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WALTER SAMUEL HUNTER
1889—1954

A Biographical Memoir by
CLARENCE H. GRAHAM

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Biographical Memoir

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W. S. Hunter

WALTER SAMUEL HUNTER

March 22, 1889—August 3, 1954

BY CLARENCE H. GRAHAM

WALTER HUNTER¹ will probably be remembered by psychologists for three different contributions to their science. The first consisted of a number of important pioneer experiments, the second a series of orientative papers that helped to establish some tenets of an objective psychology, and the third of a sequence of administrative activities that has influenced the general body of psychological practice and theory. Like many descriptions, this evaluation lacks detail. It does not present Walter Hunter as the person many of us knew: the man of good humor and sound sense, a teacher, a colleague, a good companion, a man of great ability and one eminently fitted to play the role that he undertook so successfully, the representative of psychology in the councils of scientists. Psychology and science generally have benefited greatly from his efforts.

Walter Samuel Hunter was born March 22, 1889, in Decatur, Illinois, the second son of George Hunter and Ida Weakley Hunter. Ida Hunter died in 1900 and, in 1901, George Hunter took himself and his two sons to his father's farm at Saginaw, Texas, eight miles from Fort Worth. Walter attended the two-room country school at Saginaw until 1905, when he was admitted to the Preparatory School of the Polytechnic College in Fort Worth. He entered the freshman

¹ For his own account of his life, see *W. S. Hunter, Autobiography*, in: *History of Psychology in Autobiography*, 4, 163-187. See also H. Schlosberg, "Walter S. Hunter: Pioneer Objectivist in Psychology," *Science*, 120:441-442; and L. Carmichael, "Walter Samuel Hunter: 1889-1954," *Amer. J. Psychol.*, 67:732-734. The most recent memoir has been written by J. McV. Hunt: "Walter Samuel Hunter: 1889-1954," *Psychol. Rev.*, 63:213-217.

class of the college in 1906 and remained there for two years before transferring to the University of Texas. He received the A.B. degree from Texas in 1910 and went immediately to the University of Chicago on a graduate scholarship, receiving the Ph.D. in psychology in December, 1912.

Hunter's interest in psychology first developed while he was studying at the Preparatory School of the Polytechnic College. In his autobiography he tells us of his early interest in psychology and the path that he followed thereafter. "My interest in psychology was first aroused by my roommate, a former normal school student, who lent me a psychology text by Noah K. Davis, professor at the University of Virginia. From Davis I turned to William James' *Psychology, Briefer Course*; and then being seventeen and ready to be a college freshman the following year, I decided to become a psychologist. Dr. W. B. Rinker, professor of German and Philosophy, advised me to lay a foundation for such a career by studying biology, chemistry, physics, mathematics, German, and French. It therefore came about that I spent the following two years in the study of some of these subjects, plus English and history, and then transferred to the University of Texas in order to begin a concentration in psychology. C. S. Yoakum, fresh from his doctoral work at Chicago (1908), was in charge of the subject which was at that time a division of philosophy. Due to the necessity of meeting new degree requirements within two years, it was impossible for me to enroll in chemistry or to increase my knowledge of physics. I did, however, study biology intensively, increase my mastery of German and French, and attend all of the psychology courses that were offered. In the 1909-10 academic session, I was an assistant to Dr. Yoakum at a salary of \$15 per month. This sum was enough to cover my share (\$5) of the rent of a large room shared with another student and to pay (\$10) for simple but entirely adequate meals. My grades continued high, and at the close of my senior year, Angell offered me a scholarship for graduate work at Chicago."

During his two years at Texas Hunter carried a regular academic

program and, in addition, conducted an experiment with pigeons. He carried out the experiment, an extension of J. E. Rouse's study of the maze behavior of pigeons (1906), in an outdoor cage which he constructed in the backyard of his rooming house. When Hunter went to Chicago, the results² were written in final form under the supervision of H. A. Carr.

Concerning his work at Chicago, Hunter³ says: "Graduate work in psychology at Chicago in 1910-12 was on a very modest scale compared with its status in the years after 1920. The animal laboratory was housed in a small frame building which had been the department's headquarters when Watson was working on color vision in monkeys in the unfinished attic space. The departmental offices, library, and human experimental rooms were in a three-story brick apartment building. In spite of Dr. Angell's high position in the University administration, no adequate provision for psychology was ever made, although new buildings for other departments were provided. Perhaps this was due in part, as Vice-President J. H. Tufts told me in 1925, to the fact that the University could never decide whether psychology was a social or a biological science and hence could not determine where to place the building. Angell and Carr gave all of the graduate instruction in psychology in those years, work that was generously supplemented by offerings in other departments and by visiting professors in the summer term. No specific courses in learning, statistics, or in specialized experimental areas other than space perception were available. To Harvey Carr I believe I owe in large measure my high regard for careful experimental work and my low regard for loose thinking. To Angell I owe an equally important but more general debt, a broad interest in the field of psychology and an alertness to systematic issues. Both of these men were my good friends in post-doctorate years, aiding and giving me wise professional counsel on request."

