THE PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

MEMORY, IMAGINATION, LEARNING, AND THE HIGHER MENTAL PROCESSES (EXPERIMENTAL)¹

BY J. W. BAIRD

Clark University

I. MEMORY AND IMAGINATION

(a) *Summaries and Systematic Treatises*.—Several years ago Professor G. E. Müller (38) began an investigation of a most remarkable case of supra-normal memory. During the progress of the experiments the author has been led far beyond the specific problem which he set himself at the outset; and we are promised a three-volume treatise describing and discussing the experimental findings, together with an evaluation of various points dealing with experimental procedure and a critical consideration of numerous questions which bear upon memorial and ideational theory. Colvin's book (11) is essentially a summary of the results which have been yielded from various investigations of the *Lernprozess*, together with an indication of pedagogical applications. Starch (50) has compiled a number of judiciously selected experiments from the field of experimental pedagogy, to which he has added several ingenious variations of his own. Offner's monograph (39) has appeared in a second edition in essentially unchanged form.

Ranschburg's Innsbruck *Sammelreferat* (47) is a review of recent findings in the psychopathology of memory. He points out the crudities of Freud's interpretation of the phenomena in this field,

¹ The writer is indebted for aid in the preparation of this paper to Miss S. C. Fisher and Dr. K. J. Karlson, of Clark University, and to W. S. Foster and C. A. Ruckmich, of Cornell University.

and shows that the recognized principles of associative and reproductive inhibition, associative coëxcitation, and the like furnish a much more adequate explanation of the common defects of memory. The methods of investigating memory are described and discussed; and the memorial characteristics of normal and various types of abnormal subjects are presented.

(b) *Discussions of General Questions.*—Henry's monograph (17) is based upon an elaborate mathematical treatment of a meager group of experimental data. Memory and habit are to be regarded as wholly disparate phenomena. Memorial functions are never performed successfully at the first attempt,—the failure being due to the fact that one's idea of the act is at first imperfect, and becomes perfect only as the result of repetition. In the case of habit, however, the idea of the act to be performed is complete from the outset.

Bühler (6) describes a method employing spatial relationships for memorial material. A sheet of paper is divided into thirty-six small squares, the vertical and horizontal diameters of the sheet being indicated by heavy lines. Each small square stands in a definite relationship to each of the four large squares; and a total of 1,265 spatial relationships may be differentiated upon the sheet. A given relationship, indicated by the colored contents of certain squares, is presented, learned, and reproduced, with introspections. Fischer (13) outlines a programme for the investigation of creative imagination, which includes the following problems: a description of its sphere (play, empathy, fantasy); a determination of the boundaries of this sphere, and of its relation to the sphere of the real and serious; a classification of the typical forms of creative imagination.

Moede (37) discusses the use of the term memory in the biological sciences; he points out that the term has been divested of its essential characteristics by the biologists, who then apply it in this emasculated connotation to designate certain purely biological phenomena. Even the laws of heredity and of analogous biological phenomena are held by the author to be only superficially analogous to the characteristic laws of memory. Jesinghaus (22) résumés the traditional theories of memory, and discusses the phenomena of perseveration, forgetting, and feeling of familiarity.

(c) *Imagery.*—Angell's report (3) evaluates the various tests of imagery, and adds ingenious methods from his own laboratory. None of the purely objective tests prove to be trustworthy; the author's recommendations include a complete series of tests for the whole range of mental functioning. Feuchtwanger's paper (12) reports an

investigation of the same question. His problem was essentially a comparison of results obtained by introspective and objective methods.

Meumann (35) urges the consideration of a hitherto unrecognized factor in our enumeration of ideational types. Certain individuals are able to deal efficiently with ideational material only when the imagery from each sense department is present in isolation; they are unable to make use of joint imagery from different senses. Lipmann (31) believes that in our enumeration of types of apprehension we should differentiate, within the visual type, between those individuals who best apprehend size, position, color tone, etc.

Schaub (48) finds that images (visual, auditory, tactual) possess the attribute of intensity. The difference between image and sensation is not one of intensity, but rather one of texture and context, the image being incomplete, abbreviated, and without kinæsthetic context. Lobsien (32) reports a series of results from which he concludes that auditory memory is equally well developed in girls and in boys, and that it increases uniformly and progressively with increase of age.

