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## 100 Years of Behaviorism: 1913-2013

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## **Abstract**

Behavior Analysis consists of three major branches: Behaviorism, Experimental Analysis of Behavior and Applied Behavior Analysis. Behaviorism is the philosophy of the science of behavior. In 1913 in his influential article, “*Psychology as the Behaviorist Views It*”, John B. Watson argued that the proper subject matter for psychology was not states of mind or mental process but observable behavior. In 1938 B. F. Skinner published “*The Behavior of Organisms*” giving origin to the experimental branch of behavior analysis. During the 50’s and 60’s applied researchers established that the principles of behavior are applicable to human behavior. In recent years the professional practice in diverse fields has been a predominant factor in the development of the science of behavior. This poster/paper provides a brief description of some of the major events that have marked the development of behavior analysis in the last 100 years, including professional and organizational developments, and ends with some perspectives on the future of behavior analysis.

*Key words:* history of behavior analysis, behaviorism, neobehaviorism, interbehaviorism.

## **Historical Antecedents**

Behaviorism or behavioral psychology has many and varied roots (Zuriff, 1985). The historical antecedents of our science can be traced back to the beginnings of the 17<sup>th</sup> century and the work of the British philosopher Francis Bacon. Unlike the doctrines of Aristotle and Plato, Bacon's approach placed an emphasis on experimentation and interaction. Bacon's new scientific method involved gathering data, prudently analyzing it and performing experiments to observe nature's truths in an organized way. (Michael, 1993; Smith, 1986).

Charles Darwin’s concept of natural selection formulated in *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life* (1859) had a great influence on the early developments of behaviorism. The theory of evolution by natural selection made human behavior an appropriate subject matter for the natural sciences. It led to the development of the field called *comparative psychology* and inspired scientists like Herbert Spencer (1864), Douglas Spalding, (1872), George Romanes (1882), Lloyd Morgan (1900);

William James (1890), and Jacques Loeb (1916), among others (Boakes, 1984; Gutiérrez & Papini, 2011).

In 1883, Ernst Mach's published *The Science of Mechanics*. Mach's views on mediating structures inspired B. F. Skinner's strongly inductive position, which paralleled Mach's in the field of psychology (Chiesa, 1994).

Ivan Mikhailovich Sechenov, the Father of Russian physiology, published in 1863 *Reflexes of the Brain*. In this book, Sechenov explained in physiological terms the psychological activities of humans and explained the entire behavior of the human as being a complicated reflex act. His outline of conditioned reflexes later was expanded by I. F. Cyon, a professor of physiology at Saint-Petersburg University, from 1868 to 1872. Was under Cyon guidance that I. P. Pavlov mastered the technique of vivisection experiment and accomplished his first works on the physiology of circulation and digestion (Haas, 1998).

Ivan P. Pavlov, a Russian physiologist, discovered most of the facts and principles that constitute our current understanding of respondent functional relations. Pavlov was interested in digestion and his early work involved presenting various stimuli to dogs and measuring the amount of saliva produced in response to them (Pavlov, 1927). Stimuli that automatically elicited salivation, such as food, were called unconditional stimuli and the salivation that they elicited was called an unconditional response. Conditional stimuli (i.e., the sound of footsteps, light being turn on) acquired the capacity to elicit salivation by reliably preceding unconditional stimuli in a process named respondent, classical or Pavlovian conditioning.

Pavlov work was introduced to American scholars by Robert M. Yerkes and Sergius Margulis in 1909. The Harvard's professors described how Pavlov discovered the conditioning reflex during his studies with dogs, establishing classical conditioning as a learning method:

Our purposes in preparing this article were two: first, to present a body of facts which is of great importance to both physiologists and animal psychologists; and second, to familiarize American investigators with the salivary reflex method and hasten the time when it shall be as advantageously used in this country as it now is in Russia. (Yerkes & Morgulis, 1909, p. 257)

Between 1898 and 1905, Edward Lee Thorndike published two major research monographs and several shorter articles that established the study of animal learning as a laboratory animal science. Thorndike used problem boxes as an instrument and cats as subjects. His experiments show how responding often depends on its past consequences (Catania, 2007). From the very outset of his work, Thorndike allied himself with the Darwinian proposition that complex phenomena can arise as the cumulative effects of a selection process, here the process envisioned by the *law of effect* (Donahoe, 1999). The *law of effect* was published by Edward Thorndike in 1905 and states that when an S-R association is established in instrumental conditioning between the instrumental response and the contextual stimuli that are present, the response is reinforced

and the S-R association holds the sole responsibility for the occurrence of that behavior (Thorndike, 1911).

