

Observing Ben Wyckoff: From Basic Research to Programmed Instruction and Social Issues

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L. Benjamin Wyckoff's seminal contributions to both psychological theory and application are the subject of this review. Wyckoff started his academic career as a graduate student at Indiana University, where he developed the observing-response procedure under the guidance of B. F. Skinner and C. J. Burke. At the University of Wisconsin–Madison, Wyckoff refined his mathematical theory of secondary reinforcement. This theory was the impetus for his creation of an electronic simulation of a rat running a T maze, one of the first “computer models” of learning. Wyckoff next went to Emory University, leaving there to help create two of the most successful companies dedicated to the advancement of programmed instruction and teaching machines: Teaching Machines, Inc. and the Human Development Institute. Wyckoff's involvement in these companies epitomizes the application of basic behavior-analytic principles in the development of technology to improve education and human relationships. The emergent picture of Wyckoff is that of a man who, through his research, professional work in educational applications of behavioral principles, and active involvement in the civil rights movement of the 1960s, was strongly committed to applying behavioral science to positively influence human behavior change.

Key words: Benjamin Wyckoff, observing responses, conditioned reinforcement, teaching machines, programmed instruction, human relationships, diversity issues, client-centered therapy

The first author is now at the National Autonomous University of Mexico and was supported by a postdoctoral fellowship awarded by the PROFIP of DGAPA-UNAM. This paper was possible thanks to the recollection of many contributors to whom the authors are indebted: Estelle Wyckoff and Andrew Weiskoff (Benjamin Wyckoff's family); John Cotton and Richard Atkinson (Indiana University); Lewis Gollub (Harvard University); Bernard Pyron and H. Philip Zeigler (University of Wisconsin); Stephen Kendall, Donald J. Levis, and William Deckner (Emory University); Donald Tosti, Roger Addison, Roger Steinhorst, Clifton Chadwick, and David Shields (Teaching Machines Inc.); Jerome Berlin, Gene Ruyle, and Schlomo Friedlander (Human Development Institute); Lizette Royer (Archives of the History of American Psychology); Constance Carter (Library of Congress); and Kathleen Shoemaker (Emory University Manuscript, Archives, and Rare Book Library).

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Lewis Benjamin Wyckoff, Jr., Ben to friends and colleagues, was born in 1922 in Niagara Falls, New York. He died at age 84 on June 6, 2007, at St. Simons Island, Georgia. He is perhaps best remembered among behavior analysts as the creator of the observing-response procedure. In his doctoral dissertation he noted that, “We shall adopt the term ‘observing response’ (R_O) to refer to any response which results in exposure to the pair of discriminative stimuli involved” (Wyckoff, 1951b, p. 1).

Many behavior analysts are familiar with the above statement, because Wyckoff's observing-response procedure is still widely used for investigating conditioned or secondary reinforcement (hereafter, conditioned reinforcement) (e.g., DeFulio & Hackenberg, 2008; Escobar & Bruner, 2009; Fantino & Silberberg, 2010; Lieving, Reilly, & Lattal, 2006; Pessoa, Huziwara, Perez, Endemann, & Tomanari, 2009; Shahan & Podlesnik, 2008).

Wyckoff's observing-response procedure offered a means of demonstrating the acquisition and maintenance of an operant, the only programmed consequence of which is the production of discriminative stimuli, without altering the rate of primary reinforcement (for reviews, see Dinsmoor, 1983; Fantino, 1977). The procedure typically consists of two components alternating randomly. During one component, responses are reinforced according to an intermittent schedule (e.g., a variable interval); during the other component, responses are not reinforced. A response on a second operandum briefly produces the stimulus associated with the ongoing component (e.g., a green light during the reinforcement component and a red light during the extinction component). The observing-response procedure is one of most useful methods for studying conditioned reinforcement (see, e.g., Williams, 1994, for a review).

A year after he finished his doctoral studies, the theoretical Part 1 of his dissertation was published in the *Psychological Review* (Wyckoff, 1952). The Social Sciences Citation Index indicates that this article has been cited in over 250 other research and theoretical articles in psychology. The procedural details of the observing-response procedure, which constituted Part 2 of the dissertation, were not published until 1969, however, in the volume entitled *Conditioned Reinforcement* edited by Henry (Wyckoff, 1969).

Designing the observing-response procedure is alone sufficient to secure Wyckoff mention in any history of the experimental analysis of behavior. That seminal work, however, perhaps overshadowed his less well-known work in behavior analysis from the mid-1960s that invites the attention of an even broader audience of applied behavior analysts, educational technologists, educators, computer enthusiasts, and even civil

libertarians. Wyckoff's journey through behavior analysis may be likened to the journey described by Skinner in "A Case History in Scientific Method" (1956): an inductive approach in which the scientist follows the data wherever they happen to lead. This approach in Wyckoff's career is an instructive counterpoint to the numerous examples of gaps among basic research, applied research, and service delivery aspects of behavior analysis (e.g., Michael, 1980; Pierce & Epling, 1980). The purpose of this historical review is to trace the course of Wyckoff's journey.

EARLY ACADEMIC LIFE AND INDIANA UNIVERSITY

Wyckoff attended Antioch College from 1941 to 1947, having completed 5 years of premed courses. Following graduation, he applied to Harvard Medical School, but he changed his mind and pursued a PhD in psychology instead. His wife, Estelle, noted that he learned of Skinner's work and decided to study under his supervision at Indiana University (E. Wyckoff, personal communication, March 22, 2009).

According to J. Cotton (personal communication, February 24, 2009), who became friends with Wyckoff at Indiana, he and Wyckoff took an introductory course on the topic of the experimental analysis of behavior with Skinner, circa 1947. The goal of the course was to familiarize graduate students with Skinner's 1938 book, *The Behavior of Organisms*.

Even before Skinner arrived in Bloomington in 1945, Indiana University was fertile ground for behaviorism and behaviorists. Under the influence of J. R. Kantor, W. N. Kellogg, and R. C. Davis, graduate students were well acquainted with learning theories. As part of the task to rebuild the Department of Psychology after the war, Kantor attracted Skinner to Indiana University (Hearst & Capshew, 1988). In the

following years, the addition to the faculty of W. O. Verplanck, W. K. Estes, S. W. Bijou, D. G. Ellson, C. J. Burke, W. O. Jenkins, and I. J. Saltzman favored the melding of different behavioristic approaches to the study of learning.

The origins of behavior analysis are closely tied to Bloomington, Indiana. The first and second Conferences on the Experimental Analysis of Behavior were held there, at Indiana University, in 1947 and 1948 (see Dinsmoor, 1987). Wyckoff may be seen in a photograph of the attendees of the first conference (see p. 456 of Vol. 5 of the *Journal of the Experimental Analysis of Behavior* [JEAB]; see also Hearst & Capshew, 1988; Skinner, 1979). Wyckoff also attended the third conference at Columbia University, where a photograph (Dinsmoor, 1990) shows him standing next to another graduate student, Lloyd Homme, who also was one of his closest friends in Bloomington. In the "Conference on the Experimental Analysis of Behavior Notes" dated February 1, 1949, they appeared as coauthors of one presentation on the effects of deprivation on feeding behavior. As will be described below, their collaboration and friendship continued for many years.