Hunter's doctoral thesis followed a proposal made by the always

² *J. Animal Behav.*, 1:278-304.

³ Autobiography.

imaginative and helpful Carr. When Carr presented him with the opportunity to do work on the then little known electroretinogram or to investigate the delayed reaction in animals, Hunter chose the latter. (It is of interest that, for much of his life, Hunter had a great interest in the electrical recording of action potentials, and during the last twenty-five years of his life direct contact in his laboratory with work done by colleagues on nerve impulse measurements and the electroretinogram, the area which he rejected as a thesis topic.)

The work on the delayed reaction⁴ in animals and children caused something of a stir and it is still considered to be a classical contribution. The delayed reaction involves the presentation to an animal of a stimulus, a light, for example. The stimulus is then removed and the animal, after a delay, is to go to the place where the stimulus *was*. If he goes to the proper place, he gets fed. If he doesn't, he remains hungry. In certain animals, such as the rat, the correct choice of stimulus position depends upon the animal's maintaining a rigidly orienting posture during the period the stimulus is present and during the subsequent delay period; the rat makes the correct response by "following his nose." Other animals, e.g., the raccoon, monkey, and human being, can change orientation during the delay period and still make the appropriate choice. Hunter refers to the type of memory function shown by the latter animals as symbolic process. Throughout the years following his doctorate work he was to return often to the analysis of the symbolic process.

In 1912, Hunter was awarded an instructorship at Texas at an initial salary of \$1200. On the basis of his new financial status he married Katharine Pratt of Cleveland in 1913 and became the father of a daughter, Thayer, in September, 1914. In April, 1915, shortly after Thayer's birth, he received a severe shock in the death of his young wife, an event that shadowed his life for some time thereafter.

Immediately on arriving in Texas, Hunter started a program of research. He commenced an investigation of the aftereffect of visual

⁴ *Behav. Monogs.*, vol. 2, no. 1.

motion⁵ and another on the auditory sensitivity of the rat.⁶ In 1952, Hunter still regarded the work on the aftereffect of visual motion as one of his best publications. The work on auditory sensitivity of the rat was a pioneer effort and did not provide the definitive type of result that has since been obtained by other workers who have used electronic methods of stimulus control. In 1915 Alda Grace Barber completed a thesis on the localization of sound⁷ by the white rat and shortly thereafter, in 1917, became Mrs. Hunter. A daughter, Helen Barbara, was born in 1920 and, until the time of his death, Walter and Alda Hunter remained a happily married couple, each strengthened by the affectionate regard of the other.

In 1915-16 Hunter extended his work on the delayed reaction by making observations on his infant daughter,⁸ Thayer, during her thirteenth to sixteenth months of life. He found that a child as young as this can make appropriate delayed reactions even though bodily orientation changes during the delay period. The years at Texas were fruitful and resulted in the publication of ten experimental papers, plus a number of shorter notes and reviews.

Early in his career, in 1914, Hunter began the editorial activities that comprised a significant part of his professional career for most of his life. In this year R. M. Yerkes invited him to become a member of the editorial board of the *Journal of Animal Behavior*, and in 1916 Warren forwarded an invitation from Franz asking Hunter to assume editorial responsibility for the comparative psychology number of the *Psychological Bulletin*.

In 1916 the University of Kansas offered Hunter the professorship of psychology that had just been vacated by R. M. Ogden. Hunter, just twenty-seven, accepted this offer; his salary was to be \$2500. Kansas had good facilities for teaching and research. F. C. Dockeray was a staff member, as was D. G. Paterson, who had recently received his master's degree with Pintner at Ohio. Hunter started research in

⁵ *Psychol. Rev.*, 21:245-277; 22:479-489.

⁶ *J. Animal Behav.*, 4:215-222.

⁷ *J. Animal Behav.*, 5:292-311.