## **Watson's Classical or Methodological Behaviorism**

In 1913, John Broadus Watson published in the *Psychological Review*, the journal of the American Psychological Association, his landmark article *Psychology as the Behaviorist Views it*, establishing behaviorism as a major school of thought:

Psychology as the behaviorist views it is a purely objective experimental branch of natural science. Its theoretical goal is the prediction and control of behavior. Introspection forms no essential part of its methods, nor is the scientific value of its data dependent upon the readiness with which they lend themselves to interpretation in terms of consciousness. The behaviorist, in his efforts to get a unitary scheme of animal response, recognizes no dividing line between man and brute. The behavior of man, with all of its refinement and complexity, forms only a part of the behaviorist's total scheme of investigation (Watson, 1913, p. 158).

Watson's behavioral manifesto was an excision point with the classic vision that consciousness and mental process had an explanatory value for the behavior of nonhumans or humans. Watson's behaviorism claims that psychology should concern itself with the behavior of organisms (human and nonhuman animals) and should not concern itself with mental states or events or with constructing internal information processing accounts of behavior (Michael, 1993).

In 1914, Watson published *Behavior: An introduction to comparative psychology*. He argued in this book for the acceptance of animal psychology and described the advantages of using animal subjects in psychological research (Schultz & Schultz, 2008). In 1920 Watson and Rayner published the famous and controversial "Little Albert" experiment, a case study showing empirical evidence of classical conditioning in humans (successive presentations of a rat -conditioned stimulus- followed by a strong noise -unconditioned stimulus- resulted in *fear-conditioned* response). Four years later, Mary Cover Jones (1924) reported her seminal research on the unconditioning of the fear reaction of Peter, a three-year-old child. Jones treated Peter's fear of a white rabbit using a technique known as *desensitization*, in which a pleasant stimulus (food) was associated with the rabbit. As the rabbit was gradually brought closer to him in the presence of his favorite food, Peter grew more tolerant, and was able to touch it without fear. Joseph Wolpe, a colleague and friend, dubbed her "the mother of behavior therapy" in the early 1970s.

Between 1924 and 1925, Watson wrote *Behaviorism*, a series of 12 paperback pamphlets published by The People's Publishing Company, 5 copyrighted in 1924 and 7 in 1925. In 1925 a hardcover version of the set of pamphlets was published by W.W. Norton. A revised edition was published by Norton in 1930 and reproduced in 1958 by University of Chicago Press (Reese,

2013). The 1925 edition was a nontechnical book for popular consumption. The 1930 revised edition was a university book. According to Smith (1986) Bertrand Russell published in 1926 a book review in *Dial*, a literary magazine, in which Russell referred to Watson's *Behaviorism* as "massively impressive". B. F. Skinner read the review and subsequently purchased and read *Behaviorism* and later Russell's *An Outline of Philosophy* (1927). Russell's philosophy was critical for Skinner's appreciation of a strong link between epistemology and behaviorism. Watson's point of view started the philosophical movement that constitutes today one of the three branches of behavior analysis: behaviorism, together with, experimental analysis of behavior (EAB), and applied behavior analysis (ABA). For modern perspectives on John B. Watson and classical behaviorism see Todd and Morris, 1994.