Wyckoff made a good impression on Skinner. For one thing, he shared Skinner's passion for building apparatus. For another, he and Skinner had mutual research interests. During his time at Indiana, Skinner was working on the experiments on matching to sample described in Skinner (1950, 1979, p. 320). Skinner described how these experiments, using pigeon boxes displaying three response keys, led to studies of attention and abstraction or concept formation. It is unclear on which of these experiments Skinner and Wyckoff collaborated. Based on Skinner's notes in his autobiography (1983, p. 37), however, before Skinner left Indiana in 1948, Wyckoff was work-

ing with him on experiments on discrimination in which reinforcement was contingent on two properties of the stimuli. Skinner's notes (1983, p. 415) suggest that the rationale for these experiments was to study concept formation.

From his interactions with Skinner at Indiana, Wyckoff earned an invitation to work with Skinner at Harvard during the summer of 1950. In Cambridge, Wyckoff immediately became good friends with Charles Ferster, with whom he spent many evenings playing music, sometimes joined by Skinner. Wyckoff was a fine pianist (E. Wyckoff, personal communication, June 18, 2009).

According to Skinner (1983, pp. 37, 415), during his time at Harvard, Wyckoff continued their research on concept formation that was started at Indiana. It was supposed to employ a single-key procedure in which reinforcement would be contingent on two properties of the stimuli. Skinner wanted Wyckoff to present four stimuli (red flashing, red continuous, green flashing, and green continuous) to test for the formation of the concepts of color and flashing or not flashing. Wyckoff, however, apparently modified the procedure. Skinner (1983) observed in his autobiography that "Ben Wyckoff was his own man and did the work his own way" (p. 415). Although the details of Wyckoff's modifications to Skinner's design are lost, Skinner does refer to Wyckoff's experiments in "The Science of Learning and the Art of Teaching":

In a special case first investigated by L. B. Wyckoff, Jr., the organism responds to one stimulus where the reinforcement consists of the clarification of the stimulus controlling a second response. The first response becomes, so to speak, an objective form of "paying attention" to the second stimulus. In one important version of this experiment, as yet unpublished, we could say that the pigeon is telling us whether it is "paying attention" to the shape of a spot of light or to its color. (Skinner, 1954, p. 89)

According to L. Gollub (personal communication, February 1, 2008), the experiments on “attention” to shape and color, which Skinner suggested were started by Wyckoff, continued at Harvard, and culminated in Reynolds’s (1961) paper on attention in the pigeon. The similarity between Reynolds’s procedures and the experiments that Wyckoff conducted in Skinner’s lab, in terms of the use of two-element discriminative stimuli, is notable.

Skinner (1950) stated that he had difficulty training pigeons to produce and “attend” to a sample stimulus in his experiments on matching to sample. It seems reasonable to conclude that Skinner started to discuss with Wyckoff, while he was at Harvard, the idea of measuring responses that make contact with the discriminative stimuli, the line of research that culminated in Wyckoff’s doctoral dissertation. This suggestion is supported by the fact that a few years later Wyckoff acknowledged Skinner in his dissertation for his help in the experiments that led to the observing-response procedure.

Although Skinner invited Wyckoff to stay at Harvard to complete his studies, Wyckoff decided to return to Indiana University. According to Estelle Wyckoff, the primary reason for returning to Indiana was that Wyckoff knew that Skinner’s dominant personality would compel him to be devoted exclusively to Skinner’s reinforcement theory. For Wyckoff, as he learned at Indiana, reinforcement theory was only a part of what are generally referred to as learning theories, and he wanted to take what he thought was useful from all of them. For example, as his subsequent research showed, he was not prepared to abandon the mathematical descriptions of learning. To avoid a confrontation with Skinner, however, when he had to explain his reasons for leaving, he used his wife as an excuse. Skinner was not pleased about Estelle’s pressure on her hus-

band and confronted her. She, however, had no idea what Skinner was talking about (E. Wyckoff, personal communication, June 18, 2009).

When Wyckoff returned to Indiana, he obtained his MA with W. K. Estes. He was always grateful for the high standards in writing imposed by Estes (E. Wyckoff, personal communication, March 22, 2009). Given the influence of Estes and the training in quantitative analysis in his courses with the recently hired Cletus J. Burke, it is not surprising that his master’s thesis focused on the quantitative relation between the number of lever presses during extinction and the number of reinforcers delivered during conditioning (Wyckoff, 1950, 1951a). Wyckoff chose Burke to be his adviser for the doctoral dissertation. Burke obtained his PhD in 1949 at the State University of Iowa with Kenneth Spence (Burke, 1949). He had solid training in statistics and in the Hull-Spence theories. Verplanck described Burke in 1950 as the best statistician he knew, a very good and creative experimental psychologist, and as an informal but effective teacher.¹

Wyckoff’s doctoral dissertation reflected well his two main influences: Skinner’s experimental analysis of behavior with free-operant procedures and Burke’s strong focus on quantitative methods, anchored in Spence’s theory of discrimination. Wyckoff’s observing-response procedure allowed recording of a response that exposed an animal to discriminative stimuli. Recording these responses, which were characterized at the time as “attending” and were described previously by Spence (1940), was crucial in the continuity vs discontinuity debate in discrimination learning (see also Spence, 1945).

¹ Letter of recommendation to Edwin B. Newman. January 10, 1950. William S. Verplanck Papers, Box M1878, Folder 4. Archives of the History of American Psychology, University of Akron.

Wyckoff primarily was interested in Spence's continuity theory, but he took the explanation for the occurrence of observing behavior from Skinner's (1938) *The Behavior of Organisms*: Discriminative stimuli can function as conditioned reinforcers. This double influence of Skinnerian and Hullian-Spencerian traditions was central in the subsequent positive impact of Wyckoff's observing-response procedure.

Wyckoff's procedure was adopted by researchers in the Hull-Spence tradition, like Perkins's group, which studied observing behavior in mazes (Levis & Perkins, 1965; Lutz & Perkins, 1960; Prokasy, 1956). In an E maze, for example, an observing response is recorded when the animal runs to the side in which the color of a small waiting chamber correlates with the presentation or with the absence of food instead of running to the side in which the color of the waiting chamber does not correlate with the outcome.

The observing-response procedure was used extensively by researchers in the Skinnerian tradition like Kelleher (1958), whose research on response-produced stimuli appeared in the first issue of *JEAB*, and Holland, where it appears in his vigilance tasks (Holland, 1957, 1958). Also, Killeen (1982) suggested that Herrnstein's experiments on conditioned reinforcement (Herrnstein, 1964) were at least partially inspired by Wyckoff's procedure. Furthermore, the quantitative model describing observing responses, which was central in Part 1 of Wyckoff's dissertation, appealed to behavioral researchers who were developing and extending mathematical theories of learning and attention (e.g., Atkinson, 1961; Atkinson & Estes, 1963; Bush, 1965; Norman, 1968).

