

THE PSYCHOLOGICAL BULLETIN

PROCEEDINGS OF THE TWENTY-FIFTH ANNUAL
MEETING OF THE AMERICAN PSYCHOLOGICAL
ASSOCIATION, NEW YORK, DECEMBER
27, 28, 29, 30, 1916

REPORT OF THE RETIRING SECRETARY, R. M. OGDEN, CORNELL
UNIVERSITY

The American Psychological Association held its twenty-fifth annual meeting, in affiliation with the American Association for the Advancement of Science, at Columbia University on Wednesday, Thursday, Friday and Saturday, December 27, 28, 29, and 30, 1916. The general program was conducted in rooms in the buildings of Teachers College. The sessions were attended by larger numbers than ever before. One hundred and forty-one names were registered, while many more participated at times in the various meetings. Fifty-eight papers were read, and several others were listed by title. Except for the papers on mental tests, of which there were twenty-one, the titles did not fall readily within the definite categories which have marked the special sessions of previous meetings. An approximate analysis, however, reveals among the papers fourteen on experimental, five on educational, four on physiological, two on abnormal psychology, and three on behavior. The remainder were of miscellaneous interest.

The special feature of the program was the session held on Thursday afternoon, December 28, in commemoration of the twenty-fifth anniversary of the Association's foundation. This session, which took place in the chapel of Teachers College, was so largely attended that many were denied admission. Papers were read by Messrs. Cattell and Dewey, of Columbia University, and by Mr. Jastrow, of the University of Wisconsin. Owing to an accident which prevented the attendance of President Hall, of

Clark University, a paper prepared by him for the evening banquet was read by Mr. Baird. The anniversary banquet occurred that evening at the Hotel Marseilles, one hundred and seventy-one participating. President Dodge acted as toast-master. The first to respond was Miss Calkins, of Wellesley College, who paid an eloquent tribute to the memory of two distinguished members of the Association, Professors Royce and Münsterberg, who have passed away during the year. She was followed by Mr. George T. Ladd, of Yale University, who made a plea for the broadest development of psychology as a science. President Sanford, of Clark College, presented a witty satire upon modern trends of psychological interest. In the absence of President Stanley Hall, of Clark University, who was also to have been among the speakers of the evening, brief remarks were made by Messrs. Henry Rutgers Marshall, J. B. Watson, E. L. Thorndike and Joseph Jastrow.

On Friday morning a joint session was held with Section L of the American Association for the Advancement of Science. The President's address occurred on Wednesday evening, December 27, in Schermerhorn Hall. It was followed by the annual business meeting of the Association and a smoker.

The apparatus exhibit was held in connection with a general exhibition of scientific instruments located in University Hall. Apart from the exhibits of the Bureau of Educational Experiments and of the C. H. Stoelting Co., of Chicago, the following new apparatus was offered by members of the Association: Electric Stimulus Shuffler, Automatic Timer and Rapid Counter, Artificial Pupil Apparatus, L. T. Troland, Harvard University; Test Puzzles, Grace Helen Kent, Grafton, Mass.; Multiple Choice Apparatus, R. M. Yerkes, Harvard University; Continuous Blood Pressure Conveniences, G. V. N. Dearborn, Boston; Focal Variator and Differential Demonstration Disks, A. P. Weiss, Ohio State University; Graphs of Test Performances of College Students, L. L. Thurstone, Kate Gordon and W. V. Bingham, Carnegie Institute of Technology; Collected Pieces, Madison Bentley, University of Illinois; Worsteds for Color-Blind Tests, Knight Dunlap, Johns Hopkins University; and Automatic Choice Reaction Keys, offered by H. S. Langfeld for S. L. Pressey, Harvard University.

Thanks to the efforts of Mr. Hollingworth, the local member of the Executive Committee, and of Messrs. Woodworth, Cattell and others of the Columbia faculty, the appointments of the various meetings were adequate and the sessions ran their course in an admirably effective manner.

TRANSACTIONS AT THE ANNUAL BUSINESS MEETING

The annual business meeting was held at nine p.m. on December 27, in Schermerhorn Hall, and was well attended. It was voted that the minutes of the previous meeting be accepted as printed. The President then called for the reports of committees. Mr. Bentley responded as chairman of the Program Committee and referred to an action later to be proposed by the Council defining the duties and responsibilities of this Committee. The report was accepted.

Mr. Watson, chairman of the Committee on Election of Officers, reported the result of the ballot of the Association to be as follows: for President, Mr. Robert M. Yerkes, of Harvard University; for members of the Council, elected for three years in succession to Messrs. Franz and Whipple, Messrs. Bingham and Hollingworth. The report was accepted.

Mr. Yerkes reported ten different pieces of work in progress by, and for, the Committee on Standardization of Mental Measurements and Tests. He also reported the financial needs of the Committee to be \$25 in connection with work undertaken by Mr. Bingham on tests for college students, and \$400 for the publication of results on the study of vision conducted by Messrs. Johnson, Cobb, Troland, Watson and Yerkes as a revision of the work previously published by Messrs. Watson and Yerkes. It was voted to receive the report. In the discussion which followed question was raised as to the possibility of standardization, and a motion was made by Mr. Franz that the Committee be discharged. After a debate in which Messrs. Dunlap, Cattell, Buchner, Warren and Jastrow participated, the motion was defeated. It having been remarked that a considerable item of expense to the Association was involved in the free distribution of its publications to its members, it was moved by Mr. Woodworth, and carried, that it was the sense of the Association that its monographic publications should no longer be distributed free to members.

Mr. Bingham reported for the Committee on Teaching Experiments that Mr. W. F. Dearborn had completed a series of experiments on learning, and that Mr. Sutherland was gathering accounts of other teaching experiments. He reported the need of an appropriation of \$20 to further this work, and moved to recommend that the Committee be continued under the chairmanship of Mr. W. F. Dearborn. The motion was carried.

Mr. Baldwin reported for the Committee on the Academic Status of Psychology, and offered in printed form a report entitled "A Survey of Psychological Investigations with Reference to Differentiations between Psychological Experiments and Mental Tests," copies of which will be distributed to the members of the Association. It was moved and carried that the report be accepted, and that the Council be instructed to consider defraying the costs of its printing. Mr. Warren moved that the Committee be authorized to charge an amount not to exceed twenty-five cents for this report, except in the case of a single copy to be sent to each member. Mr. Jastrow moved, and it was carried, that this matter be referred to the Council.

Mr. Warren reported progress for the Committee on Terminology, and hoped to be able to offer some tentative results another year. It was voted that the report be accepted and the Committee continued.

Mr. Woodworth reported for the Committee on the Anniversary Celebration regarding the advisability of publishing the papers prepared for this occasion. It was voted that the question of such publication be referred to the Council.

The Secretary then read the resolutions offered at the previous meeting in amendment of the constitution with reference to the election of officers. Resolutions 1 and 2, containing the amendments to Articles II and III, were voted on second reading, and the constitution now stands amended. Resolution 3, which contains a by-law providing the mode of securing elections, was then adopted with an amendment substituting "seven" for "fifteen" days as the time before the annual meeting when the final count of ballots shall take place. (The above resolutions were printed in full in the annual Proceedings of the twenty-fourth annual meeting, 1915.)

Two letters addressed to the Association were then read. The first was from Mr. M. G. Lloyd, of the *Electrical Review and Western Electrician* proposing the publication of a monthly journal dealing with scientific instruments and methods of measurement and research. Coöperation and support from the members of the Association was solicited. The second letter from the permanent secretary of the American Association for the Advancement of Science called attention to the expiration on January 1, 1917, of the invitation to members of affiliated societies to join the American Association without payment of the five-dollar entrance fee.

The following items of business reported by the Council were then acted upon:

I. Mr. H. S. Langfeld, of Harvard University, was nominated as Secretary-Treasurer of the Association for the ensuing three-year term. It was voted that the Secretary cast the ballot of the Association for Mr. Langfeld's election.

II. An invitation from the president of the University of Michigan to hold the next annual meeting of the Association in Ann Arbor was read. The Council recommended that determination of the place of meeting be left in its hands with power. The recommendation was adopted. (At a subsequent meeting of the new Council it was decided that the invitation from the University of Michigan should be accepted.)

III. Upon nomination by the Council, the Association elected Mr. G. C. Basset, of the University of Pittsburgh, as its representative for 1917 on the Council of the American Association for the Advancement of Science.

IV. The Secretary reported that the Council had ordered three copies of the complete file of Proceedings of the Association since its foundation to be bound for preservation, and that other copies of various years now on hand (3rd to 24th meetings) might be had by persons willing to pay for their transportation.

V. The Secretary reported the deaths of the following members of the Association: Josiah Royce, September 14, 1916, aged sixty; Hugo Münsterberg, December 16, 1916, aged fifty-three, and Naomi Norsworthy, December 25, 1916, aged thirty-nine.

VI. The Treasurer's report, as printed below, was then read and accepted. The following budget, prepared by the Council, was also read and adopted: .

ESTIMATE OF RESOURCES

On deposit.....	\$100.00	
Dues.....	300.00	
Interest.....	90.00	
Sale of monographs.....	?	
Authorized withdrawal from principal funds.....	<u>200.00</u>	<u>\$690.00</u>

ESTIMATE OF EXPENDITURES

Printing and supplies.....	\$125.00	
Postage.....	50.00	
Reprints.....	50.00	
Abstracts.....	30.00	
Incidentals of meeting.....	25.00	
Apparatus exhibit.....	25.00	
Election committee.....	50.00	
Secretary's stipend.....	250.00	
Binding of proceedings.....	10.00	
Other committees.....	<u>?</u>	<u>\$615.00</u>

Mr. Yerkes moved, and it was voted, that the Council be authorized to withdraw from the principal funds, at its discretion, \$400 for the use of the Committee on Standardization of Mental Measurements and Tests. Mr. Jastrow moved, and it was voted, that the Council be authorized to withdraw from the principal funds, at its discretion, \$50 to apply on the printing account of the Committee on the Academic Status of Psychology. Mr. Bingham moved, and it was voted, that the Council be authorized to withdraw from the principal funds, at its discretion, \$20 for the use of the Committee on Teaching Experiments.