⁸ *Psychol. Rev.*, 24:74-87.

animal behavior and was soon contemplating a question that Paterson asked: "What is the reliability of the maze?" "This question, which I did not at first understand and which I could not answer, was the initial stimulus for work which Paterson began in 1917 and which Carr and Angell at Chicago accepted as a suitable problem for a doctor's thesis.⁹ Paterson was to carry out the experimental work at Kansas but was to be a candidate for the doctor's degree at Chicago. The entry of America into the war stopped the work after it had barely begun, and Paterson later went on to fame as a psychologist without ever receiving his doctorate. However, when I returned to Kansas after the war, Oakland Maupin (later Mrs. W. T. Heron), W. T. Heron, and I conducted a series of experiments on the reliability of the maze and the problem box, the results of which had extensive repercussions among psychologists. The first of these studies appeared in volume one of the Comparative Psychology Monographs for 1922 (vol. 1, 37-56) and the final study under my direction appeared from the Clark University laboratory in the Journal of Comparative Psychology for 1936 (vol. 22, 1-60) under the authorship of Sidney H. Newman. No one of the numerous students of reliability has succeeded in devising for rats a method of maze training or a maze pattern which gives results of a satisfactory reliability without using the Brown-Spearman formula for predicting reliability of a whole test. And this formula is not applicable to learning data as Newman clearly demonstrated. The wide scatter about the mean performance in learning experiments with rats poses a serious problem in the control of experimental conditions, a problem, however, which is still neglected in favor of an effort to secure some sort of data on the relationship between specified variables, the hope being that by pooling enough unreliable data something having statistical significance may emerge."

On the experimental side, one of Hunter's best contributions during his period at Kansas was concerned with double alternation in the temporal maze,¹⁰ a problem that raises the question of an animal's

⁹ Autobiography.

¹⁰ *Psychobiology*, 2:1-17.

ability to react to a temporal sequence of cues when differential spatial cues are absent. The temporal maze consists of two alleys, each in the form of a rectangle, the left side of one and the right side of the other being in common. An animal is required to traverse one rectangular alley, his first and second orientations at the choice point being to the right; thereafter his third and fourth orientations, into the second alley, are to the left. In a word, his movements at the choice point are in the sequence RRL. There is nothing at the choice point to give him a cue as to direction of movement; such a cue must come from past history variables, of a sort comparable to the symbolic process of the delayed reaction. Rats can perform this temporal sequence with difficulty¹¹ if at all, but in later years at Clark extensive experiments established that higher animals and children could make this sort of discrimination. Hunter reported on this general problem as late as 1948 with Susan Bartlett; they used young children as subjects.¹²

Hunter spent nine years at the University of Kansas, with a leave of sixteen months of military service in the Army during World War I. In his military capacity he took part in the psychological testing program that was a landmark in the general application of psychological methodology. Concerning the period that he spent in the Army, Hunter writes¹³ as follows: "Before terminating my account of the years at Kansas, something should be said about my work in World War I and about the decisions that I had to make concerning the future of my career. Let us consider the war first. Although as an experimental psychologist I could not see my way clear in the spring of 1917 to promise to help in the preliminary phases of the Army intelligence testing program, August of that year found me under great pressure from W. V. Bingham to accept a commission as a first lieutenant because of the failure of one psychologist to pass his physical examination. I first served under C. S. Yoakum at Camp Lee, and

¹¹ *J. Genet. Psychol.*, 39:303-319.

¹² *J. Exper. Psychol.*, 38:558-567.

¹³ Autobiography.

then became chief psychological examiner successively at Camps Lee, Sheridan, and Devens. My records show that I was involved in only two technical contributions to the testing program. The one of lesser importance was to secure at Devens, and to encourage the Washington office to order secured elsewhere, data on the national origins of the troops tested. On the basis of large amounts of such data gathered throughout the Army, there was shown to be a clear superiority in scores of the men from Northern Europe as opposed to those for men from Southern Europe. (No consideration was given to the selective factors which might be operating in immigration.) These Army findings were later used by C. C. Brigham in defense of Nordic superiority and other wild racial theories in his *Study of American Intelligence* (1922), and they are said to have affected the postwar United States selection policies on immigrants. The more important contribution from the camps under my direction came from Camp Lee. It should be recalled that psychological examination was at first only authorized in four camps. If it failed there to win the support of military men, testing was to be discontinued. By late November examining in the four camps was completed, and psychologists awaited word from Washington on the future of the program. It was at this time that E. S. Jones, now of the University of Buffalo, came to me and proposed that our group prepare a set of charts depicting the test status of all organizations in the 80th Division. This he and the staff did, using bar diagrams for the superior and inferior men in each unit, diagrams that are reproduced in practically all reports of testing in World War I. The material was sent to Washington and laid before the Surgeon General and the Training Committee of the General Staff in support of the recommendation for the continuance of the work. I am told that the charts of the Camp Lee report were largely influential in the favorable decision that was reached in December. The contribution by E. S. Jones came at a critical time for the future of military psychology in this country."