UNIVERSITY OF WISCONSIN-MADISON

After completing his PhD, Wyckoff accepted a position as an instruc-

tor at the University of Wisconsin-Madison. He and Estelle moved to Madison in 1951 (E. Wyckoff, personal communication, March 22, 2009). Psychology at the University of Wisconsin at that time was dominated by the strong presence of Harry Harlow. The department favored empiricism with a general approach to psychology and a strong emphasis on statistics (B. Pyron, personal communication, January 18, 2009). Wyckoff had a strong background in statistics, but it is not clear how his interests in behaviorism and operant procedures were received by the department. L. Golub (personal communication, January 31, 2008) recalled that, in one of Wyckoff's visits to the Harvard Pigeon Lab when he was on the faculty at Wisconsin, he mentioned that he was given a broom closet under the flight of the stairs as his office. Whether this office assignment was a matter of space, as it was in many departments of psychology, or something less benign is unknown.

During his tenure at Wisconsin, Wyckoff published three articles that dealt with conditioned reinforcement and discrimination learning (Wyckoff, 1954, 1959; Wyckoff, Sidowski, & Chambliss, 1958). In his 1954 paper, he used a linear-operator model to describe the change in reflex strength as a function of the reinforcing value of the stimulus conditions presented after the response. He based this model on the idea of the dual function of stimuli as discriminative and reinforcing (Dinsmoor, 1950; Skinner, 1938). An interesting detail of this paper is that he corrected his mathematical model after testing it with an electronic model that he constructed (see also Cordeschi, 2002, pp. 169, 183; "Good Turn Deserves Another," 1953).

The electronic model was based on timer circuits using vacuum tubes. It simulated choices in a T maze with or without a previous observing response. In the model, Wyckoff sim-

ulated four conditions that resulted from choosing to observe or not, and choosing the reinforced or the unreinforced side of the maze. For example, if a simulated observing response occurred in combination with choosing the reinforced side of the maze, the reinforcing properties of the stimuli on the next trial increased by changing the voltage in a condenser via relay connections. This increased the probability of a simulated observing response on the following trial. The experimenter recorded the simulated responses by illuminating different sequences of four lights that represented the two responses in the two choice phases² (see also Minsky, 1961).

Earlier electronic models of learning in mazes had been developed (e.g., Ross and Smith's 1937 "robot rat," Ross, 1938; Shannon's 1951 "maze-solving rat," Cordeschi, 2002; and Wallace's, 1952, "maze-solving computer"), but Wyckoff was the first to consider the principles of discrimination and conditioned reinforcement in constructing such an electronic model. Contemporary computer models of operant conditioning such as the "Skinnerbots" (Touretzky & Saksida, 1997) and *Sniffy the Virtual Rat* (Alloway, Wilson, & Graham, 2005) now routinely incorporate these principles.

Wyckoff's other accomplishments during this time included a 1-year fellowship, in 1955, at the Center for Advanced Study in the Behavioral Sciences at Stanford University ("Faculty: Honored and Appointed," 1955). From his work at the center, he refined his theory of conditioned reinforcement by addressing the asymmetry of the reinforcing and aversive properties of the stimuli produced by observing (Wyckoff, 1959; see Dinsmoor, 1983, for a

discussion). He also coauthored a number of publications with colleagues and students (Auerbach, Waisman, & Wyckoff, 1958; Pyron & Wyckoff, 1961; Sidowski, Wyckoff, & Tabory, 1956; Wyckoff & Page, 1954; Wyckoff & Sidowski, 1955; Zeigler & Wyckoff, 1961). His interest in apparatus again was demonstrated in his 1954 paper with Page. They described a grid for administering electric shocks to rats. One problem with previous devices was that the rats could avoid the shock by standing on two bars that were on the same side of the electric circuit. A few years before, Skinner and Campbell (1947) designed the first device that avoided the problem by repeatedly changing the polarity of the bars (i.e., a shock scrambler). Rats could still detect the pattern of changes in the polarity in the bars, however (see Sloane, 1964, for details). Wyckoff and Page's device was the first modification to Skinner and Campbell's scrambler that permitted a more rapid, uniform, and reliable polarity alternation (see Azrin, Hopwood, & Powell, 1967).

Wyckoff was also coauthor of a paper on the influence of punishment and reinforcement in a minimal social situation (Sidowski et al., 1956), which received particular attention from social psychologists (e.g., Colman, 1995; Gergen & Barton, 1974). The experiment demonstrated that two participants can work together to produce reinforcement and reduce punishment for both of them even when they are unaware of being in a social interaction. This paper was reprinted and discussed in McGinnies and Ferster's volume on the reinforcement of social behavior (Sidowski, Wyckoff, & Tabory, 1971) and in Staats's edited textbook on human learning (Sidowski, Wyckoff, & Tabory, 1964).

During Wyckoff's last year at Wisconsin, a generalized discontent with the policies of the American Psychological Association (APA) to-

²The diagrams of the electronic model and the list of parts are stored as Document ADI4160 in the Library of Congress, Washington, D.C.

ward experimental psychology led to the creation of the Psychonomic Society in 1959. The primary issue was APA's strong focus on professionalization and applied psychology at the expense of basic research (see Dewsbury & Bolles, 1995, for a detailed history of the Psychonomic Society). The society started formally when a group of psychologists from the University of Wisconsin sent letters inviting W. K. Estes, F. A. Geldard, C. H. Graham, N. E. Miller, C. T. Morgan, W. D. Neff, K. W. Spence, S. S. Stevens, and B. J. Underwood to serve on the organizing committee of the American Federation of Experimental Psychologists.³ Among the psychologists who sent the invitation letters, and who should be acknowledged for their role in starting what would be called later the Psychonomic Society, were Verplanck, who was at the time a visiting professor at the University of Wisconsin, and Wyckoff.

Wyckoff's loathing of administrative work and academic politics may have contributed to his discontent at Wisconsin. According to Zeigler (personal communication, December 18, 2008), he has been described as neither practical nor political enough to survive in the academic "jungle." E. Wyckoff (personal communication, March 22, 2009) described him as "resistant to authority and rebellious, introverted, and somewhat of a loner." According to J. Cotton (personal communication, February 15, 2009), another issue that may not have helped Wyckoff's teaching career was his well known absent-mindedness. In a humorous example, Cotton recalled that Wyckoff kept an extra tie in the lab because wearing a tie was mandatory while teaching. On some occasions, he apparently forgot the tie he was wearing and put on a

second one, thereby showing up for class wearing both ties simultaneously.

When Wyckoff was offered a position of associate professor with tenure at Emory University in 1960, he accepted it without hesitation, leaving Madison with his wife and two sons, Daniel and Andrew (E. Wyckoff, personal communication, March 22, 2009). Despite their having talked only a few times, he persuaded Stephen Kendall, who was a talented graduate student at Wisconsin, to apply to Emory and study with him. Kendall had taken a few undergraduate courses with Dinsmoor at Indiana, but his graduate assistantship at Wisconsin was reduced essentially to training and testing cats. Kendall's impression was that this tedious task was unlikely to change in the near future. As a result, he considered the invitation to transfer to Emory with Wyckoff a good opportunity, and took it (S. Kendall, personal communication, March 7, 2009).