(d) *Association and Inhibition*.—Langfeld (28) investigated the effect of alcohol (30 ccm., 95 per cent., in 60 ccm. water) and caffeine (6 gr. in capsule) upon association, reproduction and suppression. Pictures were shown, and the reagents were instructed that in their choice of a reaction-word they must not name the picture. Neither drug had any appreciable effect other than to decrease the association-time. The reagents did not translate the negative into positive instructions, *i. e.*, there was a distinct negative attitude, which was usually describable in terms of cortical set. Experiments with pathological patients revealed no deviation from normal accuracy of reproduction or normal power of suppression excepting in certain cases of dementia præcox. Jacobson (21) presented pairs of weights for comparison, and introduced intensive auditory stimuli in order to determine whether and to what extent it was possible to affect the judgment of the weights by thus inhibiting the sensation obtained from the comparative weight. In other experiments auditory stimuli were presented for comparison, and pressures constituted the distraction. It was found that pressures of moderate intensity are inhibited by simultaneous sounds and by other pressures, and that sounds of moderate intensity are inhibited by intensive simultaneous pressures. Increased attention to the inhibiting sensation increases the inhibition, while increased attention to the other sensation decreases

the inhibition. Hence what is called distraction of attention consists in an inhibitory influence of one sensation upon another; and degree of (subjective) intensity of sensation is a function of degree of attention.

Dauber (11a) found that the preferred association is related to the repeated association, and also to a number of other phenomena: the frequency with which the stimulus-word and the reaction-word occur in ordinary language; the phenomenon of clang association. Nonsense syllables tend to arouse meaningful reaction-words, in spite of instructions to react with nonsense words; and preferred associations appear in these responses to nonsense stimuli, indicating that preference is not merely a product of close associative connection between stimulus-word and reaction-word. Huber (19) investigated the influence of culture and environment upon the association-reaction, by repeating with a group of soldier reagents the experiments which had been made by Reinhold with school-girl reagents. The soldiers gave fewer preferred associations, more internal associations, more adjectival and definitive reaction-words. The author confirms Jung and Riklin's finding that uncultured reagents are more influenced by the meaning of the word and less by the word as such; and he concludes that the associations of a group of reagents is always influenced by the *milieu* of the group.

Foucault (15) brings forward empirical evidence, obtained in experiments with numbers and nonsense syllables, to show that association does not take place merely as the result of resemblance. Resemblance has no associative effect unless it is perceived as such by the observer; and when resemblance is perceived, we have a case not of mere association but of comparison and judgment. Resemblance therefore owes its potency to an intellectual act, and is *per se* no more efficacious than contrast and incompatibility, cause and effect, or means and end.

Levy-Suhl (29) aimed to determine whether the association-reactions of different forms of mental abnormality manifest typically different characteristics. Employing his data as a basis of classification, he divided his forty-four patients into four groups; and his psychological classification showed a remarkable agreement with a classification which had been based upon a clinical diagnosis. The first group gave an almost normal reaction; it included a convalescent case of exhaustion delirium and three cases of dementia paralytica. The second group (hyperprosexia) was characterized by a hypervigilance and a hypertenacity of attention; here appear ten cases of mania

and a (transitional) case of acute paranoia, together with five variants from the general group-type. The third group was characterized by selective hyperprosexia (sixteen cases of paranoia); and the fourth by hypervigilant reaction, with contamination and dissociation (four cases of dementia paralytica). Ley and Menzerath (30) also report the results of an investigation of various forms of mental abnormality, by means of the association-reaction but they supplement this method by introspection. They found that characteristic differences exist between the associations of normal and abnormal subjects; that the different forms of mental abnormality are each characterized by a typical sort of association-reaction; that the lengthened reaction is due to other causes than the presence of an emotional complex.

Woodworth and Wells (55) publish the report of the committee which was charged by the American Psychological Association with the evaluation and the standardization of association tests. The report consists essentially of a series of recommendations, with directions as to precautions to be observed and methods and materials to be employed. Wells (51) draws upon 12,000 observations in his discussion of certain properties of the free association-time. Women show greater individual variation, and greater variability from day to day, than men. The former give about twice as many judgment reactions, and fewer associations by subordination and superordination. Emotional coloring may cause lengthened reaction, but it is only one of many causes of associative obstruction; suppression, distraction, indecision, and the like, must all be taken into account. In another paper (52) Wells suggests the following categories for the classification of associations: egocentric; superordinate; contrast; speech habit; miscellaneous.