VII. The Secretary reported the following nominations to membership in the Association, and was instructed to cast the ballot of the Association for their election: H. C. Bingham, A.M., professor of education, Ellsworth College; J. W. Bridges, Ph.D., instructor in psychology, Ohio State University; C. C. Brigham, Ph.D., instructor in psychology, Princeton University; H. E. Burtt, Ph.D., instructor in psychology, Harvard University; I. H. Coriat, M.D., assistant visiting physician for neurology, Boston City Hospital; A. J. Culler, Ph.D., professor of psychology, McPherson College, McPherson, Kansas; Josephine N. Curtis, Ph.D., assistant psychologist, Psychopathic Hospital, Boston; E. A. Doll, Pd.M., assistant psychologist, The Training School, Vineland, N. J.; R. M. Elliott, Ph.D., instructor in psychology, Yale University; H. B. English, Ph.D., instructor in psychology, Wellesley College; J. E. Evans, Ph.D., instructor in psychology, Ohio State University; G. O. Ferguson, A.M., associate professor of psychology and education, Colgate University; Sara C. Fisher, Ph.D., professor of psychology, State Normal School, Los Angeles, Cal.; W. S. Foster, Ph.D., assistant professor of education, Cornell University; F. H. Giddings, Ph.D., professor of sociology and the history of civilization, Columbia University; C. T. Gray, A.M., instructor in education, University of Texas; Rose S. Hardwick, M.A., psychologist, New England Home for Little Wanderers, Boston; J. D. Heilman, Ph.D., professor of educational psychology, Colorado State Teachers College; Leta S. Hollingworth, Ph.D., instructor in educational psychology, Teachers College; C. E. Kellogg, Ph.D., Framingham, Mass.; Irving King, Ph.D., assistant professor of education, University of Iowa; Mildred W. Loring, Ph.D., Sarah Berliner Fellow, Johns Hopkins University; M. A. Martin, Ph.D., professor of philosophy and education, Converse College; J. T. Metcalf, Ph.D., instructor in psychology, Smith College; J. J. B. Morgan, Ph.D., Cutting Traveling Fellow,

Johns Hopkins University; W. H. Norcross, M.A., associate professor of psychology, Dickinson College; H. B. Reed, Ph.D., assistant professor of psychology and philosophy, University of Idaho; Mildred E. Scheetz, M.D., Ph.D., assistant physician, Government Hospital for the Insane; Lorle Ida Stecher, Ph.D., professor of psychology, Temple University; E. C. Tolman, Ph.D., instructor in psychology, Northwestern University; M. R. Trabue, Ph.D., instructor in educational administration, Teachers College; H. K. Wolfe, Ph.D., professor of psychology, University of Nebraska.

VIII. The following statement was adopted by the Association in lieu of one now printed on nomination blanks and inserted in the Year Book as a note interpretative to Article I of the constitution:

A proposal for membership signed by at least two members of the Association must be submitted to the Secretary, for the Council, at least one month in advance of the annual meeting. The proposal must be accompanied (1) by a statement of the candidate's professional position and degrees, naming the institutions by which, and the dates when, conferred, and (2) by copies of his published researches. In the absence of acceptable publications of a psychological character, or a permanent position in psychology, the conditions of membership will not be regarded as having been fulfilled.

In this same connection the Council announced the adoption of the following statement of policy:

Proposals to membership that are unfavorably acted upon by the Council must be renewed for action at a subsequent meeting.

IX. With a view to defining the functions of the Program Committee, and the method of submitting papers to be read at an annual meeting, the following recommendation of the Council was adopted:

(1) That the committee be granted full power in the selection and rejection of papers;

(2) That no title shall be accepted unless accompanied by a summary of the paper giving the main points to be developed; that the summary shall be submitted typewritten in triplicate and ready for printing; that it shall not exceed one printed page of the Proceedings, and shall contain no tables or drawings;

(3) That all titles and summaries shall be in the hands of the Secretary on a certain date to be set by the committee and announced to members of the Association;

(4) That the titles of rejected papers shall not be listed on the program, nor their summaries published in the proceedings.

X. The membership of the Program Committee for the ensuing year was announced as follows: Messrs. Baird, Angier and the Secretary.

Under the head of new business the following items were disposed of:

I. It was moved by Miss Martin that the incoming President be asked to arrange for the next annual meeting a symposium on Mental Hygiene. The motion was amended by Mr. Cattell to refer the matter for consideration as to its feasibility to the Program Committee with power. The motion as amended was carried.

II. It was moved by Mr. Langfeld that the Association express its thanks to the local committee for the hospitality of its entertainment by a rising vote. The response was unanimous. The meeting then adjourned.

REPORT OF THE TREASURER FOR THE YEAR 1916

DR.

To Balance from the previous year.	\$2,729.16	
Dues received from members.	299.40	
Interest from July 1, 1915 to July 1, 1916.	93.92	
Sale of monographs No. 51 and No. 53, year ending December 31, 1915.	<u>12.53</u>	<u>\$3,135.01</u>

CR.

By Printing and supplies.	95.37	
Postage.	25.00	
Telegrams.	1.00	
Reprints of Proceedings.	26.62	
Reprints of President's Address.	17.94	
Printing of Abstracts, 1915 meeting.	15.68	
Incidental Expenses, 1915 meeting.	9.61	
Expenses Election Committee, 1916.	37.93	
Secretary's stipend.	250.00	
Exchange on checks.40	
Dues, undeposited.	<u>1.00</u>	<u>480.55</u>
Balance in Fifth Avenue Bank.	99.96	
Balance in Union Dime Savings Institution.	<u>2,554.50</u>	<u>2,654.46</u>
		<u>\$3,135.01</u>

R. M. OGDEN,
Treasurer

Audited by the Council

ITHACA, NEW YORK,
December 20, 1916

TITLES AND ABSTRACTS OF PAPERS

The Laws of Relative Fatigue. (Presidential Address.) RAYMOND DODGE, Wesleyan University.

TWENTY-FIFTH ANNIVERSARY PROGRAM

Psychology and the War. G. STANLEY HALL, Clark University.

Our Psychological Organization and Research. J. McKEEN CATTELL, Columbia University.

Varieties of Psychological Experience. JOSEPH JASTROW, University of Wisconsin.

The Need of a Social Psychology. JOHN DEWEY, Columbia University.

GENERAL AND EXPERIMENTAL PSYCHOLOGY

The Importance of Making Investigations in Mental Hygiene. L. J. MARTIN, Stanford University.

The aim of the paper is to show that the almost universal use of some form of mental hygiene makes it imperative that the American Psychological Association appoint a committee to present a preliminary report on this subject which shall take up among other matters some of the following:

1. A brief account of the teaching of personal and social mental hygiene in and out of universities and suggestions as to improving it.

2. A curtailed summary of the work which has been done by professional psychologists and others in applying mental hygiene to the preventing and removing of mental and physical weaknesses and diseases.

3. An enumeration of investigations along psychological and physiological lines which have a significance from the standpoint of mental hygiene although not directly concerned with it.

4. Hints as to the most promising and useful fields for research in mental hygiene.

5. An examination of the present laws governing the diagnosis and treatment of mental and physical diseases with a view to the modification of old laws and the passing of such new ones as will aid in the putting of mental hygiene on a more scientific basis.

The Control of Accuracy of Movement. K. S. LASHLEY, Government Hospital for the Insane, and the Johns Hopkins University.

For isolation of the factors involved in the control of the accuracy of extent of movement, studies of movement in patients

showing lesions of the afferent nerve roots and spinal tracts have been carried out. The data obtained indicate: (1) Accurate control of the extent of movement of a limb is possible in the absence of all afferent impulses from the limb; (2) hence, reflex control from a moving limb is unnecessary for accurate movement of the limb; (3) correct report of the extent of unimpeded voluntary movement of a limb is possible in the absence of afferent excitation from it; (4) the judgment of the extent of movement in these patients is made upon the basis of the energy expended, as is shown by the fact that the distances of voluntary movement which are estimated as equal vary inversely with the resistance encountered.

Two Types of Mind-lack Suggested by Cases of Cortical and Subcortical Brain-Defect. E. E. SOUTHARD, Boston State Hospital.

The ideas of the paper are drawn from work in the brain anatomy of the feeble-minded (Waverley Research Series) and from certain other material examined in comparison therewith. Enlargements of brain photographs will be presented to illustrate the point.

Notes on Vasomotion in Relation to the Mental Process. GEORGE V. N. DEARBORN, Sargent Normal School.

Nine thousand or more measurements sanction these tentative propositions, as the hemobarograms show: (1) Arterial stuffing and constriction are very active and variable in all persons; (2) peripheral arterial tension is by far the most sensitive and easiest index of vasomotor rearrangement correlate to activity "mental" or "bodily"; (3) the doubleness of blood-pressure measurement ("systolic" and "diastolic") makes possible a partially differential index of activities; (4) the systolic tension represents especially the ever-changing output of the left heart, which latter is quickly variable in size (Gesell) as well as in the frequency of its contraction. The diastolic tension is more dependent on vasomotion, direct and reciprocal. Thus the systolic variations are more directly mental and the diastolic more somatic and vegetative; (5) vasotension-variability is a ready index of the intellectual and affective psychophysical dynamism of an individual ("power of concentration") and as such may have value as a mental test; it is also useful as an index of fatigue, of "nervousness," and of neurasthenia, sometimes; (6) no personal, racial, sexual, or age-differences in the variability have appeared; each hemobarogram is unique; (7) sudden mental

activity, apparently of any sort (*e. g.*, multiplication, imagination of any kind of personal activity, transfers of the attention-line, attention to the arm-sensations, dynamic associations, unpleasant or pleasant affects); active inhibition; breath-holding; and gradual subconscious increase of psychophysical tonus, increase both the systolic and the diastolic tensions, especially the former; so does physical exertion proper; (8) really passive relaxation of the muscles and of the mind; quiet, prolonged recall of happiness; sleep-suggestion; humor; deep breathing; and usually pleasure not allowed to excite, cause a lowering of both; (9) marked rises in both tensional phases occur without conscious accompaniment, suggestive if not demonstrative of the subconscious actions of mind; (10) reciprocal variation of the systolic and the diastolic is very frequent, yet in some cases the two parallel each other for many minutes at a time; (11) true emotion (adrenin and blood-sugar are suggested) lasts much longer than pretended emotion, and "causes" (?) more variation; (12) imaginary neuromuscular fatigue exerts a strong vasomotor influence; (13) *lapsus attentionis* and other less clear conditions lower both tensions suddenly and far; (14) if cerebration proper be dependent directly on blood-supply, the brain must have a hidden and somewhat independent, widely related vasomotion of its own.

Animal, Comparative, and Genetic Psychology: Definitions. R. M. YERKES, Harvard University.

The writer would call the attention of his psychological colleagues to the unsatisfactory usage of the terms animal psychology, comparative psychology, and genetic psychology, in the hope that a scientifically unprofitable situation may be improved by the presentation of what appear to be more logical definitions. At present animal psychology designates the psychology of animals other than the human; comparative psychology is practically synonymous with animal psychology; genetic psychology usually designates the special study of mental development.

The writer wishes to recommend and urge the following usages: (1) That animal psychology shall be used, as contrasted with plant psychology, to designate the psychology of animals, man included; (2) that the psychology of each especially significant type of organism receive its own special designation, as for example, the psychology of man or human psychology, the psychology of the dog or canine psychology; (3) that comparative psychology designate a

method of inquiry, namely, the comparative method, not a particular group of materials or an assemblage of problems (in this sense, comparative psychology would be inclusive of animal and plant psychology); (4) that genetic psychology designate neither a special group of materials nor of problems, but instead, a variety of psychological description, namely, the historical or genetic. Ontogenetic psychology should refer, then, to the study of the development of mind in the individual; phylogenetic psychology, to the study of the evolution of mind in organisms.