EMORY UNIVERSITY AND TEACHING MACHINES, INC.

The environment at Emory was complicated. On the one hand, it was favorable to conducting behavioral research (D. Levis, personal communication, March 17, 2009). On the other hand, the political issues surrounding the choice of a new department chair were completely disrupting (S. Kendall, personal communication, March 7, 2009). Apparently, an unspoken reason for hiring Wyckoff at Emory was the need for a new chair of the department. Convincing Wyckoff to take the job, however, ended up being impossible (E. Wyckoff, personal communication, March 22, 2009). Some months later, Charles C. Perkins joined the faculty and took the chair position, but all the pressure exerted on Wyckoff in the previous months adversely affected his motivation to pursue an academic career.

³Letter, July 23, 1959. David Grant Papers, Box M1026, Folder: "Correspondence, 1942-1971." Archives of the History of American Psychology, University of Akron.

Wyckoff's dislike of academic politics and administrative work contrasted with his profound curiosity and love of research. D. Levis (personal communication, March 17, 2009), who was at the time a graduate student of Perkins, remembered that Wyckoff spent hours peering into his experimental chamber to see what his pigeons were doing. He investigated delayed reinforcement and superstitious behavior in pigeons, and started to develop a procedure akin to a synthetic schedule of reinforcement that generated different rates of responding without altering reinforcement frequency (S. Kendall, personal communication, March 12, 2009). None of his research conducted at Emory, however, was published. Perhaps an important reason for this was that a new enterprise, teaching machines, proposed by his old friend Lloyd Homme, became most appealing and seems to have distracted him from his academic pursuits.

After obtaining his PhD at Indiana University in 1953 under the supervision of Estes (Hearst & Capshew, 1988), Homme took a position at the University of Pittsburgh. He later was invited to work with Skinner at Harvard in his teaching machine program in the late 1950s (Skinner, 1983, p. 119). This invitation followed Skinner's first presentation of teaching machines at the University of Pittsburgh in 1954 (Skinner, 1954). One of the achievements of Homme's collaborative work with Skinner was the development of instructional programs to be used in teaching machines (Tosti & Kaufman, 2007). The programs ultimately would become the most important element in the teaching machine movement, far more important than the iconic hardware. From his work with Skinner, Homme learned that the programs were the key to making teaching machines successful. Indeed, Tosti (in Tosti & Kaufman, 2007) observed that Homme was responsi-

ble for the design of instructional programs that could be presented in books rather than by machines. Although instructional devices had been described by Pressey in the 1920s (Pressey, 1926, 1927; see Benjamin, 1988), teaching machines received more public attention after Skinner's (1954) influential paper "The Science of Learning and the Art of Teaching." In it, Skinner described a teaching device that would integrate the advances in the experimental analysis of behavior into education. An important feature of the machine was that correct responses were immediately reinforced. The device presented programmed material to individual students in the form of questions, exercises, or problems to be solved. The student was required to provide an answer, which could be compared immediately with the correct response. In this way, each student practiced and was tested for his or her advances with the material to be learned and advanced at his or her own pace (see also Lumsdaine, 1960b).

Skinner's project attracted media attention (Skinner, 1983, p. 132) and originated the golden age of teaching machines. Several companies started to build and distribute teaching machines. Some of them were more successful in disseminating the technology than Skinner, who had tried to distribute his machines with IBM but could not close the deal (Skinner, 1983, pp. 97–98). In 1959, Homme and James Evans, one of his colleagues from the University of Pittsburgh, started their own company, Teaching Machines Inc. (TMI), to develop and distribute teaching machines and programmed books. Homme invited his old friends from Indiana University, Robert Glaser, who also was a colleague at the University of Pittsburgh, and Wyckoff to join them in the enterprise. For Wyckoff, it seemed to be a good opportunity to put his acumen with

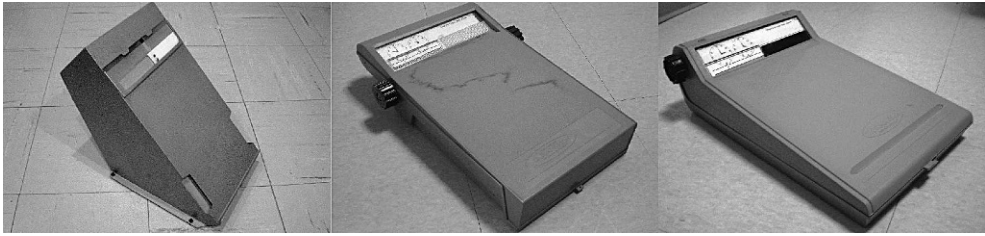


Figure 1. The picture shows from left to right, the Min/Max I, the Min/Max II, and the Min/Max III teaching machines.

apparatus to practical use. In the beginning, the company was headquartered in Pittsburgh, but in 1960 its headquarters moved to Albuquerque, New Mexico (D. Tosti, personal communication, March 18, 2009).

Although the programmed instruction industry was more concentrated on manufacturing teaching machines than on the programs for the devices (cf. Hechinger, 1966), TMI had the opposite agenda. As noted above, the first programmed instruction books were developed by Homme, along with Evans, and Glaser, at the University of Pittsburgh, between 1958 and 1960 (Glaser, Homme, & Evans, 1960; Lumsdaine, 1960b).

Dudley E. Cornell was hired by TMI to design what would become one of the most successful teaching machines, the Min/Max (Cornell, 1963). The name was short for minimum time/maximum learning. The original version, shown in Figure 1, was made of metal, was slightly larger than a typewriter and could hold several pages of programs at a time. Through a window, the student could see the question, and a space to write the answer was accessible in another window. After writing the answer, the student could see the correct responses and advance the paper by pushing it with a pencil eraser (Fine, 1962).

As TMI's Chairman of the Board, Wyckoff made frequent trips to Pittsburgh and later to Albuquerque from Atlanta to supervise the development of the programs for the Min/Max, which Tosti was in charge of

writing (D. Tosti, personal communication, March 17, 2009). In a short time, TMI developed programs that covered topics in English, basic and advanced mathematics, general science, languages, and music. The assortment of programs, in combination with a low-price teaching machine, was the key to obtaining a major distribution agreement with Grolier Inc. in November 1960. Grolier, which was one of the largest publishers of encyclopedias in the U.S., used their 5,000 door-to-door salesmen to sell their encyclopedia sets, the *Book of Knowledge* and the *Grolier Encyclopedia* (Klaw, 1962; "The Truth About Those Teaching Machines," 1962), with the added incentive of receiving a complementary Min/Max teaching machine and its programmed courses with any purchase. Of course, it was also possible to purchase the machine and the programs independently of the encyclopedia sets.