(e) *Learning and Forgetting*.—Abramowski (1) deals with the familiar phenomenon that one may fail to remember a datum while he remembers what it is not. This resistance of memorial lacunæ to being filled by erroneous data he refers to generic feelings, which he describes as being neither ideas nor definite feelings. Objects were placed upon the outstretched palms of blindfolded observers, who perceived them tactually either with concentrated or with distracted attention. In subsequent sittings, attempts were made to recognize the objects, various suggestions being introduced for the purpose of determining whether and to what degree erroneous suggestions would be resisted. The author concludes from these and from similar experiments in kinæsthetic perception that sensory impressions, even when divested of every intellectual element (by

distraction), are still retained in memory; and he finds in this fact a confirmation for his hypothesis of generic feelings. Joteyko (23) reports that in the learning of digits, syllables and words, her observers had recourse to various sorts of imaginal material, and that associated images were of prime importance. Pyle (45) found in his investigation of the immediate "substance" memory of twelve adults, that the rapid learner is more accurate than the slow learner, nor does the slow learner excel in immediate or in permanent retention.

Numerous investigators have reported that it is more economical to learn a given material as a whole than in piecemeal fashion. Is this equally true when the material is of excessive length? Pyle and Snyder (46) investigated this question, employing poetry as memory material, and assigning sections which varied in length from five to two hundred lines. They found that the *Ganzmethode* is invariably more economical, no matter how long the whole or the parts may be; and the saving is greater when the "wholes" are longer. They explain the disadvantage of the *Teilmethode* from the fact that it involves the formation of associations between the end of a section and the beginning of the same section, and the fact that the earlier sections are forgotten during the act of learning the later ones.

Ordahl (40) undertook to discover whether learning is aided by wholly or relatively unconscious factors, and whether the formation of a habit of whose existence one is unconscious can progress as well under distraction; and to discover what is the rôle of consciousness in the learning of simple tasks involving (a) almost no intellectual factor, (b) a complex coördination of motor impulses, (c) in learning of a purely intellectual character. Her experiments included the learning of nonsense syllables with unnoticed concomitants; the comparison of lifted weights, with and without distraction; writing in unusual ways; the mental multiplication of large numbers. It was found that: (1) unnoticed aids have no influence in the act of learning; (2) in learning simple muscular coördinations, where consciousness is normally focused on the end, learning can progress without consciousness either of the end or of the fact that one is learning, but a high degree of attention to the task gives better results than distracted attention; (3) in learning of every sort, both conscious and unconscious factors are present. Conscious control is most direct where the material is of an "intellectual" character. Consciousness is a corrective agent; it eliminates errors, improves on elements unconsciously developed, and organizes the whole procedure.

Can the different parts of speech be memorized and retained with equal facility? Busemann (7) employed nouns, adjectives, verbs, adverbs, and nonsense syllables. He found that consciousness of meaning is clearer in the case of nouns than in the case of adjectives and verbs, and that the retention of the former is correspondingly better. The author believes that the *Teilmethode* has not yet been shown to be more economical than the *Ganzmethode*.

Piéron (42, 43, 44) established the curve of learning and the curve of forgetting in the pond snail. Since the latter curve did not coincide exactly with that obtained by Ebbinghaus in the human subject, Piéron set himself the task of memorizing series of nonsense syllables, and found a confirmation of his own formula. He concluded from his experiments that the fixing of memorial traces continues after the stimulus has ceased to act, and that the duration of this fixing process varies widely in different animals. Where fixing progresses slowly, forgetting also progresses slowly.

(f) *Affection and Memory*.—Henderson (16) points out that in the simplest form of learning—trial and error—those movements which have disagreeable consequences are eliminated. We banish disagreeable reactions; do we really forget our disagreeable experiences? Ten observers were asked to record incidents from their lives, and to grade them into classes on the basis of their affective values. While his results show that remembrances are dominantly agreeable, the author does not believe that his query is to be answered in the affirmative. Peters (41) asked a number of reagents to respond to a stimulus-word by the reproduction of a past experience, and then to describe the affective coloring of the original incident and of the remembrance, together with details as to dates and frequency of recall. Fifty-two per cent. of the experiences were described as pleasant, recent experiences being less pleasant than earlier experiences. Individual differences were found in regard to preponderance of pleasant or unpleasant, and in regard to the constancy of the affective tone which attaches to a given experience in its successive revivals in memory.

Claparède (8) discusses the question as to whether an affective process can be an object of memory. Disagreement among psychologists is due to a failure to come to an understanding as to the definition and criteria of memory, and to a misapprehension regarding the significance of the evidence which they bring forward in support of their positions. The author differentiates the various functions or phases of memory, and concludes that only in the case of one of these, recognition, has the existence of affective memory been established.