During the period in Kansas, Hunter published eight experimental papers, six theoretical ones, a text book, and directed the research of

five experimental papers, as well as carrying on his work for the *Psychological Bulletin*, and for *Comparative Psychology Monographs*. He was the first editor of the latter journal (1922-27).

The theoretical papers that Hunter wrote at Kansas and in the years shortly thereafter comprise one of his best contributions. In 1917 he wrote a paper on the reformulation of the law of association¹⁴ in which he argued that the second term of an associative sequence need not be imaginal but could be sensory or perceptual. It was his last paper that could be classified as being in the tradition of subjective psychology. The paper did not have great influence, but it shows us the development of Hunter's thought along the lines of behavioristic analysis. In 1920 he wrote a much more important paper on the modification of instinct from the point of view of social psychology.¹⁵ In this paper he pointed out that instinctive mechanisms can be modified by activity prior to, simultaneous with, and following the time of appearance of the instinct. His analysis of the interaction of behavior components is still of considerable importance and gave, in 1920, a plausible biological basis for certain Freudian concepts. By this time Hunter had given up his general functional point of view and adopted the behavioristic position. His "thinking through" of this position was followed by a number of papers on some basic problems. In particular there appeared, in rapid succession, papers¹⁶ entitled "The Problem of Consciousness," "The Symbolic Process," and "The Subject's Report." The first of these papers was an attempt to provide a theoretical basis for psychology without reference to consciousness. Consciousness Hunter considered to be equivalent to the relationship involved in a sensory process-language response sequence (SP-LR). The existence of this relation, he said, is the necessary condition for "conscious" behavior. The sequence SP-LR of a "conscious" type is characterized by the fact that the sequence itself provides (immediately or later) a new SP with its own LR. In a word, a conscious

¹⁴ *Psychol. Rev.*, 24:188-196.

¹⁵ *Psychol. Rev.*, 27:247-269.

¹⁶ *Psychol. Rev.*, 31:1-31; 31:478-497; 32:153-170.

effect always involves a verbal response by the subject to his own language responses. The nature of the sensory process-language response and its relation to symbolic processes in general were considered in the second paper. The significance of the subject's report and its particular relation to "introspection" were taken up in an important paper in 1925. In the same year Hunter wrote another paper which specified what, in his estimation, were the important problems of psychology and how they differed from the problems of an earlier psychology.¹⁷ After he left Kansas in 1925, Hunter seems to have lost a good deal of his interest in theoretical issues. This was probably due to his conviction that the argument was won and that one could pass on to the more important activity of experimentation. After 1925 Hunter did write four more important papers, one (1926) of which, the first,¹⁸ probably gives the best presentation of his general position; the second (1930) does little more than review the presentation of the first. Hunter's 1932 paper,¹⁹ his presidential address to the American Psychological Association, was entitled the "Psychological Study of Behavior," and seems to have accurately predicted those areas that have since become significant. A paper written in 1941 on the professional training of psychologists,²⁰ his presidential speech to the Eastern Psychological Association, seems to fit into the general line of his thought about the nature of psychology and its problems.

It is difficult to overestimate the significance of Hunter's theoretical papers, particularly the early ones of 1920, 1924, and 1925. These papers appeared at the same time as some other important behavioristic interpretations, especially those of Weiss, Lashley, Holt, and Watson. It is probable, however, that the problem of consciousness and language behavior was never more imaginatively treated than it was by Hunter in these papers, nor was the nature of an appropriate program for psychology ever better stated than it was by him in his

¹⁷ *Amer. J. Psychol.*, 36:286-302.

¹⁸ "Psychology and Anthroponomy." In: *Psychologies of 1925*. See also same title in *Psychologies of 1930*.

¹⁹ *Psychol. Rev.*, 39:1-24.

²⁰ *Psychol. Rev.*, 48:498-523.

papers on psychology and anthroponomy in 1926 and his paper on the study of behavior in 1932.

In considering Hunter's theoretical papers it has been necessary for us to get somewhat ahead of our story. Let us return to 1925, an eventful year for Hunter; it was the one in which he received an invitation to become the first G. Stanley Hall Professor of Genetic Psychology at Clark University. At first he did not wish to accept the offer because of the adverse report on the administration of Clark made by an investigating committee of the American Association of University Professors. However, after talking the matter over with Angell, Warren, Boring, and Watson, he accepted the appointment and held it until 1936. The Clark appointment gave him the opportunity to teach graduate students and to devote most of his time to research.