It seems decidedly worth while for those who are professionally concerned with the study of mind to accept either these proposed usages, or more profitable ones if they can be found, in place of the current definitions. It is obviously illogical and inconsistent to exclude from the realm of the comparative psychologist any psychological materials whatever. The facts of human life are quite as important for comparative study as are any others. Moreover, it seems wholly natural that we should come to regard genetic psychology merely as a special interest, which may be advanced not only by the application of the comparative method but in many other ways. Behavioristic developments will inevitably favor such usages as are here suggested, and it may safely be predicted that comparative and genetic psychology will gradually come to designate the general science, and human psychology a special and narrowly limited branch of it.

Blood Pressure and the Attention. H. C. McCOMAS, Princeton University.

The following experiments performed in the Princeton Laboratory were designed to detect relations existing between changes in blood-pressure and variations in the ability to concentrate the attention. The apparatus used for blood-pressure was the Oliver manometer. To detect variations in the concentration of attention an apparatus was devised to register discrimination reactions for four differently colored lights appearing in an irregular order for ten minutes. The time of each reaction and the false reactions were registered upon a kymograph.

In one series of tests the subject was examined early in the morning, at midday, late in the afternoon, and late at night. The results show a high positive correlation between the rise in diastolic pressure and the excellence of work in continuous discrimination reactions.

An Ideal Spectroscope for Use in Visual Work. H. M. JOHNSON,
Nela Research Laboratory.

Spectroscopes and monochromatic illuminators at present on the market are not designed primarily for use in physiological optics, and none of them is satisfactory for that purpose. Instruments designed for visual work need not have a high resolving power, since the minimal effective difference in wave-length is as great as the difference in wave-length of the two sodium lines. Such instruments should give a maximal intensity of homogeneous illumination, however, together with a maximum of purity. The latter condition cannot be satisfied in any instrument in which lenses are used between the slits, on account of the proportion of incident light which is multiply reflected at the surfaces of the lenses, and superposed on the *main* spectrum. The effects of spherical and chromatic aberration of lenses are also incapable of complete elimination, and in some work are extremely troublesome. It is feasible, however, to use concave mirrors, figured so as practically to eliminate both axial and oblique spherical aberration, having a large angular aperture and a permanent surface of a high coefficient of reflection, in the collimator and the telescope. By this means the most troublesome features may be eliminated.

The parts should be mounted so that the axes of the collimator and the telescope are fixed, and the wave-lengths of the beams selected at the second slit should be changed by rotating the prism. The prism used should be of one of the many "constant deviation" forms; or if an ordinary prism is used it should be placed in a Wadsworth mounting. If the parts are properly disposed all the wave-lengths selected at the second slit will have suffered minimal deviation, and will lie in the axis of the telescope. By selecting a prism of the proper form all of the light suffering regular internal reflection at the unused faces of the prism may be deviated outside the effective beam. The light scattered by the instrument may be thus limited to that caused by imperfections of the reflecting surfaces or by dirt on them.

The improvements described were made possible by the active coöperation of several physicists, but especially of my friends and colleagues Dr. A. H. Pfund and Dr. A. G. Worthing.

A Study of Visual Rhythm. C. A. RUCKMICH, University of Illinois.

Architects, sculptors, mural decorators, and artists in general frequently assume the possibility of visual rhythms. But almost

all psychologists who have expressed themselves on the subject of rhythm are in agreement in limiting rhythmical perceptions to the field of auditory, kinæsthetic, and tactual processes. Earlier investigators confirmed the statements of these writers. A few psychologists admit the rhythmization of visual processes, but maintain that the rhythm is itself carried vicariously by other than visual processes, *e. g.*, by the kinesthetic processes of eye-movement. Aside from its practical bearings, the experimental study of the problem is desirable both on systematic and on methodological grounds. Systematically it seems worth while to discover whether the apparent limitation of rhythmical experiences to certain sense departments is a fact. If it is a fact, the question arises: is this limitation a matter of some innate qualitative adaptability or is it merely a case of fortuitous genetic development? Methodologically it is advisable to approach the problem of rhythm from a new angle for the purpose of reviewing the facts obtained in previous investigations. Rhythms dependent upon visual stimuli of variable intensity and duration have been studied and established; but as far as the writer is aware, no experiments have been reported in which visual stimuli of variable quality have been used.

In our own experiments, lasting over a period of two years, series consisting of one to three differently colored lights have been successively exposed in various temporal patterns. The duration of each light was constant and the colors were equated intensively for each observer in extended preliminary series. The integrations of the corresponding perceptions together with an analytical description of consciousness were recorded. The results indicate rhythmical grouping based upon visual perceptions which are often the clearest processes in consciousness. Many phenomena found in connection with auditory rhythms are also persistently reported: (1) accentuation of a member of a group in terms of the intensity or duration of the visual perception, in terms of visual schematization, or in terms of accompanying processes, (2) alterations in the length of intervals preceding and succeeding accented members, (3) presence of kinesthetic or organic processes.

The Influence of Changes of Illumination upon After-Images. L. T. TROLAND, Harvard University and Nela Research Laboratory.

Hering pointed out the importance of the effects produced upon after-images by changes in the brightness of the projection field. Experiments made by the writer with semicircular after-

images, produced by homogeneous light, and projected on one half of a full circular field of the same light, yielded the following results.

If such an after-image be permitted to fade, dimming of the field will bring it back strongly; it again fades, but if the field be brightened and then dimmed it returns. This can be done several times. The total period of rejuvenation may be twelve times that of the original life of the image on the undimmed field. The total period is a function of primary brightness, preëxposure time, dimming time, degree of dimming, size of field, and of the individual. By use of dimming, after-images can be demonstrated for pre-exposures of an eighth of a second, which leave no noticeable trace on the undimmed field. The color values of the image on the dimmed spectral fields are remarkable, both inherently and in relation to their conditions.

If the projection field is brightened, the faded negative after-image is *reversed*, and becomes positive. There is reversal both of luminosity and of saturation values. The positive image fades on the brightened field, but upon dimming and re-brightening, again appears. The total life of this effect closely parallels that of the regeneration of the negative during dimming, and depends upon a similar, complex list of conditions. The governing laws are strikingly analogous to those of the dimming effect, although in some cases in inverse form.

These two sets of phenomena can be given an approximate explanation on the assumption that preëxposure of a given area of the retino-neural system decreases its resistance to change in its state of excitation. Thus, with dimming, the preëxposed area loses luminosity more rapidly than the other, producing a negative image, while with brightening, it gains luminosity more quickly and hence causes a positive image. There are some indications that this modification of resistance is not receptorial, but is localized in sub-receptorial neurones, or synapses. Recent experiments, not yet completed, indicate that the reversal effect, at least, has a distinct dependence upon the wave-length of the stimulus.

An Experimental Note on an Assumption of the Hering Theory of Color Vision. G. F. ARPS, Ohio State University.

It was found that contrary to the requirement of the Hering color theory the grays composed upon the color wheel under a given illumination did not remain indistinguishable if "the objec-

tive illumination be made very faint." Under certain circumstances it was found necessary to add a "white sector of 25 per cent. to the gray composed of blue and yellow in order to restore equality in brightness."

Among others the following series of experiments were made following as closely as possible the conditions prevailing in the Koenig laboratory: (1) Two grays were matched in daylight illumination and transferred to the dark room. The outer ring was composed of red, green and yellow; the inner of blue, yellow and black. Under decreased illumination the two rings became distinguishable so that it was necessary to add black to the outer ring to restore the match. (2) The two grays were again matched, but in this case the outer and inner rings changed positions on the color wheel. As before the rings became distinguishable. (3) The two grays were matched as before, a heavy white cardboard was placed behind the color wheel and observation made as in the preceding experiments. The gray rings became distinguishable, but this time it was found necessary to add white to the outer ring to restore the match.

The experiments seem to indicate that the perception of the two grays is conditioned by the attending circumstances. The grays are affected by the character of the contrasting background, the effect always being greater on the outer ring. Indistinguishability thus disappears with the changed conditions of observation.

Positive and Negative Perception and Recognition. G. C. MYERS,
Brooklyn Training School for Teachers.

I. Of 38 girls of the Brooklyn Training School, 19 crossed out As and 19 crossed out those letters not-As for one minute from a group of 75 As and 75 not-As arranged by chance. The average number of As crossed per minute was 103, of the not-As, 85. The ratio of not-As to As is about .8. Only two cases for the not-As reached or exceeded the median for the As. For 18 other subjects, 9 on As and 9 on not-As, the ratio of not-As to As was still .8 on the fifth successive trial. Likewise merely counting As and not-As gives about the same ratio. According to introspections, in crossing out As the identity of the other letters was rarely noted and in crossing out the not-As the letter A was constantly held in mind, while the identity of those not-A was generally ignored. In conclusion, crossing As is about .8 as difficult as crossing not-As and this ratio is not changed by several practices. Therefore positive perception and negative perception are two distinct processes.

II. The purpose was to study the phenomena of recognizing duplicated elements within a familiar series as compared with the phenomena of supplying omitted members of the same familiar series. Visual and auditory tests were given. For the former, three classes of girls were provided with two lists of the names of their classmates, one with five names omitted, and the other with five names duplicated. Two classes were given the duplicate list first, then the omission list, the other class was given the lists in reverse order. In the auditory test about half of 69 girls supplied omitted names, the other half recorded those duplicated, after one reading by the writer. Then each took the test reversed. These subjects were also tested for omissions and duplicates of numbers between 1 and 15. Five were omitted and 5 duplicated within the same series, for names and numbers.

Supplying and noting duplicates showed about the same efficiency. Of 68 subjects 41 reported the "omissions" as the harder, and 22 the duplicates. Introspections showed an almost universal tendency to check up and memorize the duplicates when they were heard, while the omissions were supplied by subsequently going over all the familiar series and marking those not heard. Therefore, negative recognition (supplying omissions) seems to be fundamentally different from positive recognition (noting duplicates). The study is still in progress.

The Effect on Learning of the Length of Periods of Rest. H. B. HUBBERT, Randolph-Macon Woman's College.

The work described grew out of an interest in problems related to those attacked by Leuba and Hyde, Ulrich, Lashley, and others. The problem is whether a given amount of effort (as measured by the number of trials given) will result in the greatest acquisition of skill if the periods of work fall on immediately successive days or are separated by periods of rest of one or more days. The type of work selected depends on tactile discrimination. The subject was given a pack of 100 shuffled cards containing four "suits" of 25 cards each. The suits were distinguishable by patterns corresponding to them, perforated in the cards. The subjects were required to sort the pack into the four suits by touch alone, the cards and hands being concealed by a screen. Three trials were given at each sitting, and the average percentage of accuracy divided by the average time in seconds constituted the measure of the day's achievement for each individual. The subjects were

students in Randolph-Macon Woman's College, and were divided into four equal groups. Group *A* worked every day; while *between* periods of work group *B* was allowed one day of rest; group *C*, three days, and group *D*, five days.

During the first two thirds of the learning process the achievements of groups *B*, *C*, and *D* averaged several per cent. better from day to day than that of group *A*, the mean variation from the average being relatively large. Group *C* exhibited the greatest and most consistent superiority during this period. As the learning process approached the limit, the advantage, as might be expected, tended to disappear. The results raise several interesting questions regarding the optimal distribution of lecture-periods, study-periods, etc., provided the selected learning process is general in type.