(g) *Recognition*.—Alrutz (2) describes several remarkable experiences which consist in the false recognition of an acquaintance, but which are invariably followed a few minutes later by a meeting with the acquaintance who had been falsely recognized a few minutes previously. He discusses the various possible explanations of these phenomena, and concludes with the statement that in his opinion the telepathic hypothesis furnishes the most probable explanation,—*i. e.*, the acquaintance who is not yet within the range of the observer's vision is already perceived in vague fashion through the medium of a telepathic sense (!). Alrutz requests his readers to furnish him with additional reports of cases of false recognition.

Katzaroff's paper (25) contains a valuable classification and discussion of theories of recognition. His experimental procedure consisted in exposing a series of pictures, and in subsequently exposing a second series where the original pictures appeared among others of a similar character. The observers were asked to report whether or not they recognized the pictures of the second series, and if so with what degree of confidence. It was hoped by this means, and by means of the introspective records of his observers to throw light upon the process of recognition. The author concludes from his experiments that the process of recognition is a product of two separate and distinct factors, a feeling of familiarity, which constitutes pure or direct or immediate recognition, and the arousal of images or remembrances which confirm or control the immediate recognition and transform the latter into an indirect or mediated recognition. Recognition appears to be an affective rather than an intellectual process; in its pure form it is not determined by any associative process nor by the fusion or juxtaposition of imagery or remembrances. The certainty of one's recognition is independent of one's act of recognizing. Sometimes the former may be determined by the latter, and may follow immediately in its wake; but more often one's certainty develops during the progress of the recognitive process concomitant with the arousal of imagery, remembrances of details, verbal or other associations, and the like. The act of immediate recognition appears to be independent of all feelings or ideas of a precise localization in time or space, or of a precise localization in a constellation of remembrances. There is, on the subjective side, no qualitative difference between correct and erroneous recognitions. The process of recognition manifests such great individual variations that one is led to suspect the existence of typical differences in the mechanism of the process. Katzaroff's paper is followed by an

appendix by Claparède (8) who points out the similarity between Katzaroff's conception of the process of recognition and a view which Claparède himself formulated some years ago, as a result of certain pathological observations. This view makes relationship with the self (with *me* and *my* experience) the essential principle upon which recognition depends. The author assumes that mental associations are of two general sorts: connections of ideas with one another, and connections between ideas, on the one hand, and that which constitutes the self, on the other. These latter (egocentric) connections may function in a centrifugal direction,—constituting voluntary recollection,—or in a centripetal direction,—constituting recognition. Claparède illustrates and supports his view by citations from pathological observations.

Meumann (36) has observed in the course of his investigations with nonsense syllables that the feeling of unfamiliarity is much more definite than that of familiarity, *i. e.*, we are much more clearly conscious of the fact that an impression is unfamiliar than of the fact that another is familiar. Unfamiliarity is provided with a peculiar index or character which makes us aware of the unknown immediately and directly without the interposition of any act of reflection. It possesses the following characteristics: an inhibition of the motor and ideational processes; the consciousness of a blank; the feeling of unpleasantness; an absence of the ordinary reproductive flow of ideas. The experience of familiarity may come to consciousness in various stages or degrees: as the easier flow of mental processes, which gives rise in turn to characteristic feelings and organic sensations; as a lesser tension of attention; as a more ready flow of reproduction. Sometimes all of these criteria of the familiar are lacking, and still the conviction of familiarity arises, apparently as the result of physiological facilitation; but it seems more probable that even here a minimum of dimly conscious criteria have sufficed to give rise to the idea of familiarity.

II. INTELLECTUAL PROCESSES

Binet (5) differentiates emotions and intellectual acts as follows: Both are attitudes. But the attitude is emotional when it is accompanied by intensive organic sensations; and the more intensive its corporeal concomitants, the less doubt is there concerning the emotional nature of the attitude. The attitude is intellectual when it is accompanied by a minimum of subjective sensations and a maximum of objective sensations and images; it is less corporeal,

less material, apparently more worthy of pure mind. Intellectual phenomena seem to be less personal and more general; they are colder, farther removed from pleasure and pain. Emotions are more corporeal, more individual, more characterized by pleasantness and unpleasantness. To transform either attitude into the other, we need only change the group of concomitant organic sensations. Divest the attitude of its organic concomitants and you have left nothing but an intellectual act; clothe this intellectual act in a garb of organic sensations and you have an emotion.