During his days at Clark, Hunter extended the scope of his researches to include an array of problems that touched on many areas of experimental psychology, with an emphasis on learning. His graduate students published a total of twenty-two experimental papers in eleven years. Some of their papers, notably P. E. Ewert's on inverted vision²¹ in spatial behavior and Clarence Hudgins's on conditioning the pupillary reaction²² of the eye, provided important contributions. At Clark, Hunter had contact with students who later became well known in psychology: Norman Munn, Wayne Dennis, Robert Leeper, Clarence Hudgins, Gerard de Montpellier (now of Louvain), E. H. Kemp, Luberta Harden, Frank Geldard, Lorrin Riggs, and the writer. From 1927 to 1929 his acquaintance with students was increased by the membership of his class in animal behavior at Harvard, a group that he met by commuting from Worcester. Members of the class included F. W. Chapman, W. A. Hunt, F. S. Keller, B. F. Skinner, and R. W. White.

²¹ *Genet. Psychol. Monogs.*, 7:177-362.

²² *J. Genet. Psychol.*, 8:3-51. There are a number of reports on failures to repeat Hudgin's experiments, but Kotake and Mihama report methods that were successful in conditioning the pupillary reflex (Y. Kotake and H. Mihama. Conditioning of pupillary reflex in man. *Jap. J. Psychol.*, 22 [Japanese text], 79-87; [English abstract], 88).

During his stay at Clark, Hunter published twenty-one experimental papers, five theoretical studies, and four chapters in books, as well as the textbook *Human Behavior*. Among his papers was one that involved a reinterpretation of Lashley's concept of cortical equipotentiality.²³ Several conclusions concerning the problem were set forth in Hunter's vice-presidential address²⁴ to Section I of AAAS in 1933.

During his Clark days, Hunter, through his students, did a great deal to further the analysis of the sensory control of the maze habit.²⁵ The problem goes back to the days of Watson, who eliminated one sense in each of a number of groups of rats, loss of all senses except kinesthesia being represented in the total population. Watson found that the maze habit was little interfered with by such sensory deficiencies. In a number of experiments Hunter and his students analyzed the problem in an extensive way and concluded that maze performance could be maintained by the "substitution" of one sensory modality for another. Thus if a given sensory system was lost, another could be "submitted" for it. This is not the place to discuss the general significance of this problem at the present time, but it is enough to say that Hunter's analyses influenced the researches of many individuals in psychology and caused the adoption of some concepts that depended on the work on sensory control.

Another area that was emphasized by Hunter during his Clark days²⁶ was the analysis of double alternation behavior by means of the temporal maze, work that had begun at Kansas. It will be recalled that the delayed reaction experiment deals with memory and the representation of "ideas." In the case of animals that manifested a delayed reaction with an absence of rigid orientation, Hunter saw no need to talk about images. Rather he spoke about a symbolic process whose reinstatement by appropriate conditions could control a subject's behavior at an interval after the appearance of the original stim-

²³ *J. Genet. Psychol.*, 3:455-468; 5:230-234.

²⁴ *Science*, 79:145-151.

²⁵ See, for example, B. Casper, *J. Genet. Psychol.*, 43:239-292.

²⁶ See, for example, Hunter and Nagge, *J. Genet. Psychol.*, 39:303-319.

ulus. The same sort of process seemed to be required in the case of double alternation which has previously been described in some detail. An analysis of symbolic process and its role in the control of behavior was carried out by Hunter and his students until nearly the end of his life.

Hunter exhibited an interest in the problem of reliability of the maze until 1936, when his student, Sydney Newman, published the extensive study previously discussed. The problem was one of methodology: to what degree is the maze capable of giving reproducible data? A question which seems at first so simple led into problems of statistics and experimentation that resulted in the development of more reliable methods of testing.

In the early 1930s Hunter performed a number of experiments on different aspects of conditioning.²⁷ These experiments anticipated many that have been done since in a more elaborate manner. In his final days at Clark, Hunter worked with Prosser on the extinction of startle responses and spinal reflexes in the white rat."²⁸

In 1926, the American Psychological Association secured a ten-year subsidy of \$75,000 from the Laura Spellman Rockefeller Memorial for the purpose of starting an abstract journal. As chairman of the American Psychological Association committee concerned, Hunter became editor of the abstracts with the assistance of Raymond R. Willoughby. (Willoughby was a person well-known and liked by all of the people at Clark; his premature death in Providence, Rhode Island, in 1944, was regretted by many psychologists.) In preparation for recruiting the staff of the abstract journal, Hunter went to Europe to visit psychologists and to select appropriate foreign editors. The contacts that he made at this time with European psychologists influenced Hunter very greatly both in a personal and in a professional manner. In 1931 he and his wife revisited Europe during a period of sabbatical leave. At that time he again saw psychologists with whom he had earlier become acquainted. During the 1931 trip to Europe,

²⁷ See, for example, *Brit. J. Psychol.*, 26:135-148; also *Kwartalnik Psychol.*, 8:5-12.

