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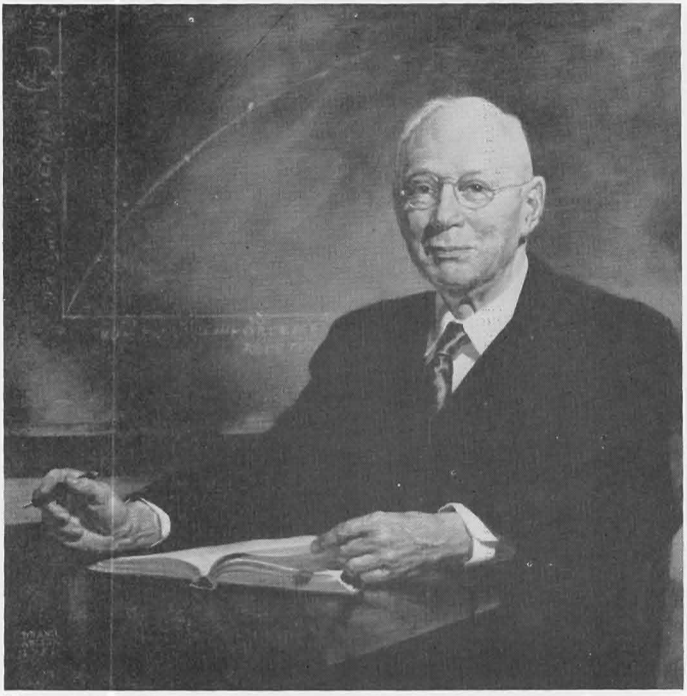
CLARK LEONARD HULL

1884—1952

A Biographical Memoir by

FRANK A. BEACH

Biographical Memoir



Clark L. Hull

CLARK LEONARD HULL

May 24, 1884–May 10, 1952

BY FRANK A. BEACH

CLARK LEONARD HULL was born in a log farmhouse near Akron, New York, on May 24, 1884. He died in New Haven, Connecticut, on May 10, 1952. He and his younger brother grew up under pioneer conditions, helping their father clear the land of stumps, splitting the rails for fences, and engaging in the usual round of farm chores.

His first paternal ancestor to come to this country was a Church of England clergyman who landed in Massachusetts in 1635. At first the family lived in that state and followed the sea. Later generations were farmers, living at first in Rhode Island and Connecticut, and later in New York State. The family religion was originally Quaker, and Hull has recorded in an autobiographical sketch the fact that one of his great aunts was hanged on Boston Common because of her religious convictions. His parents were apparently not deeply religious and his father had no formal schooling.

Hull himself seems to have had some leaning toward religion at various times in his life, but he was never able to accept it wholeheartedly. His own account of an early attempt to come to grips with religious problems appears in his autobiography.[1]

"When I was eleven or twelve years of age, some traveling evangelists known as Christian Crusaders staged a violent revival at the

[1] This and all subsequent quotations referring to Hull are taken from C. L. Hull, *A History of Psychology in Autobiography*, edited by E. G. Boring, H. S. Langfeld, and R. M. Yerkes (1952), IV, 143–62.

local Methodist Church, the only denomination active there at the time, and I, among a dozen or so other boys and girls, was 'converted' and joined the Church on probation. This experience aroused in me for the first time serious thought about religious matters, with the result that before the period of probation ended I had become very doubtful regarding the whole religious hypothesis. I finally announced my conclusions in open meeting and withdrew my affiliation."

Hull's family moved to Michigan and his formal education began in a one-room rural school. He later attended high school for one year in West Saginaw, Michigan, subsequently transferring to the academy of Alma College. At the end of his second year at Alma Academy, Hull suffered an attack of typhoid fever which was nearly fatal. His temperature remained dangerously high for four weeks, leaving him with permanent amnesia for that period and a generalized bad memory for names, according to his own account. Following his convalescence Hull enrolled in Alma College as a freshman and began to prepare for a career as a mining engineer. This plan was abandoned, however, because he contracted poliomyelitis and was left with one leg so badly paralyzed that he could not walk without crutches.

While convalescing from the polio attack, and for the next two years, Hull devoted a great deal of thought to the choice of a life occupation. His account of his own deliberations follows.

"One possibility was that I enter the ministry of the Unitarian Church, which at that time I considered essentially to be a form of free, godless religion. The preparation of ethical sermons of mainly philosophical content seemed attractive, but the contemplation of the probable necessity of attending an endless succession of ladies' teas and related functions led me to abandon this idea. What I really wanted was an occupation allied to philosophy in the sense of involving theory: one which was new enough to permit rapid growth so that a young man would not need to wait for his predecessors to die before his work could find recognition, and one which would

provide an opportunity to design and work with automatic apparatus. Psychology seemed to satisfy this unique set of requirements. Accordingly I made a preliminary survey of the subject by studying about fourteen hundred pages of William James' *Principles of Psychology.*"

As soon as his health permitted, Hull and his bride, Bertha Iutzi, entered the University of Michigan, where he majored in psychology. He considered the course in experimental psychology given by Professors W. B. Pillsbury and J. F. Shepard as the outstanding one in his entire career as a student.