Aveling (3*a*) aimed to determine: (1) What influence is exerted upon the sensorial content of percepts by the thought-processes which are involved in perception? (2) What influence is exerted upon the thought-character of perceptions by the sensorial content of percepts? (3) What influence is exerted by antecedent conscious processes upon the sensorial content and the intellectual character of perceptions? Colored pictures of familiar objects were presented tachistoscopically; and an attempt was made to predetermine the observer's perception by instructing him to perceive the picture, in one case as an individual thing, in another case, as the type of a class of similar things. In a series of control experiments, the observer was not instructed as to his mode of perception. The results show that in these control experiments, where no attempt was made to predetermine perception, the "individual" and the "type" perceptions occurred with equal frequency. Under "type" instruction, "type" perceptions occurred in seventy-five per cent. of the cases; and under "individual" instruction, "individual" perceptions also occurred in seventy-five per cent. of the cases, a fact which shows the degree to which a given consciousness may successfully be predetermined. The fact that the same picture is perceived in symbolic fashion by one observer, and in asymbolic fashion by another furnishes a basis for the classification of observers into types, since they seem, in the one case, to be in the presence of a real object, and in the other case, to be in the presence of a mere picture. This difference between observers seems to be due to different degrees in the facility with which previous experiences are assimilated into the present perception.

In Kakise's investigation (24) words and phrases were presented, in auditory or visual fashion, with a view to obtaining an introspective description of the conscious concomitants of understanding. It was found that the characteristic constituents of the meaning of a word or phrase are not selective experiences; they are rather a series of phases of a process of reproduction. If many such associations

of related past experiences are reproductively aroused, the result is a feeling of richness of content; when the number of reproduced associations is small, a feeling of poverty of content results; if there are no associations, a feeling of no content arises. This feeling of content, which is the awareness of the more or less fused aggregate of incipient associations, seems to be irreducible to specific imagery. The frequency of imagery in the understanding consciousness is primarily conditioned neither by the concrete or abstract character of the stimulus-word, nor by any peculiarity of the individual, but by the rapidity of his response. When the reaction-word came slowly and with difficulty, imagery tended to intervene; when reaction was prompt, imagery tended to be absent. The author is convinced that the association-method, as customarily employed, is too artificial to give satisfactory results; the *Ausfragemethode* seems to be better adapted both to the study of the general laws of association and to the study of individual peculiarities of association.

Hollingworth (18) suggests that the failure of certain individuals to find that sensory components are present in their consciousness of relation, of intention, of purpose, and the like, may be due to the fact that they seek for relevant imagery. His own introspections convince him of the existence of thoughts whose character represents an intermediate between "the conventionally costumed idea and the nude relational process"; and he cites illustrations to show that three stages of this vicarious functioning may be differentiated. "The first stage includes dream states in which images quite irrelevant as to source or quality may be seen to play a symbolic or metaphorical rôle in the play of meanings, relations and complications of situation which make up the plot of the dream. The third stage is shown in the common observations that the vehicle of a waking meaning, the two poles of a relation, may be fragmentary, transitory, and only remotely relevant, relevant only by virtue of accidental association. The second stage is an intermediate one disclosed by observations of drowsiness hallucinations, a stage in which the thought process is a sensible and adequate waking affair, although the sensory content of consciousness may be evident dream material or even actual sensory impression of a quite foreign character."

Jacobson (20) investigated the perception of single letters, the understanding of words, and the understanding of sentences, employing the "method of examination." His observers were required to furnish two reports of each experience—a description of their conscious processes, and a statement concerning meanings, objects,

stimuli, and physiological occurrences. No imageless processes were reported; and he found that the correlated meanings and processes are two renderings, from different points of view, of one and the same experience.

Koffka (27) reports having asked a "catch question," in consequence of which a latent *Einstellung* was produced in his auditors, a fact which was shown by their changed attitude toward a second question. The author describes methods of investigating the laws of the latent *Einstellung*, and discusses the relation between this phenomenon and the *determinierende Tendenz*.