Experimental Studies in Memory. E. F. MULHALL, Vassar College.

This paper is concerned with the following questions: (1) Does the person who *recalls* one material well also *recognize* that material well?—*i. e.*, is there any correlation between recall and recognition? (2) Does the person who *recalls* one material well, also recall another material well?—*i. e.*, is there any correlation between the recall of different materials? (3) Does the person who *recognizes* one material well, also *recognize* another material well?—*i. e.*, is there any correlation between recognition of one material and recognition of another material? (4) Are there sex differences in achievement in recall and recognition? (5) Is there any difference in sex variability? (6) Is there any difference in the scores of the children of different ages and grades for recall and recognition?

The results are based on six memory tests: recall of words, geometrical forms, nonsense syllables, and recognition of the same. These were given to 285 boys and 353 girls in grades 4-*A* through 8-*B* in a large city public school. The results were as follows: (1) The average of all coefficients of correlation between recall and recognition is .21. Thus it seems that a person who recalls well may or may not recognize the same kind of material well: we know little about one's score for recognition from his score for recall, and *vice versa*; (2) the average of all the coefficients of correlation for recall is .09; (3) the average of all the coefficients for recognition is .18, thus showing that a person who can recognize one material may not recognize another well (the coefficients are about the same for the different materials of the above tests); (4) there is probably little or no sex difference in achievement; what difference there

may be is not in the processes of recall and recognition; (5) no marked sex difference in variability is present; (6) the results show an improvement in both recall and recognition, varying somewhat in degree according to material and process, from grade 4-*A* through 8-*B* regardless of age, and from age nine through sixteen regardless of grade within this range. Further analysis of the data seems to indicate that both age and grade have an influence, probably age especially.

Alleged Elements of Waste in Learning a Motor Problem by the "Part" Method. L. A. PECHSTEIN, University of Rochester.

When a motor problem of the maze type is used as a basis of test, it can be demonstrated that several factors generally supposed to condition the waste found in learning rote and logical material by the "part" method fail to operate. Chief of these alleged causes failing to render the "part" method inefficient in the motor field are as follows: Loss due to negative transfer in the learning of the motor units; loss due to disintegration through time; loss due to retroactive inhibition; loss due to contiguity of unit functioning; loss due to unit incompatibility in a larger series. The weakness of the "part" method occurs in the complex act of connecting the several motor units. The disturbing factors here are statable in the spatial and temporal series. When the connecting act is properly controlled, the "part" method of learning becomes not only equal to, but far surpasses the "whole" method. This generalization is made solely for the motor problem of the maze type, though it bears important implications for any motor activity and also for the mastery of rote and logical material.

Simultaneous vs. Successive Association. SVEN FROEBERG, University of Michigan.

In a recent paper Wohlgemuth presents some experimental data in support of the theory which holds that association is always between simultaneous experiences. When association appears to be formed between two successive experiences the assertion is made that it is in reality formed between the succeeding experience and the disappearance phase of the preceding one. The theory is regarded as proved because the results seem to indicate that simultaneous presentation is more advantageous than successive for the learning of paired associates. Since certain features of the work seem open to criticism, such as questionable assumptions

and the large P. E., it was considered worth while to repeat the experiments with various material and different methods. The results seem to point to the opposite conclusion, namely that successive presentation is more advantageous than simultaneous, provided the succession is immediate.

The Doctrine of the Stages of Consciousness. R. M. OGDEN, Cornell University.

In the solution of problems concerning number of sides and angles of polygons, Ernst Westphal has differentiated five stages of consciousness, as follows: (1) The result of the task is "given" in consciousness (*bewusst gegeben*); (2) the object is noted (*beachtet*) from the point of view of the task; (3) the object is potentially known, though unexpressed (*potentielle Wissen*); (4) the object is known, and the knowledge formulated (*konstatiert*); (5) there is also a lower stage than the first when the result is not given at all, but only the data from which it is obtained (*erschliessbar*).

Since Westphal's analysis is experimentally restricted to the problems of his investigation, it considers only the envisagement and solution of certain tasks, primary and secondary, which the instruction has set. In the interest of a more general psychological interpretation we may revise his stages into the following: (1) *Simple presentation*, embracing essentially the contents, sensory, imaginal, etc., registered, however vaguely, at any moment of consciousness, but without reference to directive tendency or mental activity other than possibly that of free association; (2) *awareness*, which is effected by act of attention, and is registered as a clarification of the contents acted upon. Varying degrees of clearness may result; (3) *knowing*, which as Westphal has shown may achieve different stages of fullness and completeness. The precise number of stages depends upon the nature and urgency of the problem, but all may be said to arise from the unique *act of relating*, whereby the task or point of view influences the correlation and unification of certain contents into a meaningful whole.

Contents of mind must first be presented. Attention must then be aroused before further action upon them can be had. Attention may be conditioned in an objective or sensory fashion; it may likewise result from tasks previously defined in consciousness. The degree of clearness is irrelevant so long as the content or contents to be related emerge at all. The relating activity bears upon those which emerge and are relevant to the problem or

problems at hand. The amount of work done, varying from mere envisagement of parts as formally available, to the definite establishment of a judgment, formulated and expressed, is a matter of the precise nature and urgency of the issue.

Auditory and Tactual Illusions of Movement. H. E. BURTT, Harvard University.

The work of Wertheimer and Korte upon the kinematoscopic illusion and their explanation of the phenomenon in terms of *physiologische Kurzschluss* between the two regions of the cortex corresponding to the two points in visual space, suggested a study of the same illusion in audition and touch. The similar tactual or auditory stimuli in quick succession in different positions were found to yield the illusory movement from one position to the other. Moreover the same relations between the time, distance and intensity factors that had been found to be operative in producing the optimal effect of visual movement proved to be involved in the present case. For instance, the times of exposure and interval were reciprocally related; increase of intensity of the second stimulus produced the apparent movement in the reverse direction.

The auditory results necessitate a reconsideration of Wertheimer's theory, for the auditory organ is not stimulable at different points as are the retina and the epidermis, and there is no evidence for the correlation of separate points in auditory space with separate regions of the sensory cortex. Yet the same subjective phenomena are manifested in all three sense departments. The writer is inclined to explain the illusion on the basis of the action theory. A sound produces by its binaural intensity difference a motor impulse to turn the head or eyes in its direction. If another sound follows shortly there is a second impulse to turn still farther. The sounds may thus be cortically represented by impulses of different intensity in the motor regions leading to the muscles of the eyes or neck, and when the second stimulus supervenes quickly enough there is a continuity of impulses. A similar factor may well be involved in the visual and tactual illusions. Such stimuli produce impulses to make some muscular adjustment in order to more clearly perceive the source of stimulus. At least Wertheimer's theory is inadequate for the auditory phenomena. The writer hazards the belief that all three forms of illusion are due to a continuity of motor impulses.

Sound Intensity Apparatus. A. P. WEISS, Ohio State University.

This apparatus was designed to investigate those problems in audition in which tone intensity, or loudness, might be considered an important factor. The apparatus will give: (1) a number of pure tones; (2) control of the intensity of the tones; (3) control of the phase relations in which the sound waves reach the ear.

The system consists of (1) batteries, (2) rotary converter, (3) regulating fork, (4) interrupter disks, (5) tone forks, (6) resonators, (7) timing device.

The storage batteries drive the direct current end of the converter. On the converter shaft are mounted a series of interrupter disks which furnish interrupted currents of various frequencies. These currents pass through the magnets of the tone producing forks which thus vibrate without the contact noise of the ordinary electrically driven fork. The alternating current generated by the converter is used to regulate the speed of the converter so that the angular velocity is practically constant. For this purpose a regulating fork is used which opens and closes the alternating current circuit in such a way that it acts as a variable load which either retards or accelerates the converter.

Any number of tone forks may be driven at the same time and the phase of the forks can be determined by the relative positions of the interrupter disks. The tone forks are mounted on a heavy iron frame and vibrate silently and continuously. To produce a tone a resonator, properly tuned, is moved near the fork and the distance of the fork from the resonator determines the intensity of the tone.

The mouth of the resonator is opened and closed by a shutter which may be controlled magnetically, either by pressing a key or by a timing device. In this way the duration and order of presentation is brought about.

Some Experiments in Motor Reproduction of Visually Perceived Forms. G. R. WELLS, Oberlin College.

A series of somewhat complexly curved figures was presented to the subject by means of the Whipple tachistoscope. The subject was instructed to call for the smallest number of presentations which was necessary to enable him to be sure that he could reproduce it on paper, being urged to make the number of presentations as small as possible. Immediately after the presentation of a figure in this manner the subject reproduced it with pencil and paper.

There were two sets of figures so studied, and they were reproduced under different conditions, as follows: (*A*) The figures were drawn on paper in full sight of the subject; (*B*) the figures while being drawn were concealed from the sight of the subject. In all other respects the conditions under which "*A*" and "*B*" were performed were identical.

Twenty subjects were used. Care was taken that a practice effect did not prejudice the results. Half the subjects reproduced by the "*B*" method the figures which the other subjects reproduced by the "*A*" method, and *vice versa*. Each subject, therefore, worked in both ways. It is shown that the results of the "*B*" method of reproduction are superior to those of the "*A*" method: (1) in total average results, when the performances are scored according to a carefully arranged system of evaluation; (2) in the actual number of subjects whose performances under the "*B*" conditions are better than under the "*A*"; and (3) in the reports of the majority of the subjects as to the relative ease and satisfaction of working under the two conditions.

The Spatial Differential Threshold for Finger Span. H. S. LANGFELD, Harvard University.

The threshold was obtained for the perception of differences in the size of an object grasped between the thumb and forefinger as given by the sensations of touch, muscle, tendon and joint. Sensations of movement were made constant and thus ruled out as a factor. The instruments used were specially arranged calipers. Six subjects took part in the experiments. Practice effects were almost eliminated by six months' preliminary training. The method of constant stimuli was employed and the threshold calculated according to the $\Phi(\gamma)$ hypothesis. For purposes of comparison three methods of presentation of stimuli were used on all the subjects: (1) The standard and comparison distances were grasped successively by the right hand; (2) the two distances were grasped simultaneously, one by each hand; (3) the two distances were grasped successively, first by one hand, then by the other. The thresholds under these three conditions were calculated separately. Comparatively large individual differences were discovered. A further object of the experiment was to ascertain the degree of correlation between accuracy and confidence. For this purpose the subjects graded their judgments according to the degree of subjective certainty. Beside finding the individual characteristics

in this respect, it was also possible by using these data to analyze the distribution of the various degrees of certainty over the right and wrong judgments, and for the different degrees of objective difference. When the subject reported a mere guess on equality judgments, he was forced to guess one way or the other. The results of these judgments showed the effect of unconscious factors.

A New Method with the Complication Experiment. K. DUNLAP, Johns Hopkins University.