Hull won the B.A. degree in 1913, left school to teach for a year, and then began his graduate training in psychology at the University of Wisconsin. Here he was strongly influenced by his contacts with Professors Daniel Starch and V. A. C. Henmon. He was awarded the Ph.D. degree in 1918.

Hull had begun his teaching career before entering college. At seventeen he passed a teacher's examination and was appointed to a one-room country school for one year. After recovering from the attack of poliomyelitis he taught grades 7, 8, 9, and 10 in the rural school which he had attended as a child. Years later Hull wrote of this experience, "This work was deeply satisfying, and I believe that the teaching was the best I've ever done." Following graduation from Michigan, Hull taught for one year in a small normal school in Richmond, Kentucky. This was a less rewarding experience, and Hull was "impressed with the casual attitude of students from the blue grass country, and the generally sterile nature of the faculty."

The next year as a beginning graduate student at the University of Wisconsin he held a part-time teaching assistantship. He was responsible for quiz sessions connected with the elementary course and was also in charge of the laboratory portion of the course in experimental psychology. The amount of teaching Hull did during his career as a graduate student exceeded the assignment of beginning instructors in some universities today. During his second year at Wisconsin he was officially a full-time instructor in the department. He

was asked to take over a course in psychological tests and measurements. He renamed the course "Aptitude Testing" and completely reorganized the syllabus, eventually writing a book on the subject.

During the same year he taught a special course in "Introductory Psychology" for premedical students. In connection with this responsibility Hull became interested in problems of suggestibility, and this eventually led him into a long program of research on hypnosis. Finally, still during his years as a graduate student, Hull lectured on experimental psychology. This was the one course above all others that he wanted to give because he believed it constituted the foundation of a truly scientific psychology.

After earning his advanced degree, Hull remained at Wisconsin as a member of the Department of Psychology. He became intensely interested in the current conflict between American behaviorism and the German Gestalt school. He tried unsuccessfully to get a foreign fellowship to study with Professor Kurt Koffka in Germany. He did, however, manage to arrange for Koffka to spend a year at Wisconsin.

Koffka spent most of his time attacking Watsonian behaviorism; but Hull, instead of being converted to the Gestalt point of view, reached the conclusion that Watson had not made out as good a case for behaviorism as the facts warranted. Hull decided to do this himself. Just before leaving Wisconsin he read Anrap's new translation of Pavlov's book, *Conditioned Reflexes,* and his later thinking was strongly influenced by some of the notions of Pavlov.

In 1929 Hull moved to Yale University as a research professor in the Institute of Psychology, which later became a part of the Institute of Human Relations. Still later Hull was appointed Sterling Professor of Psychology.

In the summer of 1929 Hull taught a course on aptitude testing in the School of Education at Harvard University. Discussions of various scientific concepts with C. I. Lewis and with A. N. Whitehead strengthened Hull's interest in theory-building. At this time he purchased and became thoroughly familiar with Newton's *Principia,*

a work which strongly influenced his thinking from that time on. He also found stimulating the *Principia Mathematica* of Whitehead and Russell.

During his years at Yale he had no formal teaching responsibilities but regularly conducted a small, weekly seminar for graduate students, "in order to keep in contact with the young." The seminars were almost always centered upon Hull's current research and theoretical formulations. Accordingly the content varied from year to year and it was not uncommon for a student to take the seminar several years in succession.

It was about 1930 when Hull finally reached the decision which was to shape his research and teaching for the remainder of his life. He described his own thinking in the following excerpt from his autobiography.

"I came to the definite conclusion . . . that psychology is a true natural science; that its primary laws are expressible quantitatively by means of a moderate number of ordinary equations; that all of the complex behavior of single individuals will ultimately be derivable as secondary laws from (1) these primary laws together with (2) the conditions under which the behavior occurs; and that all the behavior of groups as a whole, i.e., strictly social behavior as such, may similarly be derived as quantitative laws from the same primary equations. With these and similar views as a background, the task of psychologists obviously is that of laying bare these laws as quickly and accurately as possible, particularly the primary laws."

In 1936, together with a few students and associates, Hull instituted a series of evening seminars which came to be known as the "Monday Night Meetings." With the cooperation of Neal Miller, John Dollard, Hobart Mowrer, and others, Hull discussed the essential identities in conditioned reflexes and behavior laws on the one hand and the phenomena dealt with by Freud and his psychoanalytic associates on the other. These meetings aroused much interest on the part of psychologists, sociologists, psychiatrists, and anthropologists, and at times as many as seventy people attended.