Clarke (10) attempted to analyze a number of typical *Bewusstseinslagen* by a method which consisted in obtaining introspections regarding the processes involved in learning to read type for the blind; in the understanding of the meaning of words, sentences, paragraphs; in the answering of questions, requiring and not requiring thought; and in the filling out of broken sentences ("rule of three"). It was found that the conscious attitude instead of being a mental ultimate is, in numerous instances at least, capable of being further analyzed, especially in the light of its genesis. When the attitudes occur often enough for generalization, there is found a marked agreement between different observers, and between the same observer's attitudes at different times. This is true of such attitudes as surprise, seeking, doubt, hesitation, uncertainty, all of which may be described in typically different terms. The same observer may report a graded series of transitions in his imagery, from vivid and explicit images to the vague and condensed consciousness which may be supposed to be analogous to that which has been called "imageless thought." Attitudes may, then, be analyzed into sensations, images and feelings, or their genesis may be traced to these elements.

Betz (4) cites illustrations to show that recognition may be a product not of imagery but of "*Einstellung*." Perception is ordinarily attended by a reaction which is essentially organic, kinæsthetic and affective in character. The subsequent reproduction of this reactive complex may serve to represent the perceived object in consciousness, and to give rise to a process of recognition. This revived complex is (inappropriately) called *Einstellung*, by Betz, in contradistinction to *Vorstellung*. The author refers our consciousness of similarity and identity to these organic, kinæsthetic and affective vestiges of original perceptions; and in a second paper, he invokes the same principle (together with the *vorgestellte Einstellung*) to explain the origin in consciousness of our concepts, our general ideas and our definitions.

III. PRACTICE, HABIT, TRANSFER

Foster (14) undertook to make a qualitative and quantitative determination of the relationship which obtains between "native" (or unpracticed) and practiced ability to evoke images of sensory experiences. Pictures, objects, and nonsense drawings were shown to three observers, whose immediate reproduction was then tested by their drawings or descriptions of the material. Practice was continued for three months. It was found that ability to reproduce increased with practice, rapidly at first, then more slowly; but in not a single instance did practice improve the ability to visualize or even increase the tendency to visualize. The improved efficiency in reproduction was found to be due to the following factors: increased confidence in ability to perform the task, and consequent increased attention to the task; increased familiarity with the material; the adoption of a more systematic procedure and a more economical distribution of attention during the act of learning; the discovery of subsidiary aids, such as counting, grouping, naming.

Kent (26) investigated the possibility of habit formation in dementia præcox. The procedure consisted in an attempt to obtain effects of practice. Eighteen women, representing various stages in the progressive development of the disease, were asked to practice a series of exercises for a period of several months. The exercises consisted in arranging a series of fifteen digits in a prescribed order, in tracing a path through a (printed) labyrinth, in crossing out digits, letters and geometrical figures. A second series of exercises consisted in placing pegs in holes in a board, and in fitting wooden blocks into a form-board. The records of the errors and of the times required for these exercises show that it is possible for the dementia præcox patient to acquire new habits as the result of practice, and that the results attained in one sort of exercise make themselves felt in other exercises of a similar motor sort.

Wells reports an investigation of the effect of practice upon the free association (53). He employed six normal observers; and the procedure consisted in obtaining reactions to one thousand stimulus-words,—twenty sittings, fifty reactions at each sitting,—and subsequently in obtaining a second set of reactions from the initial part of the original list of stimulus-words. It was found that the association-time tended to decrease toward a limit of approximately six fifths of a second; that the responses became further differentiated and generalized as a result of the increased readiness with which the reagent's whole vocabulary became available; that the forms of association

became more superficial; and that the emotive value of the associations decreased. The author mentions the fact that this last result diminishes the applicability of the association-method for any purpose where emotive value is involved.

Sleight (49) investigated the problem of the transfer of training in memorial acquisition. His procedure consisted in making an initial test of memorial ability (first "cross-section"), and then in practicing his observers in memorizing for a period of three weeks, when a second "cross-section" was made. Then practice was resumed for another three weeks, and a third "cross-section" was taken. His tests and his practice consisted in the memorizing of prose, poetry, nonsense-syllables, tables of arithmetical and geographical data, and in learning the "substance" of prose, and the like. His observers were divided into three groups; and the procedure was such that no group was tested by means of the same sort of material which had been employed in its training exercises. The results show that there appears to be no general memory improvement as the result of practice, nor any evidence for the hypothesis of a general memory function; that there would seem instead to be a very large number of related and unrelated memory functions; that the factors which contribute to the transfer of memorizing power are similarities of a fundamental nature, such as specific forms of attention, imagery, rhythm,—in short, similarities of procedure.