The present method of working with the complication-experiment is one I tried in rougher form several years ago, and for which I have been building improved apparatus during the last two years. It consists essentially in either (1) illuminating the dial of the complication-apparatus intermittently, or (2) interrupting the visual impression the observer receives from the constantly illuminated dial. When the light-period, as compared with the dark-period, is short, the observer, fixating some point on the dial, sees the moving index-hand sharply outlined at a series of positions, whose spatial separation is governed by the rate of intermittence. If the observer's eyes move, not only the positions of the index-hand, but also the marks on the dial become badly confused, so that the observer finds fixation the only easy method, instead of the reverse as in the old method with continuous vision of the dial. For use by the new method, an improved complication-clock, motor driven, has been built. By means of a vernier scale, the discrete stimulus can be set with great accuracy at any point in the circle of rotation. A sound stimulus which is *single, short*, and does not vary with speed, is produced by the aid of the automatic relay which was built for this work.

The procedure so far found most satisfactory, is to keep the illumination of the dial constant, and interrupt the observer's vision. For this purpose, a special revolving shutter has been built, consisting of two discs closely approximated on a common axis, each having two adjustable apertures, and revolving in opposite directions before the observer's eyes, so that the two eyes are exposed simultaneously. As the intermittence reduces the brightness of the visual image, the dial is illuminated by a nitrogen lamp of sufficient intensity.

The oldest method of observation is used, *i. e.*, the sound stimulus is set at a certain point, and the observer is required to judge what this point is. The apparatus is designed to be used ultimately with

both Burrow's method and Klemm's method, but attachments for these have not yet been put on.

The absolute exclusion of eye-movement by the above-described method of course does not in itself abolish the normal illusion, since there is still a reaction by which one position of the pointer is picked out. But the abolition of the illusion is made easy, and the only change from my earlier conclusions is that the reaction which fails to synchronize with the sound is not necessarily an eye reaction.

The Synthetic Method in the Study of the Behavior of the Higher Vertebrates. W. CRAIG, University of Maine.

In order to understand the behavior of a single species of animal, the psychologist may well devote his entire time to the study of that one species. Doing so, he finds that he must apply a great variety of methods, even of separate sciences. For example, a study of the behavior of doves, in order to be at all complete, must include not only the customary investigation of the senses, reflexes and instincts, intelligence, and a good deal of physiology, but also ecology, life histories studied in the field, individual histories studied in the aviary, development and education of the young (with interpretations in the light of child psychology), emotional behavior, language, music, social behavior, sex behavior, "mental mechanisms," valuation, and other studies. The need and the justification for each of these studies in bird behavior are shown concisely in the complete paper. All these phases of behavior are so intimately interrelated as to constitute one complex whole. Any single reaction may involve many of the phases of behavior here mentioned, and be an integral part of the bird's whole life. By studying only one phase of behavior, *e. g.*, in one problem box, the observer may reach fundamentally wrong conclusions, because of not understanding his subject. Of course there must be specialists on certain methods and apparatus, to develop each to the highest perfection. But there should be other specialists, who choose the synthetic study of one animal. For animals, like persons, are individuals, and they need to be understood as such.

The Grasping Reflex in Infants. J. B. WATSON & J. J. B. MORGAN, The Johns Hopkins University.

Arrangements have been made in the psychological laboratory at the Johns Hopkins Hospital for an extensive study of the reflexes, instincts, and early habits of the human infant. The

grasping reflex has so far yielded the most rapid results. Several hundred observations have been made upon children ranging in age from a few hours to two or three months. The grasping reflex is present in all but exceptional cases. A measure of the strength of the reflex has been made. Most infants lying on the back are able to cling to a rod with either the right or left hand until the full body has been lifted, and to maintain this position for an appreciable time. If the infant is very heavy the complete weight cannot be lifted, although the grasping reflex is present in the heaviest babies. The factors entering into its modification have not yet been sufficiently studied. The reflex cannot be looked upon as atavistic in any degree; but on the contrary as an important and fundamental mode of response; one upon which varied habits of manipulation are grafted. The reflex seems to give way *pari passu* with the putting on of habits of manipulation. There is some slight evidence to show that it persists for a longer period of time in cases of underfeeding than in normals.

Distribution and Elimination of Errors. H. A. CARR, University of Chicago.

The average temporal order in which the various *cul de sacs* were eliminated was determined for nine mazes. This order was correlated with that representing the spatial proximity of the *cul de sacs* to the food box. Positive values were obtained for six mazes and negative values for three. The *cul de sacs* were now arranged in an order representing the number of entrances for successive stages of learning. This order was correlated with the temporal order of elimination. Negative values were invariably obtained for all mazes and for all stages of mastery. The difficulty in mastering any *cul de sac* is a function of the frequency with which it is entered; elimination must be explained to a large extent in terms of the distribution of errors. Some of the factors determining the relative frequency of entrance into the various *cul de sacs* are the returning tendency, changing motives, and the character of the maze habit.

The Discovery of Autistic Thinking During a Memory Test. C. S. YOAKUM, University of Texas.

In a preliminary study of an experimental problem, we had occasion to use the Binet letter squares to establish individual norms for immediate memory. One subject showed the greatest pleasure

in this mechanical work. A chance remark led to the discovery that every card, each card containing twelve consonants, recalled a "story" and the consonants acted as "cues" for different parts of the "story" thus revived. Although only twenty seconds were allowed in which to memorize each card and over one hundred cards were used, yet less than thirty per cent. of the "stories" were repeated and this subject made 98.7 per cent. of a perfect score. In these "stories," we find a series of individual fancies and experiences that correlate and form a picturesque life history unrelated to the subject's usual activities. The main objective evidence for this inner group of thoughts lies in an extreme emotional impatience when certain topics are broached and in the pleasure accompanying memory tests. Further study shows that this emotional impatience occurs when some situation is presented in which the subject cannot participate because of "ideal" formulations that conflict. As soon as the subject is fully aware of the instinctive tendencies that are in arrears and realizes clearly that others are unsocially developed, the change in behavior begins. Independent sources of information show that such a change has occurred in this subject. Her childish voice is changed; her petulance is lessened; her resistance to non-imaginative experiencing has changed to a curiosity that leads her to try out actual activities.

A Theory of the Origin of Delusions of Persecution. T. H. HAINES, Columbus, O.

The history is of a robust male who came into the care of a hospital for the insane at thirty-four years of age on account of his systematized delusions of persecution by the father of a fraternity brother. The persecutors had pursued him half way around the earth repeatedly, and in many different positions in life. These delusions seem to have originated in an inherent defect in his character, which lies in the conative side of his nature. The patient is intelligent but apparently constitutionally incapacitated for carrying through to completion anything to which he sets his hand. He hated to finish things even as a boy. The patient's first serious break with himself occurred when he was twenty-four. He left his place where he had been for six years, and without any plan for the future, because he could not earn enough to support the girl he wished to marry. Soon after this he broke his engagement and went to the Philippines. There he became aware of persecutions of the "old man," father of his friend, in an eastern city in

the United States. He believed this man was using his powerful relations in business, church, and government circles to spread the word that the patient was sexually incompetent. This persecution became so hot that he left the islands. Insinuating references were made to him in an entertainment on shipboard. His fraternity opposed the financing of his scientific expedition. He tried theology. He secured a quiet position in a museum. He had to change from each of these. He could not live alone in the old family home. All along he insisted he was to be married to his former fiancée, though he knew full well she had married another. This patient appears to be perfectly normal except for these delusions and his contentment with confinement.

Analyzing his mental makeup we discern: (1) *Lack of persistence* of purpose; (2) emotional inconstancy (a cyclothymia); (3) depression at times, sometimes very irritable and quarrelsome; (4) mental *awkwardness* and morbid introspection; (5) *realization* of his social and economical incompetence, which proceeds from mental awkwardness and lack of persistence of purpose. In order that his subjective world shall be consistent and unified, the patient must see the real cause, or hypostatize another. He has too much ambition and self-esteem to assume responsibility for the abortions of his career. He is, therefore, driven to invent his persecutors as a *defense* for (explanation of) his character defects.

*Personality as Revealed by the Content of Images.*¹ L. J. MARTIN, Stanford University.

The aim of the present investigation was to ascertain whether it is possible through the examination of the content of an individual's images to obtain an insight into the predominating features of his personality, that is, the psychical and physical activities which characterize and distinguish him from others.

The experiments of Series I were made by the visual image method, and those of Series II by the feeling image or reinstatement method. In half the experiments of each series, the images were spontaneous, that is, the observer allowed them to arise of themselves, and in the other half he used his will in arousing them. Naturally the method was *unwissentlich*. Twenty observers took part.

¹ Summary of the address given by the retiring Vice-president and Chairman of Section H, Anthropology and Psychology, American Association for the Advancement of Science, New York meeting, December, 1916.

Opinions based upon the experimental results as to the observer's mental and physical activities are confirmed by what has been published concerning him, by his general reputation in the community, by what his intimate friends say of him, by my knowledge of him and by his own opinion expressed after the experiments were completed. The results everywhere show that images are not isolated entities, but are closely bound together, supporting and supplementing each other as information bearers and for this reason one gets, through taking images apparently at random, typical examples of the entire range of an individual's imagery. Stated briefly, the results show that the image method is a mode of "sampling" which is adequate for a diagnosis of a personality. Both of the above series are needed in making such an investigation, for in some cases emotions transform major image centers into minor, and *vice versa*. Moreover, feeling has an energizing and a non-energizing effect on thinking and acting that must be taken into account. Supplementation and modification of Series I and II would be desirable, as, for example, the effect on imagery of shifting the environment systematically. Again, experiments where the experimenter suggested the subject of the image would throw light on the initiating thought power of the observer. Experiments were also made by the association method. The results showed that the image method yielded much more information concerning the personality of the observer.

An Experiment in Vocational Selection. W. D. SCOTT, Carnegie Institute of Technology.

The adequacy of a vocational test is determined by checking it with some recognized standards. Three such standards were presented at the annual meeting last December. A fourth standard has been used as a further check and has served to corroborate the results secured from the other three standards.

In a selling organization over 85 per cent. of all new men failed and resigned annually for a period of several years. During the last two years groups of applicants for these selling positions, after having been recommended for appointment, were submitted to a series of tests. During the same period and in the same territory other groups were tested composed of those who had been successful in selling in the same territory. A comparison of the accomplishments of the candidates, most of whom fail, with the accomplishment of the successful salesmen indicates the adequacy of the tests for differentiating the two groups. This particular standard of

comparison is ordinarily available and offers a rough and ready method of testing tests.

PAPERS ON EDUCATIONAL PSYCHOLOGY

Experiments with Different Types of Readers. C. T. GRAY, University of Texas.

It is the purpose of this paper to present some of the results of an investigation in which different types of reading were studied by means of various tests and experiments.

The subjects were only sixty in number (that the work might be intensive rather than extensive), distributed through the various elementary school grades, from the third to the seventh. In addition to these, other persons were secured from the different high-school grades, and also from the various classes in college. For the purpose of measuring oral reading ability Gray's *Oral Reading Scale*, which consists of twelve short selections, was used. In addition to this, three poetical selections and one oratorical selection were used. In giving these tests, the time was recorded and all mispronunciations, omissions, repetitions, insertions were noted. In addition to the above points, a grade was given upon interpretation, poise, pitch, emphasis, force, and articulation. Silent reading was tested by having the subject answer questions upon the material read, by reproduction, by outlining, by a test in rapid reading, by a direction test, and by a newspaper test. A very important point suggested by this part of the work is that there are different methods of reading which vary with the purpose which the reader has in mind while reading.