Hull's interest in research manifested itself early. As an undergraduate at Michigan he carried out an experiment on learning under the supervision of Professor J. F. Shepard. At that time and throughout his professional career Hull was very much interested in the evolution of concepts. Prior to his entry into graduate school he designed and constructed an automatic memory machine which he later used in the prosecution of his thesis research. Hull's thesis dealt with concept formation.

Another major research project dealt with the effects of tobacco smoking on mental and motor efficiency. Hull devised an ingenious methodology. Control subjects sat in the dark and "smoked" a special pipe which smelled of tobacco but contained instead of tobacco a special metal capsule with an electrical heating element combined with an asbestos moisture-holding device. This pipe provided a close approximation to the sensations of smoking and the artificiality of the situation went unnoticed by all but one of his subjects.

When he took over the course on psychological tests and measurements at Wisconsin, Hull was concerned with the chaotic nature of the available material and with the necessity for test validation. He addressed himself to these problems with characteristic vigor and incisiveness. In addition to inventing new tests of his own, he created test batteries intended to measure various special aptitudes. This necessitated the computation of large numbers of product-moment correlations. To reduce the time and labor involved in these computations Hull designed and constructed a correlation machine which performed nearly all of the arithmetical work automatically.

As a result of his original researches in the field and his thorough examination of the relevant literature, Hull published in 1928 a book entitled *Aptitude Testing*. This definitive volume had an immediate and beneficial effect upon the testing field and is still cited in modern writings.

As has been mentioned, Hull became interested in suggestibility as a consequence of his lectures to premedical students. This interest led to a major research program on hypnosis and other forms of

suggestion. The work covered a span of ten years and yielded more than thirty separate experimental reports. The program was finally summarized in 1933 in the book *Hypnosis and Suggestibility: An Experimental Approach.* This volume is regarded as a classic and is widely studied today.

Following the periods of work on aptitude testing and suggestibility, Hull concentrated for the remainder of his professional life upon learning and behavior theory. For twenty years he labored to construct a theoretical system which has been one of the most stimulating influences upon the American approach to learning during the present century. From 1929 to 1943 Hull worked incessantly upon the ideas which were to appear in his most important scientific contribution. This volume, *Principles of Behavior,* was published in 1943 when its author was fifty-nine years old. It has been one of the most influential books on the theory of learning since the days of Pavlov and Thorndike, if not the most influential.

It was typical of Hull that he continued to develop his system after the book's publication. Students and former associates frequently were deluged with many-paged mimeographed memoranda embodying additions or emendations of the original formulations.

Many of the changes were radical, constituting major revisions, and in 1951 Hull published the *Essentials of Behavior,* in which he put forth an extensively modified theory.

Hull was what might be called a "quantitative thinker," and from his earliest school days he found arithmetic an easy study, while grammar and languages were comparatively difficult. In connection with a description of his high school education he once wrote as follows:

"Indeed, the study of geometry proved to be the most important event of my intellectual life; it opened to me an entirely new world —the fact that thought itself could generate and really prove new relationships from previously possessed elements."

Hull's attitude toward science was characterized by a missionary zeal. He championed the hypothetico-deductive technique and al-

ways strove for rigorous formalization and quantification. His concept of the fruitful approach to behavioral science involved making postulates about untestable functions or processes, and then deriving theorems to test the postulates.

He was an exceedingly critical thinker and could be intolerant of lack of rigor in the thinking of students or colleagues. Even as a graduate student he found reason to compain of lack of clarity and content in the lectures delivered by some of his professors.

"I found Professor 'J' a kindly person to serve under, but I learned little from the years of association with him. His mind could scintillate in a brilliant fashion but his approach to psychology was largely qualitative and literary. [He] had remarkable linguistic fluence. He could sometimes lecture for five minutes at a time in perfectly good sentences, yet hardly saying a thing."

Occasional lapses from rigorous thinking on the part of graduate students were apt to provoke profanity (which might be better described as "cussing") and a threatening shake of Hull's cane in the direction of the offender. In contrast to his contempt for slipshod thinking, Hull encouraged students to disagree with him on theoretical issues. His graduate seminars were suffused with an air of intellectual excitement. He was always willing to assume positions or make statements which stood a good chance of being wrong, if such behavior contributed to a closer examination of the system and if the statements were open to experimental proof or disproof. Of public reactions to his own theorizing as represented by the *Principles,* Hull once wrote the following statement: "In general I have found the hostile examinations much more helpful in the continuing development of the system than the more friendly ones."

His prevailing ill health exerted its effects upon Hull's general outlook. The early attack of typhoid, the subsequent contraction of poliomyelitis, and a coronary attack in 1948 combined to convince him that he would not live long enough to complete the grand program he had laid out for himself. This feeling contributed to his single-minded devotion to research and impatience with any inter-

ference or delay. Toward the end of his life, failing strength limited him to four hours of work each day, and even this could only be accomplished in two two-hour stints. Nevertheless, he persevered and completed the manuscript of his last book, *A Behavior System,* which was published after his death.