²⁸ *Amer. J. Physiol.*, 117:609-618.

Hunter wrote his presidential address, "The Psychological Study of Behavior," which was delivered to the membership of the American Psychological Association at Toronto in September. This paper has been mentioned previously in connection with his theoretical contributions. It was probably the most influential of his later systematic papers.

Hunter's life at Clark was, in general, happy and professionally fruitful. He was a member of committees of the American Psychological Association and the National Research Council that took a considerable amount of his time, and his editorial duties involved considerable effort. Nevertheless, his years at Clark probably constitute, from the point of view of research, a more fruitful period than any comparable interval in his life. During his years at Clark he was friendly with and influenced by John Paul Nafe, Hudson Hoagland of the Physiology Department, and Wolfgang Köhler, who was a visiting professor for a short time. His hobby of painting developed during this period and he, in fact, showed a certain amount of talent; in any case, it provided an avocation which he followed with great interest until the end of his life. He was elected to the American Academy of Arts and Sciences in 1933 and to the National Academy of Sciences in 1935.

In 1936, Hunter accepted a call to Brown University to succeed Leonard Carmichael, who had gone to Rochester. Hunter remained at Brown as Professor of Psychology for the rest of his life. With him from Clark went Raymond R. Willoughby and the present writer. J. McV. Hunt of Worcester State Hospital also became a staff member, and at Brown we found E. H. Kemp. Kemp was a student of Hunter's who had been appointed an instructor by Carmichael during the preceding year, which had been spent at Harvard Medical School on an NRC Fellowship with Hallowell Davis. These individuals, together with Harold Schlosberg, Herbert H. Jasper, and, later, Donald B. Lindsley, who succeeded Jasper in 1939, formed an able and enthusiastic staff at Brown until it was broken up during and after the war.

With the move to Brown in 1936, Hunter's professional life took on a different cast. From then on he was increasingly involved in administrative activities and appeared in various executive roles. In this type of activity he was very effective; he always truly gave the impression that he was a man of good judgment and sound motives. His research time became greatly reduced, but during his years at Brown he did publish eight experimental papers, as well as seven of a general nature. In addition, he directed the theses of six graduate students. He was elected to the American Philosophical Society in 1941.

Among his more important experiments done at Brown was one on the conditioning, extinction, and disinhibition of responses in the gastrocnemius muscle of the rat, with light the conditioned stimulus for leg flexion and shock the reinforcing stimulus.²⁹ Concentric needle electrodes were used to analyze the responses of individual motoneurons during the different aspects of conditioning. The analysis showed how motoneuron activity changes during conditioning, extinction, and disinhibition.

A second important experiment was the one on "span of attention" done in collaboration with Marian Sigler. This experiment³⁰ showed that the absolute naming of object-number is under sensory control, as indicated by the fact that the Bunson-Roscoe law applies to the discriminations; the product of intensity and duration of flash is constant for the correct naming of a given number of dots. This experiment has many implications for the study of the interrelations of sensory and perceptual phenomena and, in a certain sense, serves as a model of appropriate analysis.³¹

In 1936 Hunter was appointed Chairman of the Division of Anthropology and Psychology of the National Research Council for a two-year period. He had earlier served as a member of Division Committees in the 1920s and 30s. From 1936 until the end of his term in

²⁹ *J. Exper. Psychol.*, 21:611-624.

³⁰ *J. Exper. Psychol.*, 26:160-179.

³¹ Among other experiments done at Brown were two on double alternation: one done in collaboration with B. E. Hall, *J. Comp. Psychol.*, 32:253-266; and one with Susan Bartlett, *J. Exper. Psychol.*, 38:558-567.

1938, and thereafter as a member of various committees through World War II and beyond, his activities in the National Research Council required the expenditure of considerable time and energy. In his own opinion, one of his main accomplishments as chairman of the Division during the years 1936-38 lay in the promotion of interest in research in psychopathology. A Committee on Problems of Neurotic Behavior was established, with W. R. Miles as chairman; it founded the *Journal of Psychosomatic Medicine*. Malamud and Hunter as members of the committee prepared a report in 1941 emphasizing the importance of cooperation between psychiatrists and psychologists in the interest of national defense, and this statement transmitted to the Surgeon General may have had an influence in establishing a more satisfactory status for clinical psychology and psychiatry in the Army Medical Service. During the same period Hunter served on committees concerned with aging and work in industry. He was instrumental in establishing an Advisory Committee to the Adjutant General's Office on the Classification of Military Personnel in 1940, with W. V. Bingham as chairman. In 1940 an Emergency Committee in Psychology was set up in the National Research Council, with K. M. Dallenbach as chairman. Hunter's work on the committee involved investigating the supply of psychologists in terms of known military demands, and his findings led to the introduction of psychology in the Army Specialized Training Program.