The experimental work included both perception and motor tests. The perception tests consisted of: (1) Short exposure work with both sense and non-sense material; (2) voice-eye separation test in oral reading; (3) test for determining the relation of the focus and margin of attention in silent reading. The motor tests were as follows: (1) Rate of vocalization; (2) amount of vocalization in silent reading; (3) relation between breathing and oral reading; (4) eye movements.

The work in perception may be summarized in the one statement, that there is a high correlation between the span of attention and the rate of reading. That is, the slow reader usually has a short span of attention, while the fast reader usually has a much greater span than the slow reader. That part of the work which was devoted to eye movement shows clearly that there are different

types of rapid readers, and that the regressive movements may indicate a method of reading.

An Application of Standard Measurements of Achievement in School Work to a Group of Delinquent Women. M. A. CLARK, Laboratory of Social Hygiene.

In this paper are presented the results obtained from a series of standardized tests in school subjects given to 100 delinquent women at the time of their admission to the New York State Reformatory for Women at Bedford Hills. The series included the Thorndike Reading Scales, A and Alpha, the Kansas Silent-Reading Test (Kelly), the Courtis tests in arithmetic, a list of words selected from the Buckingham Spelling Scale, and the Trabue Completion-Test Language Scales.

The correlation of these tests with one of the modifications of the Binet Scale, which had also been given to this same group, was worked out as an indication of the relation between achievement in school work and native ability. As an indication of the relation between present capacity in the various school subjects and the amount of school training which a given individual had received, the ratings of the women in the tests are compared with the grades which they had made in school, and also with the number of years which they had taken to cover a given number of grades.

The Relative Value of $6\frac{1}{2}$ Minutes vs. $4 + 2\frac{1}{2}$ Minutes in Studying a Page of History. A. S. EDWARDS, University of Georgia.

Classes in high school and grammar grades were divided on the basis of school grades in history by the teachers. Half of each class was a review group; half a non-review group. The non-review groups studied $6\frac{1}{2}$ minutes, wrote 12 minutes and took an examination from ten to twelve days later. The review groups studied 4 minutes, wrote for 12 minutes, and about 5 or 6 days later reviewed $2\frac{1}{2}$ minutes. They were examined five or six days later. In order to check the factor of recency, part of the non-review groups studied when the review groups studied, and part studied when the review groups reviewed. The total amount of time was thus the same for all. It is found that the review groups were without exception better in reproduction. In the experiments in which the non-review group studied when the review group studied, the review group reproduced nearly twice as much per pupil as the non-review group. In the experiments where the non-review group

did their study of 6½ minutes when the review group had their *review*, the review groups reproduced per pupil as high as fifty per cent. more than the non-review group. All papers were graded in exactly the same way according to plan so that the results should be strictly comparable.

The Problem of Handedness in Education. W. F. JONES, University of South Dakota.

Out of 10,000 persons 417 are born left-handed, 9,853 are born right-handed; 4 per cent. of the race are left-handed, 96 per cent. are right-handed. Out of 417 born left-handers, 323 shift to the right-hand. 77 per cent. of born left-handers adopt the minor arm. Out of 417 born left-handers 4 are shifted by accident, 1 per cent. of all left-handers; 319 are shifted by purposive interference; 94 are allowed to use the major arm. Out of 9,583 born right-handers 96 are shifted to the left hand, 1 per cent. (accident). 419 persons (323 plus 96) out of 10,000 adopt the wrong arm, that is, one person out of 25 is using the minor arm.

Conclusions from skill tests of the three types of handedness are: (1) The pure left-hander reveals no less skill than the pure right-hander; (2) the shiftover is regularly deficient in hand and arm skill though the average skill of his two hands is equal to the average skill of the two hands of the right- or left-hander, he has two minor hands and arms rather than one dextral and one minor; (3) it is possible to shift back to the major arm if the shiftover does not show a muscle swell of minor arm exceeding that of the major (born) arm, and if the shiftover is below adolescence the back-shift should be made.

The Learning Curve Equation. L. L. THURSTONE, Carnegie Institute of Technology.

The learning curve equation is an attempt to state the learning process of any single individual for any particular kind of material as a law, expressed in the form of an empirical equation. About forty different equations have been tried and among these one form of the hyperbola seems most available both from the standpoint of satisfying learning data and from that of ease in statistical manipulation. The equation, so selected, takes the form $y = [a(x + c)] / [(x + c) + b]$, in which x = *formal practice* in terms of the total number of practice acts since the beginning of practice or a multiple thereof, y = *attainment* in terms of the number of successful acts

per units of time, or a multiple thereof, c = *equivalent previous practice* in terms of units of formal practice, a = *physiological limit* in terms of attainment units, b = *rate of learning*, a pure number, expressing the rate at which the physiological limit is being approached.

$v = \Sigma(d)/n$, in which v = *variability coefficient*, d is the deviation of the individual learning scores from their theoretical values as determined by the equation, n is the number of observations.

A high variability coefficient indicates an erratic learning subject, a low variability coefficient indicates a steady improvement in the learning function.

It should be noted that each one of these four coefficients is based on all the observations combined, and that by substituting their numerical values in the learning curve equation we obtain a general law for the learning process.

The applications of this statistical procedure are perhaps obvious. By means of it one may attack scientifically such questions as the prediction of the limit of practice from a limited number of observations, the relationship between the rate of learning and the limit of practice, the relative effectiveness of different learning attitudes, concentrated versus distributed effort, all the classical problems in memory, and the relative effectiveness of teaching and learning methods wherever attainment can be quantified.

PAPERS ON MENTAL TESTS

The Evaluation of a Method for Finely Graduated Estimates of Abilities. J. B. MINER, Carnegie Institute of Technology.

Estimates on general ability, and five more specific traits, common sense, energy, initiative, leadership, and reliability were obtained for each senior at Carnegie Institute of Technology from members of the faculty who knew him best. The estimates were made in terms of fifths of a defined group with the opportunity for finer grading within these five steps of the scale by means of a dot placed on a standard line divided into fifths. The results show such agreement of two judgments with two others on the same students that it seems not to be necessary to have all of the group estimated by the same judges. How fine grading is desirable was determined by the coefficients of reliability. The records afford the employment office information to supplement scholarship ratings. Certain relations of the estimated abilities have been meas-

ured. It is proposed to correlate them ultimately with records of the success of the graduates.

A Dissected-Story Test. K. GORDON, Carnegie Institute of Technology.

An anecdote, sixty words long, was cut into eighteen parts. These parts were pasted on separate cards and spread on a table in a certain incorrect order. The subject of the test was directed to re-arrange them as quickly as he could, so as to make out of them a consecutive story. The exercise seems to test a certain facility in language, and a readiness in making and breaking combinations of ideas. It has been given individually to 78 college freshmen girls, and to 17 college instructors, of whom 9 are women and 6 are men. The time of performance ranges for the students from 80 to 1,320 seconds, the median being 306 seconds. The range for the instructors is 89 to 302 seconds, the median being 189 seconds. In the case of 47 students it was possible to compare rank in this test with an amalgamated rank from six other tests, with the result: $r = .60$.

A Graded Series of Dovetail Puzzles. G. H. KENT, Grafton, Mass.

In view of the number and variety of mental tests that have appeared during the last few years, it is fair to raise the question whether the practical value of these devices is sufficient to justify so great expenditure of effort. In the clinical field the results are disappointing; but this may be due to our tendency to expect too much. At least, the test is useful for tentative classification of subjects who are waiting their turn for a more thorough examination. In my work among insane subjects I have found non-verbal tests more serviceable than tests requiring a verbal response, because the former are applicable to patients having no knowledge of English, to aphasic patients, to patients who cannot be induced to speak, and to patients whose speech is too incoherent to be intelligible.

This series of puzzles is offered as a means of measuring mechanical ability of a certain type and determining to what extent this ability depends upon special training. One need not take time to allow the subject to solve all the puzzles of the series, for the ability which is measurable by this method can usually be determined by the use of two or three puzzles. The extremes of the series will be used comparatively little, but they are necessary in

order to give the test a wide range of applicability. It is possible, if desirable, to extend the series still further.

No attempt will be made at present, if at all, to standardize this test. Standardization is not essential to the usefulness of a test, because the user will probably rely quite as much upon his own experience as upon the standard. Furthermore the standard may be misleading, as it has a tendency to call our attention to the averages of groups to the disregard of variations within groups. In any event, standardization is a matter for collective rather than individual effort, since it requires the coöperation of many persons who are not concerned with the results. I do not feel justified in asking for so much assistance until I have strong evidence that the test is worthy of being standardized, and I think it advisable to refer this question to some person less biased than the originator of the test. The present indications are that the test possesses possibilities of usefulness in the clinic and especially in the vocational school.

Group Tests for Preliminary Mental Surveys of Institutions and Schools. R. PINTNER, Ohio State University.

A set of six to eight class tests has been standardized and used for preliminary mental surveys of institutions or schools. The tests are: Rote Memory Test, Digit-Symbol Test, Symbol-Digit Test, Word Building Test, Easy Opposites, Cancellation of a's, Directions Tests *A* and *B*.

The tests were given to 88 cases, the population of a children's home. These 88 cases were also tested on the Yerkes-Bridges Point-Scale. The correlation between the ranks of the children on the class tests as determined by their Intelligence Quotient and their ranks on the Point-Scale as determined by the C. M. A. is .80. The practical advantage of a group of preliminary tests is shown by the more accurate selection of doubtful cases by means of the tests than by means of the opinion of the superintendent or teachers.

Six of these tests have been used in two schools, one a school attended by children belonging to the so-called upper middle class and the other by children of the lower middle class and laboring class. An attempt has been made to obtain a rough comparison between the mentality of these two groups of children. The standardization of the tests in the form of percentiles allows a percentile grade to be given to the child's performance on each test. The median percentile of the six percentiles for the six tests

serves as the index for the mentality of the child. The median of these indices for a class gives an index for the mentality of the class, and likewise the median for all the children in the school gives an index for the mentality of the school. Grades 2 to 6 inclusive were tested in each school, comprising in all 773 children. The class medians of the first school were in general slightly above the class medians of the second school. The median index for the whole school was in the first case 59 and in the second 50.

A development of this method will lead to a better measurement of the mentality of large groups. It is the writer's belief that the results of educational tests in the future will have to be evaluated in terms of the mentality of the children tested. A school with children of poorer mentality cannot be expected to achieve as good results as a school with children of superior mentality. Conversely a school having children of better than average mentality ought to accomplish better than average educational results.

The Mental Level of a Group of Immigrants. H. H. GODDARD,
Vineland Training School.

Mental tests of 185 immigrants tested upon their arrival at Ellis Island. Tests used: The Binet-Simon Scale, the De Sanctis tests, Healy Construction Puzzles *A* and *B*, the Adaptation Board, the Form-board. Experiment to answer questions: (1) Can mental tests be used under such conditions? (2) If so, what is the mentality of immigrants? Possibility of giving the test by means of an interpreter. Evidence fairly satisfactory that this method does not invalidate the work. Several methods employed for interpreting the data.