By 1962, the Min/Max was made more efficient and portable. Cornell had designed two new versions of the Min/Max, also shown in Figure 1. The Min/Max II and III were made of plastic and also about the size of a small typewriter. Both models included two knobs on the sides that served to advance the paper, but the Min/Max III was smaller and lighter (Cornell, 1966).

The advertisements of TMI promoting a low-cost teaching machine and a variety of programs can be found in many newspapers, education journals, and journals of that era

focused on programmed instruction and behavior (e.g., *American Behavioral Scientist*, *Grade Teacher*, *Harvard Educational Review*, *Journal of Educational Research*, *Journal of Programmed Instruction*, *JEAB*, *The American School Board Journal*, *School Management*, *The Elementary School Journal*, *The New York Times*, *The Science Teacher*, *Today's Education*, among others). Even articles in the general media described the "revolutionary" teaching machines sold by TMI-Grolier (e.g., Klaw, 1962; "The Teaching Machines," 1960). In the first 2 years, TMI-Grolier sold over 150,000 teaching machines, thereby becoming the most successful company devoted to programmed instruction and teaching machines (Klaw, 1962).

After the enormous success of the Min/Max and the company's programmed texts, TMI's focus widened when they offered a version of one of Skinner's most controversial gadgets, the air crib or baby tender (Skinner, 1945/1972). In 1962, TMI began selling its own version of Skinner's air crib. The first model, named the Incu-crib, sold for \$499. It was first advertised in the April 1962 issue of *JEAB*. Skinner recalled in his autobiography that he was asked to comment on the crib, and he disliked the use of a plastic bubble because of the resonating acoustics (Skinner, 1983, pp. 250, 251). A few months later the model was modified to make the child more visible, improve the acoustics inside the crib, and lower its cost. After Skinner approved the modifications, the name of the crib was changed to TMI-Aircrib and it sold for \$250. D. Tosti (personal communication, March 17, 2009) recalled that he used this crib for three of his children. An advertisement in the April 1963 issue of *JEAB* portrays Jill A. Cornell, Dudley Cornell's daughter, as a happy child in a TMI-Aircrib.

Even before the Min/Max I was on the market, Wyckoff began designing

a more sophisticated teaching machine than the Min/Max series. The first version of the machine, which Kendall helped construct, was controlled with five keys and presented the instructional material on a screen. The material, designed to teach children to read, was encoded on 35-mm slides. The slides showed incomplete words that the children were required to complete, one letter at a time. Various combinations of presses on the five keys made up the alphabet. Only when the keystrokes matched the pattern in the film strip was the answer coded as correct and the film allowed to advance, presenting the correct letter on the screen.

The machine was labeled the Wyckoff film-tutor and was first available in 1959 (Kopstein & Shillestad, 1961). Wyckoff filed for a patent in 1960 (Wyckoff, 1964). Figure 2 shows a diagram of the machine based on the patent description. A serious problem with the film-tutor was that, to use the machine, students had to learn a new code (i.e., the key combinations for each letter) or use a conversion table. Wyckoff subsequently designed improved versions of the machine that included a full keyboard, eliminating the need to learn a code. Two versions of the machine are also shown in Figure 2. The Wyckoff film-tutor solved two problems posed by the Min/Max. One was the amount of paper required to present the programs. In a single year, TMI consumed 1,000 tons of paper in printing programs for the Min/Max (Donnelly, 1964). The other problem was that the length of each question item was constrained by the size of the window in the Min/Max. The Wyckoff film-tutor allowed the presentation of question items of various sizes (Lumsdaine, 1960a).

At TMI, Roger Steinhorst was in charge of testing Wyckoff's teaching machine in the laboratories in New Mexico. Steinhorst recalled that it worked flawlessly (R. Steinhorst,

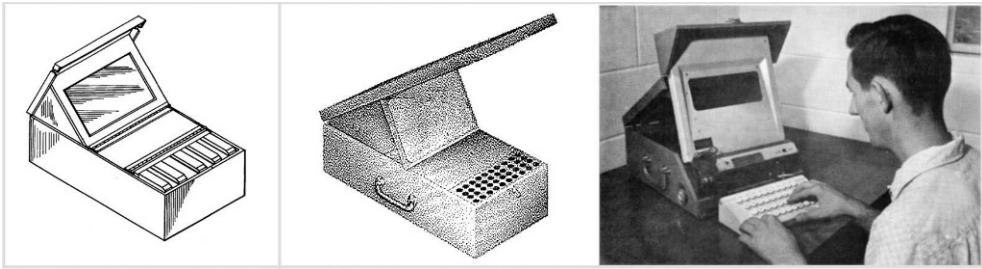


Figure 2. Three versions of the Wyckoff film-tutor. The diagram on the left shows the first version of the machine available in 1959. The machine was controlled with five keys, projected the material on a screen, and could be folded to make it portable (drawing based on U.S. Patent No. 3,137,948). The middle drawing shows an improved version with a full keyboard. This drawing was used as the TMI logo in commercial letters circa 1960 (William S. Verplanck Papers, Box M1887, Folder 1. Archives of the History of American Psychology, The University of Akron). The picture on the right shows the commercial version of the Wyckoff film-tutor (picture based on Malpass et al., 1963).

personal communication, March 19, 2009). When TMI offered the Wyckoff film-tutor to Grolier for distribution, Grolier executives refused (R. Steinhorst, personal communication, March 19, 2009). The executives considered it to be too expensive. At \$445, it was more than 20 times the price of the Min/Max and weighed close to 30 lb, too heavy to be carried and sold door to door. Although TMI advertised the Wyckoff film-tutor independently of Grolier (see, e.g., *JEAB*, 1961, Vol. 3, No. 4; 1962, Vol. 4, No. 1), it was never a commercial success. As might be expected, Wyckoff was demoralized by this outcome (J. Berlin, personal communication, March 18, 2009). Nevertheless, he developed a new model that presented an audible version of the instructional material.

Although the Wyckoff film-tutor was not distributed by Grolier, the program inside the machine was translated into a TMI-Grolier programmed course for the Min/Max (see Andrego, de Baca, Fullilove, Stranczek, & Wyckoff, 1962). The purpose of the program was to teach children reading skills more rapidly than the conventional methods. Instead of teaching the child to read letter by letter, the program first trained the child to match an image with a written word. This is similar to

the procedure of stimulus equivalence used by Sidman (1971), more than 10 years later, to teach children with disabilities spoken and written words. Afterwards, using a procedure that was similar to the method of stimulus fading used by Skinner and Holland (e.g., Holland, 1960), parts of the word were removed. The child had to choose or type the letters that completed the missing segments of the word. After the word was trained, it was incorporated into a sentence and the procedure was repeated.