REFERENCES

1. ABRAMOWSKI, E. La résistance de l'oublié dans la mémoire tactile et musculaire. *J. de psychol. norm. et path.*, 1911, 8, 221-245.
2. ALRUTZ, S. Det falska igenkännandet ("La fausse reconnaissance"). *Psyke*, 1910, 6, Bilaga 1, 87-99.
3. ANGELL, J. R. Methods for the Determination of Mental Imagery. *Psychol. Monog.*, 1910., 13, 61-107.
- 3a. AVELING, F. The Relation of Thought-Process and Percept in Perception. *Brit. J. of Psychol.*, 1911, 4, 211-227.
4. BETZ, W. Vorstellung und Einstellung. I. Ueber Wiedererkennen. *Arch. f. d. ges. Psychol.*, 1910, 17, 266-296. II. Ueber Begriffe. *Ibid.*, 1911, 20, 186-225.
5. BINET, A. Qu'est-ce qu'une émotion? Qu'est-ce qu'un acte intellectuel? *L'année psychol.*, 1911, 17, 1-47.
6. BÜHLER, K. Ein Verfahren zur Untersuchung des Gedächtnisses für räumliche Beziehungen. *Ber. IV. Kongress f. exper. Psychol.*, 1911, 252-255.
7. BUSEMANN, A. Lernen und Behalten. *Zsch. f. angew. Psychol.*, 1911, 5, 211-271.
8. CLAPARÈDE, E. Récognition et moïité. *Arch. de psychol.*, 1911, 11, 79-90.
9. CLAPARÈDE, E. La question de la mémoire affective. *Arch. de psychol.*, 1911, 10, 361-377.
10. CLARKE, H. M. Conscious Attitudes. *Amer. J. of Psychol.*, 1911, 22, 214-249.

11. COLVIN, S. S. *The Learning Process*. New York: Macmillan, 1911. Pp. xix+336.
- 11a. DAUBER, J. Ueber bevorzugte Assoziationen und verwandte Phänomene. *Zsch. f. Psychol.*, 1911, 59, 176-222.
12. FEUCHTWANGER, A. Versuche über Vorstellungstypen. *Zsch. f. Psychol.*, 1911, 58, 161-199.
13. FISCHER, A. Methoden zur experimentellen Untersuchung der elementaren Phantasieprozesse. *Zsch. f. päd. Psychol.*, 1911, 12, 448-458; 497-507.
14. FOSTER, W. S. The Effect of Practice upon Visualizing and upon the Reproduction of Visual Impressions. *J. of Educ. Psychol.*, 1911, 2, 11-22.
15. FOUCAULT, M. Etude expérimentale sur l'association de ressemblance. *Arch. de psychol.*, 1911, 10, 338-360.
16. HENDERSON, E. N. Do we Forget the Disagreeable? *J. of Phil., Psychol. &c.*, 1911, 8, 432-437.
17. HENRY, C. *Mémoire et habitude*. Paris: Hermann et Fils, 1911. Pp. 116.
18. HOLLINGWORTH, H. L. Vicarious Functioning of Irrelevant Imagery. *J. of Phil., Psychol., &c.*, 1911, 8, 688-692.
19. HUBER, E. Assoziationsversuche an Soldaten. *Zsch. f. Psychol.*, 1911, 59, 241-272.
20. JACOBSON, E. On Meaning and Understanding. *Amer. J. of Psychol.*, 1911, 22, 553-577.
21. JACOBSON, E. Experiments on the Inhibition of Sensations. *Psychol. Rev.*, 1911, 18, 24-53.
22. JESINGHAUS, C. Zur psychologischen Theorie des Gedächtnisses. *Psychol. Stud.*, 1911, 7, 336-375.
23. JOTEYKO, J. Comment on retient les chiffres, les syllabes, les mots, les images. *Rev. psychol.*, 1911, 4, 3-20.
24. KAKISE, H. A Preliminary Experimental Study of the Conscious Concomitants of Understanding. *Amer. J. of Psychol.*, 1911, 22, 14-64.
25. KATZAROFF, D. Contribution à l'étude de la reconnaissance. *Arch. de Psychol.*, 1911, 11, 2-78.
26. KENT, G. H. Experiments on Habit Formation in Dementia Præcox. *Psychol. Rev.*, 1911, 18, 375-410.
27. KOFFKA, K. Ueber latente Einstellung. *Ber. IV. Kongress f. exper. Psychol.*, 1911, 239-241.
28. LANGFELD, H. S. Suppression with Negative Instruction. *Psychol. Rev.*, 1911, 18, 411-424.
29. LEVY-SUHL, M. Studien über die experimentelle Beeinflussung des Vorstellungsverlaufes. *Zsch. f. Psychol.*, 1911, 59, 1-90. (See also Vols. 42 and 45.) Collected and republished as a monograph. Leipzig: Barth, 1911. Pp. vi+142.
30. LEY & MENZERATH. *L'étude expérimentale de l'association des idées dans les maladies mentales*. Gand: Van der Haeghen, 1911. Pp. 199.
31. LIPMANN, O. Visuelle Auffassungstypen. *Ber. IV. Kongress f. exper. Psychol.*, 1911, 198-201.
32. LOBSIEN, M. Zur Entwicklung des akustischen Wortgedächtnisses der Schüler. *Zsch. f. päd. Psychol.*, 1911, 12, 238-245.
33. LOEB, S. Ein Beitrag zur Lehre vom Farbengedächtnis. *Zsch. f. Sinnesphysiol.*, 1911, 46, 83-128.
34. MARTIN, L. J. Zur Lehre von den Bewegungsvorstellungen. *Ber. IV. Kongress f. exper. Psychol.*, 1911, 196-198.