Hunter was a good committeeman. He took his responsibilities seriously and did not usually underestimate or overestimate the importance of a particular project. He could just as readily recommend that a program be discontinued as that it be enlarged. He was guided in his judgment only by considerations of relevance and worth.

Hunter's most important wartime endeavors took place in his capacity as Chairman of the Applied Psychology Panel of the National Defense Research Committee. His appointment took place in September, 1943, when J. B. Conant asked him to be chairman of the Applied Psychology Panel with which the National Defense Research Committee had decided to replace the Committee on Service Person-

nel, Selection and Training. The latter committee had been operating under the National Research Council on contract with NDRC from June, 1942. The Committee was created through the leadership of Leonard Carmichael, who was then Chairman of the Division of Anthropology and Psychology. By September, 1943, the Committee had shown its value, and it was considered appropriate to formalize its status as a Panel within the structure of NDRC. The history of the Applied Psychology Panel has been well described by C. W. Bray³² and here we may only briefly consider Hunter's role. In his capacity as Chief he had great responsibilities for the work undertaken under the Panel program for which contracts were let by the United States Government. Despite the fact that he depended for advice upon the members of the Panel as well as his Technical Aides, it must not be forgotten that the responsibility for the program was in a large and official sense his. In assuming his responsibilities he never wavered, nor did he try to establish programs which he could not justify either to himself or to others. Those of us who were members of the Applied Psychology Panel remember him for his remarkable ability to lead discussion, to limit it, and to gain cooperation in the course of a conference. The Panel seemed to us to be a smoothly functioning organization and we did not fail to recognize that Hunter played a primary role in its effectiveness. It is sufficient to say that the Presidential Medal of Merit that Hunter received in 1948 was, in the eyes of all of us who were associated with him, an appropriate award for a job well done. Hunter resigned as Chief of the Applied Psychology Panel in September, 1945, and returned to Brown to resume his academic duties.

On November 17, 1944, President Roosevelt wrote a letter to Vannevar Bush requesting his advice on measures to insure the continuation in peace time of the high level of scientific endeavor manifested in wartime. Bush's report is contained in the famous volume *Science, the Endless Frontier* (1945). Hunter was a member of a subcommittee appointed by Bush to investigate the problem of the discovery and

³² *Psychology and Military Proficiency*. Princeton: Princeton University Press, 1948.

development of scientific talent; the subcommittee was under the chairmanship of Henry Allen Moe of the John Simon Guggenheim Memorial Foundation. Hunter and Moe felt that the over-all inquiry should include the social sciences. Bush's report did make some reference to them, but not to the extent of recommending them for inclusion in the advocated program.

From September, 1945, until his death on August 3, 1954, Hunter contributed his services to many organizations. He served as a member of the Scientific Advisory Group, Air Force Headquarters, in 1946-47. From 1946 until his death, he was a member of the Undersea Warfare Committee, National Research Council, and for a number of years after 1947 he was a deputy member of the now inactivated Research and Development Board's Committee on Human Resources. In 1945 he became a member of President Conant's committee, under the chairmanship of Alan Gregg of the Rockefeller Foundation, to advise on the future of psychology at Harvard and "the place of psychology in an ideal university." A report³³ of the commission was published in 1947. Harvard made its decision before the report was published, a decision contrary to the recommendations of the committee. The report stands, however, as an important policy document on a problem that still does not receive unanimity of opinion. Footnotes in the report indicate where and how members differ from the prevailing opinion. Hunter differed on a number of points from the majority but concurred with the over-all recommendations. He says,³⁴ "My central thesis was that the future of psychology as a science and as a profession depended, from the educational point of view, primarily upon the maintenance of a solid groundwork in experimental fields, upon a closing of the widening gap between fundamental psychology and such areas as social and clinical psychology by requiring of all psychologists a common core of knowledge of experimental work supported by training in related sciences."

³³ *The Place of Psychology in an Ideal University*. Cambridge: Harvard University Press, 1947.

³⁴ Autobiography.