Hull utilized the services of many helpers during his research career. One of the most faithful and devoted assistants was Miss Ruth Hayes, who served him for many years during his appointment at Yale. At different times he enlisted the aid of undergraduates, and upon occasion even the janitor was pressed into service as a runner of rats.

Hull never conducted experiments himself. His habitual working attire include a white laboratory coat and a green eyeshade, but he left the actual testing of his theories to volunteer and paid assistants. His interaction with students was close and was not confined to the lecture room or laboratory. He frequently lunched with students and younger faculty members at a small restaurant near the Institute, and these occasions invariably were marked by spirited discussion and argumentation concerning psychological experiments and theories. In later years Hull's poor health deprived him of such contacts, which he valued highly as a source of informed criticism.

In his autobiography, Hull specifically acknowledged his debt to former students and associates. The list which he compiled included Everet F. Patten, St. Clair A. Switzer, Kenneth W. Spence, Neal E. Miller, John Dollard, O. H. Mowrer, Robert T. Ross, Marshall Hall, Donald P. Perkins, Carl I. Hovland, Eleanor J. Gibson, and Harry G. Yamaguchi.

Toward his graduate students Hull did his best to maintain an attitude of meticulous fairness, always taking great care to make public acknowledgment of the original contributions made by others. Quite frequently results of studies inspired and designed by Hull appeared over the name of the student who carried out the actual experimentation. Hull was not an outgoing or particularly warm per-

son, but he commanded the respect of his associates and the affection of those few who knew him intimately.

He tried to keep in touch with his students after they left Yale, and in his outer office was kept a collection of snapshots of former students, their wives, and their children.

He was president of the American Psychological Association in 1935–36. He was a member of the National Academy of Sciences, the American Academy of Arts and Sciences, and the Society of Experimental Psychology. The latter society awarded its cherished Warren Medal to Hull in 1945 with the following citation.

"To Clark L. Hull: For his careful development of a systematic theory of behavior. This theory has stimulated much research and it has been developed in a precise and quantitative form so as to permit predictions which can be tested empirically. The theory thus contains within itself the seeds of its own ultimate verification and of its possible final disproof. A truly unique achievement in the history of psychology to date."

The impact of Professor Hull's work upon psychology cannot be fully estimated at this time, but it has been powerful and widespread. His contributions to aptitude testing and to the study of suggestibility still influence present thinking. His system of behavior theory may well have produced more controversy and provoked more experimental work than any other psychological theory in the twentieth century. The system will not stand unaltered, as he knew it would not, but it will always be an important landmark in the history of theoretical psychology; and those parts of it which withstand the test of time will inevitably influence and perhaps be woven into later formulations by subsequent generations of psychologists.

Hull probably had less interest in his theory as such than in the broader issue of contributing to the solution of social problems. His autobiography closes with the following statement:

"I believe that one of the greatest sources of international conflict and human misery lies ultimately in our prevalent subjectivity. It is bad enough to have religious considerations interfere with the evolu-

tion of science. It is even more surprising and quite as unfortunate to have an international socio-economic system do so. Let us hope that with a sufficiently clear objectivity in our behavioral science these biases and their deplorable sequels will largely disappear. Perhaps the most effective means to that great end will be the accurate and wholly convincing determination of the primary laws of human behavior, together with the scientifically true and unmistakable definition of all critical terms involved. These laws should take the form of quantitative equations readily yielding unambiguous deductions of major behavioral phenomena, both individual and social. Present achievements are small, but the goal at least now seems fairly clear."

KEY TO ABBREVIATIONS

Amer. J. Psychol.=American Journal of Psychology
J. Abn. Soc. Psychol.=Journal of Abnormal and Social Psychology
J. Amer. Statist. Assn.=Journal of the American Statistical Association
J. Appl. Psychol.=Journal of Applied Psychology
J. Comp. Physiol. Psychol.=Journal of Comparative and Physiological Psychology
J. Comp. Psychol.=Journal of Comparative Psychology
J. Educ. Psychol.=Journal of Educational Psychology
J. Educ. Res.=Journal of Educational Research
J. Exper. Psychol.=Journal of Experimental Psychology
J. Gen. Psychol.=Journal of Genetic Psychology
J. Philos.=Journal of Philosophy
Ped. Sem.=Pedagogical Seminary
Philos. Sci.=Philosophy of Science
Psychol. Bull.=Psychological Bulletin
Psychol. Clinic=Psychological Clinic
Psychol. Rev.=Psychological Review
Trans. N. Y. Acad. Sci.=Transactions of the New York Academy of Science

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