Attempts to standardize the Binet Scale on the group itself by determining the questions of the Scale that are answered by 75 per cent. of the immigrants, and comparing those who fail with this standard. Second, assuming the Scale valid, the results give a very high percentage of morons. Discussion of the question, "Is it possible that this is true?" Facts showing that as a matter of fact many immigrants are treated as morons, that is to say, recognized as out of their environment, needing special care, employing them in menial work, excusing them on account of their language, and other practices the same as those used with morons. The question of heredity as related to the problem. The study of the other tests used with statement as to the extent to which they corroborate or contradict the findings of the Binet Scale.

The problem is a difficult one on account of the conditons under which the immigrants arrive in this country, but the conclusion seems warranted that mental tests have at least a limited application to the problem and undoubtedly with more study this might be increased until they became fairly satisfactory.

Notes on the Use of Certain Binet and Related Tests on College Students. E. MURRAY, Wilson College.

The original purpose of this study was the gathering of evidence relative to the popular belief that the Binet tests are too difficult for the average adult. Later, the relation of the scores of these and similar tests to academic ability was made the object of investigation, with a view to the ultimate utilization of these results in the advising of college freshmen, and in estimating the causes of academic failure. The tests selected for study were weight-discrimination, line-suggestion, sentence, digit, and diagram-memory from the Binet series; supplemented by the Fernald-Healy construction puzzles, the Knox-Pintner imitation test, an incidental memory and object pairing test (Ellis), and a handwriting-pairing test. The subjects were twenty-eight college women of the junior class, whose ages averaged twenty years and six months.

The average scores, though by no means the maximum attainable, are, in general, superior to those of children. There is, further, a positive correlation of .70 between class rank based on a composite score for all eleven tests and rank based on academic grades covering three years. The highest correlations for single tests are those between digit-memory and grades (+.47), and incidental memory for objects and grades (+.46); the lowest, that between Construction Puzzle B and grades (-.03). There is also a high positive correlation (.68) between composite test score rank, and composite class estimate of its own ability, whereas the corresponding correlation with instructor's estimate is +.48 (with the average of two instructors' estimates, +.54). On the other hand, the correlation of a group of six controlled association tests with grades is +.50, with class estimate +.55, with instructors' estimate +.60. The relation, therefore, in which the eleven tests stand to grades, to class and to instructors' estimates is apparently inverse to that obtaining for controlled associations. These figures are, however, subject to certain criticisms, and, pending the repetition of the tests with certain refinements of method and of scoring, any conclusions as to the relative significance in academic problems of

tests of the clinical (or practical performance) and verbal (or logical) association type would be premature.

Mentality Testing of College Students. W. V. BINGHAM, Carnegie Institute of Technology.

The demand for psychologists to turn seriously to the task of testing undergraduates arises from the need of supplementary means of selecting from among the applicants for admission; of classifying students according to ability; of adjusting the curriculum to the peculiar needs of the individual student; of adjusting the student to the curriculum through adequate diagnosis of the causes of his failure to do good work; of assisting the employment office in placing the seniors in the right positions; and of measuring the results of instruction.

The well-nigh baffling problems which confront the psychologists who undertake to meet this demand include the devising and adapting of tests and of sound and convenient statistical methods; the standardization of procedure in giving the tests; the calibration of the tests, or the determination of the best methods of scoring; the accumulation of norms and the establishment of boundary lines and zones; and finally, the evaluation of the tests as regards their relative reliability, convenience and practical significance, and the interpretation of the results through studies of their correlation with instructors' estimates, class standing and other measures of ability. The manner in which these problems are being met is illustrated by reference to the results of recent researches, particularly at the Carnegie Institute of Technology.

University Instructors Tested by the Stanford Scale. J. E. DOWNEY, University of Wyoming.

In connection with a study of the Stanford Adult Tests a group of thirty members of the University of Wyoming faculty was examined. The following points were considered: (1) Does the faculty group as a whole, when rated in terms of *I Q*, show a higher central tendency than does a group of college freshmen or of upper classmen? (2) What irregularities in the results of scale-testing appear when these are correlated with the judgments passed on these faculty members by their colleagues? (3) What particular character traits that need to be measured for vocational purposes are thrown into relief? (4) Do differing degrees of success in the tests primarily verbal or constructive (concrete) appear for different departmental groups within the faculty?

The results indicate that the faculty group tests considerably higher than either of the student groups. The median *I Q* is 113, while the median for the same number of freshmen is 104.1. Only one instructor tested below seventeen years, which Terman places as the lower limit of the superior adult. Some interesting discrepancies occur, however, between the judgments of their colleagues and the ranking of the faculty group on the basis of the *I Q*'s. A reputation for great fluency of speech, for example, does not guarantee an unduly successful handling of the vocabulary test. It is possible to guess at meanings with great social effectiveness, though insufficiently successful when measured by dictionary requirements. Three character traits seem especially to serve in augmenting achievement and, hence, reputation: (1) Energy; (2) Persistence; (3) Assurance. Indirect evidence of the degree of presence of these traits appears in the examination. Some definite groupings on the basis of success with the verbal or construction tests were indicated by the results. The most noticeable difference between the scientific and literary group was, perhaps, objectivity versus subjectivity of attitude. The former was glad to try out the tests as a matter of general interest; the latter submitted to the tests with greater reluctance and as individuals were more interested in their personal records than in the general principles involved. The rapidity with which the test was completed also proved somewhat significant. With the same examiner the range was from thirty-five minutes to one hour and forty-five minutes. The executives among the faculty showed the greater rapidity, with or without accuracy, of decision.

A Detailed Study of Whipple's Range of Information Test. J. C. BELL, Brooklyn Training School for Teachers.

The test was given to 596 college students, distributed as follows: 81 seniors, 59 juniors, 84 sophomores, and 372 freshmen. The students were asked to place before each of the 100 terms on the test sheet the letter "D" if the term could be accurately defined, "E" if its use could be explained, "F" if it was only vaguely familiar, and "N" if it was entirely new. The score on each term was computed for each class of students, and the terms then arranged in decreasing order of familiarity.

In order to determine somewhat more broadly the proficiency of students in different fields of information, the terms of the test were collected into nine groups, as follows: 1. History and litera-

ture (12). 2. Language, including musical, social and household terms (11). 3. Philosophy, including education, politics and theology (11). 4. Physical sciences and mathematics (17). 5. Biological sciences (12). 6. Anatomy, physiology, hygiene and psychology (8). 7. Arts and manufactures (15). 8. Business (7). 9. Sports and games (6).

The percentage of familiarity with each group of terms was then computed for each class, and comparisons were made on the basis of increasing college experience. In the case of the seniors the greatest familiarity was shown with the history and literature group, followed closely by the business, the physical science and the philosophy groups. The arts and manufactures, anatomy, and biological science groups fell much lower, the latter group showing only a little more than half as high a percentage as the highest group.

Point-Scale Coefficients of Intelligence. R. M. YERKES, Harvard University.

The Yerkes-Bridges point scale, as first proposed, was intended for application to children over three and under fifteen years of age. The results of several thousand examinations have proved that its reliability diminishes rapidly toward the extremes of this age range. It seems to us most satisfactory between the ages of seven and twelve. Because of this, we are supplementing the original scale by two additional scales, the first to be known as the infant scale, the other as the adolescent-adult scale.

In each of these three scales, twenty tests will appear, each graded in difficulty so that the credit given may be proportional to the reactive capacity. For each test, norms will be made available so that any and every test of the groups may be used either separately or as part of a scale. With use the number of tests common to the three scales will increase and the scales will tend to fuse.

The purposes of these three intimately related point scales are: (1) To determine intellectual status for all ages or degrees of development between two and one half or three years and maturity; (2) to differentiate between high grade intellects; and (3) to supplement the measure of intellectual status by more detailed and specific descriptions of intellectual constitution.

The coefficient of intelligence originally suggested as a convenient method of expressing the general result of a point-scale examination may be defined as the ratio of the point scale to the

expected score or norm. It is not directly comparable with the intelligence quotient of the Binet scale, and anyone who designates the point-scale result as a quotient or the Binet result as a coefficient will cause inexcusable confusion and errors of judgment.

The characteristics of the coefficient of intelligence, and its range between the ages of eight and thirteen, suggest the following classification of intellects: Dependent, Inferior, Subnormal, Normal, Supernormal, Superior, Genius.

The Weighting of Point Scale Tests. R. S. HARDWICK, Harvard University.

Since the Point-Scale examination has for its object the measurement of mental ability the tests would be correctly weighted if their scores were proportional to their respective correlations with general intelligence. Our only way of representing a subject's intelligence numerically is by the result of the mental examination. Hence the problem of the correct weighting of the tests must be solved by a series of approximations.

The present scoring of the Point-Scale tests represents a first approximation to the correct weighting. A second approximation would naturally be based on correlations existing between the scores made on the several tests as now given and the total scores resulting. These correlations have been computed for three different age groups of public school children, 53 subjects at twelve and thirteen years, 43 at nine years, and 53 at six years.

From the average values of r for all three groups the "theoretical weighting" was obtained by means of a graph. As some of the tests do not lend themselves readily to the scoring thus determined, a set of "suggested weightings" was worked out as a compromise, nine of them being identical with the corresponding "theoretical" values. These "suggested" scores were then tried out with a group of thirteen records chosen for purposes of illustration. Comparison of the revised scores with the original ones indicates that the correct weighting would tend to lower the total scores.

Comparison of "actual" and "theoretical" scores for the several tests shows three for which no correction is required, and five more for which the correction amounts to only one point. The greatest discrepancy is found in the case of "Reaction to the three Binet pictures" (now too high by 5 points) and "Words in three minutes," "Memory for digits," and "Comparison of remembered objects" (respectively, 4, 3 and 3 points too low). There is a

closer resemblance between the orders of correlation for the two higher age groups than between either of these and the order for the youngest group. "Resistance of line suggestion" and "Choosing prettier" rank low for all three groups.

The Diagnostic Value of Some Mental Tests. C. C. BRIGHAM, Princeton University.

Twenty-three of the Binet tests for the upper years and ten other sorts of tests (tests of memory, suggestibility, puzzle-solving ability, reasoning, etc.) were given to 59 retarded subjects aged 12, 13 and 14 in the special classes for backward and defective children, and to 58 subjects of the same age in the sixth, seventh and eighth grades of the Trenton, N. J., public schools. The retarded group had attended school slightly longer than the normal group (av. time in school = 7.42 yrs.), but had progressed only half as far (av. grade = 3.71). It was impossible to account for the extreme pedagogical retardation of the members of this group or for their presence in the special classes on any ground other than that of intellectual inferiority.