Based on the tests conducted at TMI, the time required to complete the course ranged from 15 to 35 hours. Fine (1962, p. 77) witnessed the success of the program with 4- to 5-year-old children when he visited TMI's facilities. The program also proved to be successful for teaching children with learning disabilities to read (Malpass, Gilmore, Hardy, & Williams, 1963; "Teaching Machines Speed Progress," 1964). Malpass et al. described how children with disabilities, using Wyckoff's method, learned from two to six times more words in 8 weeks than the children who used the conventional classroom methods learned in 4 years. They also suggested that the method was as effective as personalized instruction, with the advantage that it could be used with several children concur-

rently. The method used by Wyckoff also had an impact on subsequent programs developed by TMI. For example, D. Tosti (personal communication, March 17, 2009) recalled that he and Homme used it in a course on letter writing.

Wyckoff's method for teaching reading skills reached a diverse audience. For example, James Cook Brown discussed with Wyckoff the idea of using the modified film-tutor for teaching Loglan, an artificial human language created by Brown ("Eight Languages into One," 1960). Loglan was created originally to test the Sapir-Whorf hypothesis of language relativity. Brown's idea was to create a language that could be learned independently of cultural differences and used a grammar based on logical rules to eliminate ambiguities (Brown, 1989). As will be described below, Wyckoff's method also came to the attention of Robert Moses, who planned to use it to teach illiterate African-American citizens from Mississippi to read (see section on Human Rights, below).

PERSONAL RELATIONS AND PROGRAMMED INSTRUCTION: THE HUMAN DEVELOPMENT INSTITUTE

During his tenure at Emory, Wyckoff befriended Jerome Berlin, a faculty colleague in clinical psychology who, as a former student of Carl Rogers at the University of Chicago, was a proponent of client-centered therapy. The two frequently discussed their seemingly different approaches to psychology. The most fruitful of these interactions may have been around the topic of how personal relationships are maintained. They both agreed that an important element in such maintenance is communication. For Berlin, effective communication was accomplished if the listener resembled a client-centered therapist by showing empathy, congruence, and uncondi-

tional positive regard throughout his or her interaction with the speaker. Wyckoff might have been expected to disagree with his colleague's analysis, but instead, he carefully considered it (J. Berlin, personal communication, March 18, 2009).

Wyckoff went on to suggest that communication can be analyzed as a learning process. People communicate on the basis of interlocking contingencies (Skinner, 1957, p. 40); that is, speaking provides discriminative and reinforcing stimuli for one another. A person communicates with another if his or her verbal responses are reinforced, and the person stops communicating if his or her verbal responses are extinguished or punished. The three elements Berlin considered to be important in achieving good communication were analyzed by Wyckoff in terms of positive reinforcement made contingent on the verbal responses of the other person (see also Truax, 1966a, 1966b, for a similar analysis). For Wyckoff, Rogers had identified reinforcers for adults' verbal behavior (J. Berlin, personal communication, March 18, 2009). Wyckoff noted the complexity of such reinforcers, because he firmly believed that simply acknowledging what another person has to say is not an effective way to increase communication, even if it is contingent on a verbal response. Deckner, one of Wyckoff's graduate students at Emory, recalled that, as a joke, Wyckoff built a small apparatus with a lever, that, when pressed, put up a little sign that said, "mmm hmm" (W. Deckner, personal communication, March 6, 2009). Of course, no one expected it to work.

Wyckoff went further in analyzing communication by pointing out that, if it involves a learning process, it can be shaped. He reasoned that communication could be systematically trained using programmed instruction with two persons simultaneously (G. Ruyle, personal communication,

January 28, 2009; J. Berlin, personal communication, March 18, 2009). Wyckoff's analysis was convincing enough to persuade Berlin to test these ideas.

Several of Wyckoff's students served as participants in the first experiments in which spontaneous, and later preestablished, dialogues were scrutinized (G. Ruyle, personal communication, January 28, 2009; J. Berlin, personal communication, March 18, 2009). Wyckoff and Berlin asked the participants to interact in dyads (R. Addison, personal communication, March 18, 2009). They assessed whether communication was improved by training each participant to make positive statements about the previous verbal response of the other. For subsequent experiments, they created examples of appropriate and inappropriate dialogues to serve as the basis for discriminating the correct and incorrect verbal responses of the other participant.

From these experiments, Wyckoff and Berlin derived systematic examples of everyday dialogues and a series of questions that they incorporated into the first programmed instruction course completed in 1963 and designed to improve communication in general relationships. Figure 3 shows a fragment of the sixth edition of the manual (Human Development Institute [HDI], 1972), which was designed to train each individual in a dyad to identify and reinforce the appropriate verbal responses of the other individual. In this way, communication was expected to improve in the absence of a therapist (see HDI, 1972). These ideas, the program, and the results of several tests were presented at the 1963 and 1964 APA conventions (Berlin & Wyckoff, 1964; Wyckoff & Berlin, 1963).

Wyckoff suggested that the manual be edited by TMI and distributed by Grolier, but the executives of Grolier again declined, noting that there was

no market for this product (D. Tosti, personal communication, March 17, 2008). After this rejection, Wyckoff and Berlin turned to selling it on their own. Wyckoff resigned as Chairman of the Board of TMI to have more time for the new project (J. Berlin, personal communication, March 18, 2009), but he continued as a member of the board of directors.

To embark on the new enterprise, both Wyckoff and Berlin also resigned their faculty positions at Emory (Wyckoff was allowed to continue as Kendall's adviser until he obtained his PhD in 1963; S. Kendall, personal communication, March 7, 2009). They rented a small building on West Peachtree Street in Atlanta, and founded their company. The HDI was nominally started in March 1962, but was not fully operational until 1964. Figure 4 shows a part of a brochure describing the institute. In their new environs, they continued their work on interpersonal communication and, during 1963 and 1964 they wrote the first programmed courses to improve communication in business and organizations, and others to improve communication in marriages. Figure 3 also shows a fragment of the fourth edition of the latter (HDI, 1970).

The strong emphasis on research in developing the training programs resulted in HDI becoming a great success. The training programs were used to improve communication between employees at United Airlines, Union Carbide, Lockheed Aircraft, Space Technology Laboratories, Baylor University Hospital, the Social Security Administration, Western Electric, Procter and Gamble, volunteers at the Atlanta Chapter of Hadassah, and graduate students at both the University of Alabama and Georgia State College (Berlin & Wyckoff, 1964; Nicholson, 1963; Roalman, 1963).

Originally created to improve communication between two persons, the training programs started to gain

General Relationship Improvement Program

1.30 A very important part of the art of relating is the ability to let another person know that you are aware of his feelings, and to do this in a way that does not make him wish that he had kept them hidden. There is no word that describes this kind of response precisely, but for purposes of this program we will arbitrarily call it showing acceptance of a feeling.

If you communicate to another person that you are aware of his feelings, and do this without making him wish that he had kept them hidden, then according to the definition above, you are _____ acceptance of his feelings.

showing

1.31 As it has been defined for this program, showing acceptance of feelings involves two things: first you do let the other person know that you are _____ of his feelings and second, you do not make him wish that he had kept them _____.

aware

hidden/to himself

1.32 A good friend of yours is looking very sad, even close to tears. You perceive his great sadness, but don't know the cause of it. Suppose you say something like: "I don't know what it is, but something seems to be making you terribly sad right now." Discuss whether this response would be likely to make him wish he had kept his feeling hidden.