35. MEUMANN, E. Ueber den kombinatorischen Faktor der Vorstellungs-typen. *Zsch. f. päd. Psychol.*, 1911, 12, 115-120.
36. MEUMANN, E. Ueber Bekanntheits- und Unbekanntheitsqualität. *Arch. f. d. ges. Psychol.*, 1911, 20, 36-44.
37. MOEDE, W. Gedächtnis in Psychologie, Physiologie und Biologie. Kritische Beiträge zum Gedächtnisproblem. *Arch. f. d. ges. Psychol.*, 1911, 22, 312-389.
38. MÜLLER, G. E. Zur Analyse der Gedächtnistätigkeit und des Vorstellungsverlaufes. (*Zsch. f. Psychol.*, Ergbd. 5, Teil 1.) Leipzig: Barth, 1911. Pp. xiv+403.
39. OFFNER, M. *Das Gedächtnis. Die Ergebnisse der experimentellen Psychologie und ihre Anwendung in Unterricht und Erziehung.* (2. Aufl.) Berlin: Reuther & Reichard, 1911. Pp. x+258.
40. ORDAHL, L. E. Consciousness in Relation to Learning. *Amer. J. of Psychol.*, 1911, 22, 158-213.
41. PETERS, W. Gefühl und Erinnerung. *Psychol. Arbeiten (Kraepelin)*, 1911, 6, 197-260.
42. PIÉRON, H. Les courbes d'évanouissement des traces mnémoniques. *C. r. acad. d. sci.*, 1911, 152, 1115-1118.
43. PIÉRON, H. L'étude biologique de la mémoire. *Bull. soc. franc. de phil.*, 1911, 11, 1-27.
44. PIÉRON, H. Sur la détermination de la période d'établissement dans les acquisitions mnémoniques. *C. r. acad. d. sci.*, 1911, 152, 1410-1413.
45. PYLE, W. H. Retention as Related to Repetition. *J. of Educ. Psychol.*, 1911, 2, 311-321.
46. PYLE, W. H., & SNYDER, J. C. The Most Economical Unit for Committing to Memory. *J. of Educ. Psychol.*, 1911, 2, 133-142.
47. RANSCHBURG, P. Die Ergebnisse der experimentellen Psychopathologie des Gedächtnisses. *Ber. IV. Kongress f. exper. Psychol.*, 1911, 95-180.
48. SCHAUB, A. DEV. On the Intensity of Images. *Amer. J. of Psychol.*, 1911, 22, 346-368.
49. SLEIGHT, W. G. Memory and Formal Training. *Brit. J. of Psychol.*, 1911, 4, 386-457.
50. STARCH, D. Transfer of Training in Arithmetical Operations. *J. of Educ. Psychol.*, 1911, 2, 306-310.
51. WELLS, F. L. Some Properties of Free Association Time. *Psychol. Rev.*, 1911, 18, 1-23.
52. WELLS, F. L. A Preliminary Note on the Categories of Association Reactions. *Psychol. Rev.*, 1911, 18, 229-233.
53. WELLS, F. L. Practice Effect in Free Association. *Amer. J. of Psychol.*, 1911, 22, 1-13.
54. WINCH, W. H. Further Work on Numerical Accuracy in School Children. Does Improvement in Numerical Accuracy Transfer? *J. of Educ. Psychol.*, 1911, 2, 262-271.
55. WOODWORTH, R. S., & WELLS, F. L. Association Tests. *Psychol. Monog.*, 1911, 13, No. 57. Pp. 85.