It was found that some tests were equally easy or equally difficult for both groups (the five weights tests, for example, being passed by 70 per cent. normal and 55 per cent. retarded). Other tests were extremely easy for the normal group, but practically impossible for the retarded group (the dissected sentence test being passed by 100 per cent. normal and 29 per cent. retarded). In other words, certain tests were found to be highly diagnostic of intelligence, while others were not diagnostic. It was found that the Binet scale would have been more effective in diagnosing intelligence if 18 of the 23 tests had been eliminated entirely. The presence of tests that are not diagnostic obscures the value of the effective tests in such a way that the same "mental age" may be attained by a normal or by a feeble-minded individual. The diagnostic values of the 30 sorts of tests used varied from 74 per cent. in favor of the normal group to 2 per cent. in favor of the retarded group, so that the tests may be arranged in the approximate order of their value in diagnosing intelligence.

The problem of improving present methods of diagnosing intelligence would seem to be that of discovering tests that are more highly diagnostic of intelligence and substituting them for those that are less diagnostic. An elastic type of measuring scale can be constructed (on the basis of the standardization of individual

tests) in such a way that more effective tests may be substituted at any time, and the accuracy of the whole scale increased without discarding all the norms of previous experimental work.

"Scattering" in the Binet-Simon Tests. E. A. DOLL, Training School, Vineland, N. J.

It has been observed that feeble-minded subjects "scatter" more (*i. e.*, test over a wider range) than normal subjects in Binet-Simon examinations. It also seems evident that this scattering varies according to the etiological types of mental defect. This implies that the individual tests of the Binet-Simon Scale are of unequal degrees of difficulty for normal and feeble-minded subjects of similar mental levels. A new standardization of the Scale, involving several new statistical procedures, is presented, and gives an arrangement of the tests in successive order of difficulty as well as in year-groups. This order of difficulty is significantly different from that which is obtained for feeble-minded subjects. This gives rise to greater scattering for mental defectives, and indicates important qualitative differences in the mental abilities of the feeble-minded. Analysis of the tests which show specific differences for the two groups results in important additions to the psychology of mental defect. The typical distribution of tests passed and failed in Binet-Simon examinations is developed as a significant aid to mental diagnosis.

Some Differences between Normals and Defectives which are not Indicated by Intelligence Tests. F. MATEER, Waverly, Mass.

A mental examination by the Goddard or the Stanford revision of the Binet or by the Point-Scale is a valuable help to diagnosis, and there is but a very small group in which these findings are not sufficient as an indication of the mental features of the abnormality. This exceptional group is the one to which we must look for the solution of the greater number of our problems concerning the defective, and consists of those we call the borderline cases. These are so near the normal that any test of mental level fails to differentiate them sufficiently for an immediate diagnosis or prognosis. The lack of certainty regarding prognosis is complicated by another factor of fallibility indicated by some recent investigations I have been making. These experiments indicate that even the diagnosis of a mental age in the child who is assuredly defective means a very different thing from a diagnosis of the same mental level or age in a normal child.

The difference comes out markedly when we study the scholastic acquirements of two groups, defective and normal, and is also marked in the clinical cases of children who are normal in the mental tests, but who are by other findings defective. One thing which may explain the difference is that the school examinations give us the result of a continued psychological examination of the learning process to which the pupil has been subjected since his first school admission.

The field for exploration here is large, and I can indicate but one or two of the methods which seem feasible. The learning process of the youngest infants, as well as of older children, can be readily studied by the method of conditioned reflexes. This method applied to defectives who tested normal, gave results differentiating them effectively from normals of an unselected group. Another method is the repeated use of any performance test which is fully up to the child's level. We shall probably find that the development of learning norms for young children will bring about a marked increase in efficiency of psychological clinics.

A Comparison of the Binet-Simon Scale (1911 Revision), the Stanford Revision, and the Yerkes-Bridges Point-Scale as Given to Delinquent Women. M. R. FERNALD & M. H. S. HAYES, Laboratory of Social Hygiene.

The comparison here described constitutes part of a longer series of tests given by the authors to 120 committed to the State Reformatory for Women at Bedford Hills. A method was worked out by which we could, with what appeared to us reasonable justice to each scale, evaluate any given test in accordance with the rules for each of the forms used: *viz.*, the Binet-Simon scale, 1911 Revision, in both the form used by Binet (according to Town translation) and that used by Goddard, the Stanford Revision, and the Yerkes-Bridges Point-Scale. In many cases an identical method of presenting and of marking the test was possible for all scales; in some the method of presentation was the same for all, but variation in the grading was necessary; in others certain additions had to be made to the test as given for one of the forms, to make it available for the others; in only a few of the tests were the differences in presentation such that a compromise between the three methods was necessary. In such cases we have given precedence to the form of the Binet-Simon scale, Town translation, and have made the best adjustment possible for the other forms.

Two check series of 50 cases each have also been given, in which the Stanford Revision and the Yerkes-Bridges Point-Scale have in turn been given precedence.

Correlations have been computed between the different forms, and between individual tests in each scale with the total result for this scale. The scores for the various scales have also been considered with reference to the school records of the women before admission here, and with reference to their capacities as shown in the school work of the institution.

On the basis of these comparisons we have considered the question of what should be accepted as the standard of intellectual normality as contrasted with feeble-mindedness. The results vary according to the scale used and the standard applied to the given scale. The significance of these variations is discussed.

A Study of Tests Additional to Those of the Binet Scales as Given to Delinquent Women. M. H. S. HAYES & M. R. FERNALD, Laboratory of Social Hygiene.

This paper discusses the results obtained by the application of thirty psychological tests, not included in the various modifications of the Binet Scale, to 120 delinquent women committed to the State Reformatory for Women at Bedford Hills. The selection of tests was guided mainly by the following considerations: (1) The desire to try out different mental processes; (2) a recognition of the importance of having both tests definitely appealing to language facility and also performance tests eliminating the language factor as completely as possible; (3) the attempt to include both tests which have general diagnostic value and also more specialized tests which indicate only capacity in certain specific lines; (4) the desire to use, wherever possible, tests which have been or are being standardized elsewhere, since our group is not a standard one. We have included in the series seven memory tests, both rote and logical memory, four association tests, both controlled and uncontrolled association, three tests calling for constructive imagination, two tests primarily of reasoning capacity, six forms of cancellation test calling for concentration of attention and prompt and accurate perceptual discrimination, two tests of ability to follow instructions (written), one test of mechanical constructive ability, four tests of the puzzle form-board type and one test of ability in a routine process such as that of factory work.

Where practicable, the test was either repeated or given in

slightly different form, in order that its reliability might be computed. The reliability of any given test as a measure of ability in a given type of process was also tested by determining the correlations between the various tests of one given type. Correlations were also found between specific tests of the various groups. To determine the value of a given test for diagnostic purposes, its correlation was found with one of the organized groups of tests as represented by the modifications of the Binet scale and by the Woolley series. Where standards for any test are available, reference has been made to these and a comparison made of the age norm for the given test with those for other tests, and with the mental age obtained by one of the Binet modifications.

The After History of Fifty Delinquent Girls, Adjudged Feeble-Minded on the Basis of a Binet Examination Given Five Years Ago. H. H. GODDARD, Training School, Vineland, N. J.

This is a follow-up study of the 50 girls who had been in a Massachusetts Reformatory but were out on probation. This is the group studied by the writer and Helen F. Hill, published in *The Training School Bulletin*, June, 1911. At that time as a result of the test it was concluded that 52 out of the 56 were feeble-minded. It must be remembered that this was a very select group. On the assumption that these girls were feeble-minded, and realizing the bad habits that they had already formed, it was not to be expected that any radical reformation would occur, rather that continued trouble would be met with. The later history of these girls shows this to have been true. The value of mental tests in these cases is shown by the fact that a very few of these girls were recognized at the time, by the persons who had been dealing with them, as feeble-minded. Consequently, this fundamental fact was consistently ignored in their treatment. By means of the test their true condition and responsibility was shown, and an adequate explanation furnished for their conduct with definite indications for their future treatment.

The Mental Status of One Thousand Delinquent Boys and Girls as Shown by a Critical Application of the Yerkes-Bridges Scale for Measuring Intelligence. B. T. BALDWIN, Swarthmore College and Johns Hopkins University.

A psychological analysis of the mental traits of juvenile delinquents and a constructive, critical evaluation of mental tests

furnish the purpose of this investigation. The scope includes a statistical and a graphic representation of the sixty tests on a thousand individuals, supplemented by the subjects' physical condition, hereditary orientation, social deviation and school progress.

The correlations obtained show (1) that the scale needs revising and supplementing, and (2) that social deviation of the nature of delinquency is correlated with and partially dependent on mental deficiency, since 40.5 per cent. of the white girls are retarded mentally 4 years or more, 47 per cent. of the colored girls, and 32 per cent. of the white boys.

Comparison of Delinquent and Normal Boys in Tests, Some Little and Some Much Influenced by Environment. T. L. KELLEY, University of Texas.

Twenty different measurements and tests were made of boys at the Texas State Juvenile Training School, enabling a comparison with normal boys in a large number of traits. The physical measurements include height, weight, head measurements, strength of grip, rapidity of tapping, and physiological age. An examination of the eyes, ears and nose was made, and three tests involving the higher mental processes were given. These were the Binet test, Kelley's Constructive Ability test, and an adaptation of Trabue's Completion test.

Surprising differences are found to be present in certain traits, while the absence of such differences in others is no less striking. The boys compare very favorably physically with normal boys, being appreciably ahead in body weight. In physiological age they are retarded; subnormal in all the sensory and motor tests, markedly so in strength of vision; with the greatest retardation in the mental tests proper and in school standing.

The retardation of the various age-groups is expressed both in terms of years and in percentile position. School standing shows the greatest backwardness. A readily suggested though perhaps hasty conclusion is that this is the cause for the other deficiencies, and that it is caused by truancy and lack of school facilities. This might be contended were it not for the fact that the retardation shown by the Constructive Ability test is the greatest of all in terms of years, and next to the greatest (the completion test) in percentile position. The constructive ability test is surely little affected by ordinary school training, and ground is given for believing that the cause of delinquency is rooted in a deeper stratum

of human nature than that dependent upon environmental accretion. The retardation by the percentile position shows that the completion test sets off the delinquent boy group more completely from the normal group than any other test used, possibly because it depends upon native reasoning capacity and upon school training in English. The weakness in native reasoning ability plus the amount of truancy combine to cause a low record in this test.

NOTES AND NEWS

THE following items have been taken from the press:

PROFESSOR J. R. ANGELL, of the University of Chicago, is giving a course of lectures on "The Makers of Modern Psychology," on the Spencer Foundation at Union College.

PROFESSOR C. E. SEASHORE, of the University of Iowa, has announced a four-weeks' course on the psychology of musical talent and musical education during the next summer.

THE following deaths have been announced in different journals: The Rev. Bro. Chrysostom, professor of philosophy and psychology at Manhattan College, on January 24, at the age of 54 years; Sir E. B. Tylor, professor emeritus of anthropology at the University of Oxford, on January 2, at the age of 84 years; A. Chauveau, the physiologist and sometime collaborator of the late Professor Marey, at Paris, aged 89 years; H. Schule, coeditor of *Allgemeine Zeitschrift für Psychiatrie*, aged 76 years; Professor Bruns, of Hannover, author of numerous contributions on neurology and especially known for his work on nervous disorders of children, aged 58 years.