Improving Communication in Marriage

3.27 First of all, it is important to distinguish between conflict and argument. A marital conflict, as we use the term, is any problem situation arising out of the differing opinions, needs, or goals of husband and wife. Argument, on the other hand, is simply one method for attempting to settle a _____.

conflict

3.28 As we define it, _____ means using facts and logic to try to prove that you are right, and that the other person is wrong.

argument

3.29 Since argument involves trying to prove who is right and who is wrong, it is most useful only where there is an objectively correct solution to a conflict. But for most of the conflicts that arise in marriage, there is no single _____ solution.

correct

Figure 3. Sample items from the *General Relationship Improvement Program* and *Improving Communication in Marriage* (courtesy of Jerome Berlin). The first edition of the former was written by the Human Development Institute in 1963. The top three items were designed to teach people how to avoid punishing others' verbal responses. The bottom three items were used to teach people how to distinguish different situations in a marital relation that require different types of conversations. The terminology was taken from Rogers's client-centered therapy.

popularity as an alternative to counseling (cf. Eisenberg & Zingle, 1975; Ellis, 1966; Hickman & Baldwin, 1971). Although Hickman and Baldwin found that HDI's program for improving communication in marriage positively influenced the attitudes of couples toward marriage, it was not found to be more effective than personalized marriage counseling. Nevertheless, it is worth noting that Wyckoff and Berlin's attempt to use psychological principles to train two persons simultaneously in improving their relationship was preceded only by the creation of field

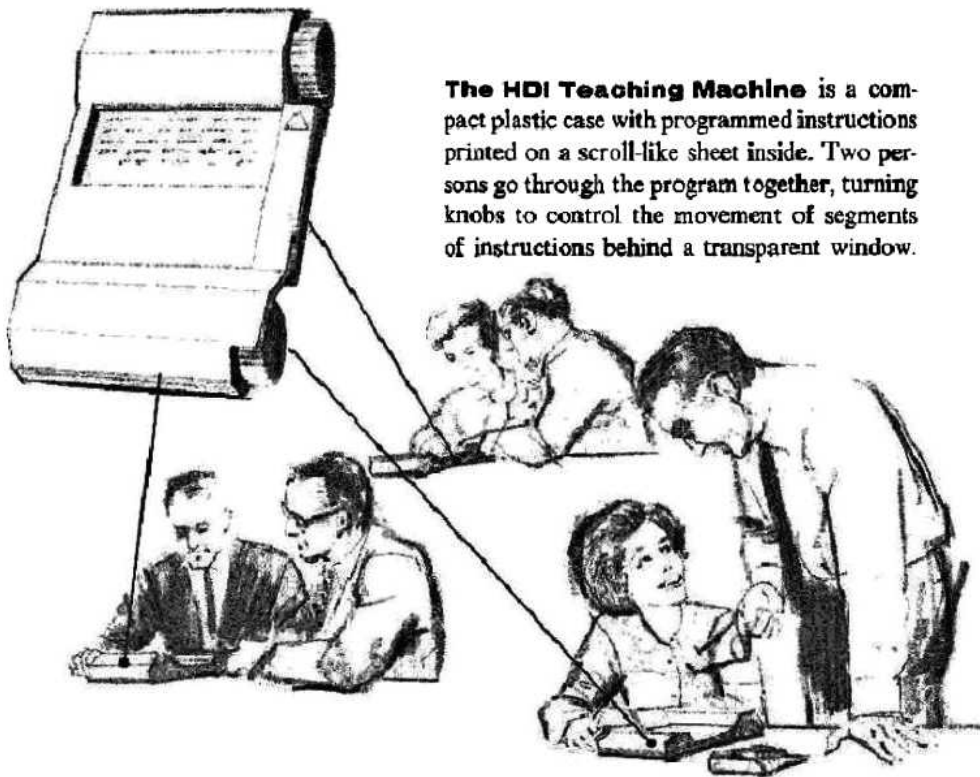
theory (Lewin, 1951) grounded t-groups in 1947 (Margulies & Raia, 1978). Because of programmed instruction, however, Wyckoff and Berlin's manuals were more systematic than t-groups, and could be used in the absence of a therapist or observer.

According to J. Berlin (personal communication, March 18, 2009), revising and developing new programs at HDI, although successful, was exhausting. The first years of the company were difficult. Each program took months and even years to develop. To survive, the work at HDI

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HDI HDI

*introduces a new scientific approach
to improved person-to-person relationships*



The HDI Teaching Machine is a compact plastic case with programmed instructions printed on a scroll-like sheet inside. Two persons go through the program together, turning knobs to control the movement of segments of instructions behind a transparent window.

Figure 4. Fragments of a brochure distributed by the Human Development Institute in 1964 (courtesy of Jerome Berlin). The left section shows a teaching machine, designed by Wyckoff, that could be used to work through HDI's manuals. The right section shows hand drawings of Jerome Berlin and Benjamin Wyckoff.

was transformed from a research enterprise into a business, which was completely different from what Wyckoff and Berlin envisioned in the beginning. Once again exasperated by administrative issues, Wyckoff left HDI in 1965.

About the same time, TMI was collapsing. To begin with, teaching machines were no longer thought to be revolutionary devices (see Benjamin, 1988, for a history of teaching machines). Criticisms raised by educators had reduced the sales of both

the Min/Max and programmed books. These criticisms had two thrusts. One was the dehumanization inherent in the use of machines. Although Skinner never intended teaching machines to be a substitute for teachers, this idea surfaced in the general media as a threat to the development of creative and free-thinking students (e.g., Boroff, 1960; Gilmore, 1961). The other criticism pointed to the functionality of teaching machines. It was suggested that teaching machines were nothing more than expensive page turners (e.g., "The Truth About Those Teaching Machines," 1962). One solid criticism was that the primitive state of the technology available for teaching machines was limiting the evolution of programmed instruction (Gilbert, 1960). TMI survived for some years because, by 1963, it had shifted from the massive door-to-door teaching machine business to developing custom courses for large organizations such as IBM, the U.S. Navy, and others. In 1963, Glaser left TMI to start an independent project, and Homme did the same in 1964. In 1966, Evans and Cornell declared bankruptcy, and TMI's assets were purchased by Grolier.

By the mid 1960s, HDI also was struggling for survival. To be relieved of some of the administrative and financial issues, in 1967, Berlin was forced to negotiate establishing HDI as a subsidiary of Bell & Howell ("Bell-Howell Plans to Buy," 1967; J. Berlin, personal communication, March 18, 2009). Bell & Howell capitalized on the commonalities between the work done at HDI and Rogers's client-centered psychotherapy to develop and distribute audiotapes designed to train groups of people to interact effectively. These tapes were known as encountertapes in the Human Potential Movement (Klemesrud, 1970). The encountertapes were developed by Betty Berzon at the Western Behavioral Sci-

ences Institute in La Jolla, California. At that time, Rogers was a resident fellow at the Institute. Berzon moved to Atlanta to learn about programmed instruction at HDI, from which the tapes then developed (e.g., Berzon & Solomon, 1964).

