is in the case of sensation and perception more deep-seated

and inexplicable. Finally, the photographer was more restricted than is the process of perception, since he could only trace outlines and shadings and perhaps colors, and could not commit to his drawing the more remote relations and meanings which can be perceived, and, being later recalled, furnish the content of "imageless thought."