In 1946, Hunter became adviser to a Committee on Testing established, under the chairmanship of President Conant, by the Carnegie Corporation and Carnegie Foundation. Through Hunter's recommendations, the programs of four nonprofit national testing agencies were integrated into a single national testing agency, the Educational Testing Service. Hunter's recommendations have had, among other outcomes, the effect of increasing research opportunities in the important area of large-scale psychological testing.

In the years following the war, Hunter devoted most of his time to the chairmanship of the Psychology Department at Brown. After the war the staff of the department was depleted, and a new rebuilding job was necessary. The staff which had served with him before the war had dwindled as individual after individual left to take positions in other universities. Hunter continued to work in his own patient way and at the end of his life had the pleasure of knowing that he had again at Brown a fine group of able teachers and research psychologists.

In all aspects of his administrative work, Hunter manifested the high ideals that characterized his general behavior. He would not compromise with the second-rate nor would he surrender conviction for advantage. His personal characteristics were well known in the National Academy where he was, for a number of years, a member of the Council and where his proposals were recognized as informed and disinterested. He was a man of good judgment. He suspected flashiness and respected hard work. Once he accepted the challenge of a job, he carried out his part with a full appreciation of his commitment.

In his autobiography, Hunter presents two final paragraphs appraising his field and his relation to it. They show a mature person looking back on himself and his career with some pride and no regrets. He had a full life and a good one. He says:

"I am happy to be counted among the many workers who have brought about the change from a psychology of experience to a psychology of behavior. The fundamental issue in behaviorism is not,

and never was, the particular speculations of any one behaviorist—of Watson, for example. Behaviorism is the point of view in psychology which holds that an adequate account can be given of psychological problems without reference to the terms consciousness and introspection. So thoroughly has psychology been permeated by this point of view that the term behaviorism is currently seldom used, although the term behavior is constantly employed and although only a negligible number of studies even purport to deal with consciousness.

“Since my first paper in 1911, two-thirds of my publications and those of my students have been in the central area of psychology, the field of learning. Nevertheless, I have not thought of myself as a psychologist with a specific program to be worked out in detail. Rather, I have looked for problems where, as it seemed to me, the expenditure of experimental and theoretical effort might push forward the boundaries of knowledge significantly and on a varied front. Such a point of view results in a less integrated body of experimental findings than that which follows from the adherence to a program; and yet were it possible to relive the period, my choice would again be for the varied rather than for the programmatic approach to experimentation.”

Hunter will not be forgotten by his colleagues, and those at Brown University will have a special reason to remember him. The Walter S. Hunter Laboratory of Psychology, under construction as this Memoir is being written, will be officially dedicated in the early fall of 1958, a fitting memorial to a man who placed service to his science above all else.

KEY TO ABBREVIATIONS

- Amer. J. Physiol.=American Journal of Physiology
 Amer. J. Psychol.=American Journal of Psychology
 Amer. Psychologist=American Psychologist
 Behavior Monogs.=Behavior Monographs
 Brit. J. Psychol.=British Journal of Psychology
 Comp. Psychol. Monogs.=Comparative Psychology Monographs
 Genet. Psychol. Monogs.=Genetic Psychology Monographs
 J. Abnorm. Soc. Psychol.=Journal of Abnormal and Social Psychology
 J. Animal Behav.=Journal of Animal Behavior
 J. Comp. Psychol.=Journal of Comparative Psychology
 J. Comp. Physiol. Psychol.=Journal of Comparative and Physiological Psychology
 J. Comp. Physiol. Psychol.=Journal of Comparative and Physiological Psychology
 J. Consult. Psychol.=Journal of Consulting Psychology
 J. de Psychol.=Journal de Psychologie
 J. Educ. Psychol.=Journal of Educational Psychology
 J. Exper. Psychol.=Journal of Experimental Psychology
 J. Gen. Psychol.=Journal of General Psychology
 J. Genet. Psychol.=Journal of Genetic Psychology
 J. Phil.=Journal of Philosophy
 J. Phil. Psychol. & Sci. Method=Journal of Philosophy, Psychology, and Scientific Method
 Kwartalnik Psychol.=Kwartalnik Psychologiczny
 Nat. Acad. Sci. Bio. Memoirs=National Academy of Sciences Biographical Memoirs
 Ped. Sem.=Pedagogical Seminary and Journal of Genetic Psychology
 Proc. IX Internat. Cong. Psychol.=Proceedings of the Ninth International Congress of Psychology
 Proc. Nat. Acad. Sci.=Proceedings of the National Academy of Sciences
 Psychol. Bull.=Psychological Bulletin
 Psychol. Rev.=Psychological Review
 Psychosomatic Med.=Psychosomatic Medicine

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