From interactions with employees of several different companies, Berlin observed that most often workplace structures consisted of white supervisors and African-American or Hispanic employees. He adapted HDI's programs to train the supervisors to relate to the employees with empathy and respect. The final product was named the Sensitivity Kit or S-Kit ("How to Succeed in Hard-Core Hiring," 1968; James, 1969). Friedlander, who arrived at HDI in 1967, recalled:

I was *de facto* leader of the team that produced the breakthrough product, called the S-Kit, which was used to train 130,000 "front-line supervisors" in industries around the country to manage culturally different workers. In my opinion this was the true "proof of concept" that prosocial behavior in adults could be systematically modified through the application of the principles of operant conditioning to the design of a sequence of INTERACTIVE interpersonal exercises. (S. Friedlander, personal communication, March 16, 2009)

Although HDI was enormously successful, Berlin decided, as Wyckoff had earlier, that he had had enough of administrative issues and left the organization in the early 1970s. The assets of HDI then were sold entirely to Bell & Howell, and the institute was moved to Chicago in 1974 (G. Ruyle, personal communication, January 28, 2009). Given the debates between Rogers and Skinner (e.g., Rogers & Skinner, 1956) in which they each strongly asserted their points of view of psychology, it is somewhat ironic that the work of Berlin and Wyckoff, firmly anchored in the principles of operant conditioning, was one of the starting points of the expansion of client-centered therapy into what became the Hu-

man Potential Movement (e.g., Howard, 1970).

HUMAN RIGHTS

Wyckoff strove to treat everyone with empathy, dignity, and respect (A. Weiskoff, personal communication, March 22, 2009). His experience of working in the early 1960s in industries in which African-American employees had conflicts with white supervisors, and women were paid only a fraction of what men earned, seemed to have strongly affected him. Several of the people interviewed for this review corroborated that Wyckoff was a passionate supporter of human rights. He was remembered for talking in the TMI offices and among friends about the successful civil rights protests in the U.S. South in the 1960s, and of the importance of supporting both the civil rights and the women's rights movements (D. Tosti, personal communication, March 17, 2009). He was a member of the National Association for the Advancement of Colored People and hosted civil rights meetings at his home (S. Kendall, personal communication, March 7, 2009).

Holt (1965) described Wyckoff's rather unique involvement in the Freedom Vote Campaign in 1963. One of the political issues in Mississippi was that in 1962, only 6.7% of Mississippi's African-American adults were eligible to vote. The reason was that voter eligibility demanded the citizen meet a series of strict requirements (e.g., paying a poll tax, fulfilling a residency condition, and passing a literacy test). The result of such requirements was that, prior to the 1965 Voting Rights Act that abolished them, an African-American citizen's opportunity to vote was long delayed after the initial attempt to register. Holt noted that the Student Nonviolent Coordinating Committee (SNCC) had considered

a plan to use programmed instruction to teach illiterate African-American Mississippians to read, thereby increasing the likelihood of their passing the literacy test.

In the spring of 1963, Wyckoff and Robert Moses, field secretary for SNCC, met at Wyckoff's home in Atlanta to discuss programmed instruction. One of the topics was how reinforcement theory was used in programmed instruction. Wyckoff reportedly noted the importance of reinforcement immediacy, a principle that "fermented within Bob Moses" (Holt, 1965, p. 153). Holt describes how Moses came to conceptualize the many obstacles imposed to register to vote as delays of reinforcement.

As a result of the seed planted by the discussion with Wyckoff, Moses and his colleagues conceived a plan to capitalize on the principle of immediate reinforcement. This involved establishing the 1963 Freedom Vote Campaign in Mississippi. Holt (1965) noted that "The Freedom Vote Campaign provided positive and quick reinforcement" (p. 153). It was as a result of this, according to Holt, that the Mississippi Freedom Democratic Party (MFDP) became established as an alternative to the Mississippi Democratic Party. The former, following the principle of immediacy of reinforcement, allowed any citizen to vote in its delegate elections, regardless of whether they met state eligibility requirements. The outcome was the massive media attention that the MFDP received at the 1964 Democratic National Convention (see Smith, 2004) that resulted in the MFDP delegation receiving two at-large seats at the convention. Holt relates these outcomes directly back to Wyckoff and the principle of immediacy of reinforcement. The ultimate outcome, according to Holt, was that the campaign demonstrated convincingly to the country as a whole that African-Ameri-

cans in Mississippi were eager to exert their right to vote.⁴

LATER CAREER AND LEGACY

Although the enterprises in which Wyckoff was involved were successful in terms of their impact on education and improving human relationships, none of them were financial successes. Both TMI and HDI generated large profits, but most of those profits were reinvested to improve the machines and programs. After Wyckoff left HDI, he worked as a systems analyst at the Georgia Department of Vocational Rehabilitation. He also obtained a position as director of research and evaluation at the Georgia Department of Corrections, where later created a program used to keep track of the records (A. Weiskoff, personal communication, March 22, 2009). He retired from that position in 1987.

Even though Wyckoff had only a few doctoral graduates during his career (Benjamin Pubols, H. Philip Zeigler, Jerry Tate, William Deckner, and Stephen Kendall), his influence is evident in their academic careers. Although Pubols was primarily involved in neuroscience, he conducted research on the parameters of reinforcement (e.g., Pubols, 1958, 1960, 1962). Zeigler's primary interest was comparative cognition. He modified Wyckoff's observing-response procedure such that a pair of stimuli was presented after an observing response was emitted. In this way, he used the procedure as an analogue of Harlow's Wisconsin General Test Apparatus (Zeigler, 1958; Zeigler & Wyckoff, 1961). Wyckoff directly

⁴Wyckoff's interest in social issues continued throughout his life. In 2006 he completed the script of a musical (music and lyrics by Thomas A. Gaines; U.S. Copyright Office, Registration Number: PAu003079245) based on the 1960s novel *Peaceable Lane* by Keith Wheeler. The novel narrates the segregation issues faced by an African-American family who moved to a white community in the suburbs of Westchester, New York.

influenced Deckner's work on educational games based on programmed instruction (Deckner, Deckner, & Davis, 2007), and Kendall's significant contributions to the literature on conditioned reinforcement using the observing-response procedure (e.g., Kendall, 1965, 1972, 1973).

Wyckoff saw that all psychologists, independent of their particular orientation, are concerned with the study of behavior. He was open to different approaches to the study of behavior, rather than being identified strictly as a Skinnerian, Hullian, or Spencian. This openness contributed to his enduring contributions to both Skinnerian and Hull-Spence theories of behavior through the observing-response procedure, his mathematical theory of secondary reinforcement, and programmed instruction. Like Skinner, he was committed to the application of behavioral research to improving the human condition. His active involvement with TMI and HDI exemplifies the translation of basic principles of behavior analysis to applied settings and social issues. Wyckoff's most important message was that, by leaving aside theoretical and conceptual biases, it is possible to integrate psychological knowledge to improve the quality of peoples' lives.

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