## **Neobehaviorism**

### *Edward Chance Tolman*

Edward C. Tolman was a learning theorist that opposed the S-R behaviorism of Watson. Tolman is known for initiating his own kind of behaviorism which he referred to as "*purposive behaviorism*" (Kimble, Wertheimer, & White, 1991). His idea of purposive, or molar, behaviorism, as illustrated in his book *Purposive Behavior in Animals and Men* (1932), sought to demonstrate that insight (the cognitive control of learning) was not restricted to the evolutionary capabilities of the apes. Tolman strongly advocated theorizing at the molar level, which was demonstrated by several studies showing that rats learn the place (*place learning*) where they have been rewarded rather than the particular movements required to get there (Tolman, Ritchie & Kalish, 1946). Although early behaviorists equated learning with behavior changes through reinforcement, Tolman argued that learning can occur without being reflected in a change in behavior, using the term *latent learning* for such unobservable learning (Tolman & Honzik, 1930). For the inclusion of mental phenomena on his explanations of how learning occurs, Tolman is considered one of the founders of the cognitive-behavioral psychology movement.

### *Clark Leonard Hull*

While Watson and others were interested in describing the formation of the connections between stimulus and response, Clark L. Hull was more interested in the nature of the connections (habit strength) and the variables that influenced their development. Hull incorporated intervening variables into his theory of learning, arguing that variables such as drive, habit strength, and incentive play critical roles. For Hull, the attainment of a genuinely scientific theory of mammalian behavior offers the promise of development in the understanding and control of human conduct (Hull, 1935) in its immensely varied aspects which will be comparable to the control already achieved over inanimate nature, and of which the modern world is in such dire need (Hull, 1935, p. 516). Hull most significant works were, the *Mathematico-Deductive Theory*

of *Rote Learning* (1940), and *Principles of Behavior* (1943), which established his analysis of animal learning and conditioning as the dominant learning theory of its time.

### *Kenneth Wartenbe Spence*

Kenneth W. Spence extended the research and theories of Hull. Spence received his Ph.D. in 1933 from Yale University, supervised by Robert Yerkes. After receiving his degree, Spence went to Orange Park, Florida, to the *Yale Laboratories of Primate Biology*. He stayed there for four years, studying discrimination learning in the chimpanzee (Spence, 1936, 1937, 1939). Was during his time as a student at Yale that Spence met Hull, with whom he would remain associated for the next two decades. During his long career, Spence elaborated in the continuity and non-continuity theories of learning (Spence, 1945), and work in mathematical formulations of learning phenomena (Spence, 1952). He also formulated that reinforcement influences the enactment of a response but not the learning of a response. This idea later became known as the Hull-Spence hypothesis of conditioning and learning (Spence, 1956; Wagner, 2008). At the end of his career Spence and his wife Janet published *The psychology of learning and motivation: Advances in research and theory* (Spence & Spence, 1967).

## **Kantor's Interbehaviorism**

The development of behavioral psychology saw the emergence of different systems and approaches to the study of behavior. The work and ideas of Jacob Robert Kantor and his interbehavioral psychology is one of the most important (Kantor, 1924, 1926, 1947; Kantor & Smith, 1975). Kantor's interbehavioral psychology may be characterized by its conceptual emphases upon (a) naturalism, (b) scientific pluralism, (c) organism-environment interactions, and (d) integrated event fields of continuously interrelated and interrelating factors (Moore, 1984).

Kantor was influenced by the functionalists at Chicago (e.g., Dewey, Angell, and Carr), as well as by the early objectivist trend in psychology (Morris, Higgins & Bickel, 1982). Kantor spent his academic career in the Department of Psychology at Indiana University, from 1920 until 1959:

In addition to founding *The Record* [*The Psychological Record*, 1937], Kantor was also responsible for bringing Skinner to Indiana from Minnesota in 1945. During Skinner's stay there, he and Kantor jointly taught a seminar entitled "Theory Construction in Psychology" and were especially influential in their thoroughgoing functionalism and their criticisms of conventional operationism (Fuller, 1973, p. 319, 321). Fuller (1973, p. 321, 324) and Lichtenstein (1973, p. 332) both made the interesting observation that during this time it was Kantor, not Skinner, who was the more adamant about extending behavioral psychology to human activities, whereas most radical behaviorists tended to pursue basic research with nonhumans (Morris, Higgins & Bickel, 1982, p. 161).

In the 60's and 70's, Sidney W. Bijou and Don M. Baer partially integrated the visions of Kantor and Skinner while working in the behavior analysis approach to child development. An special

moment in the history of behavior analysis was Kantor's treatment of *The Experimental Analysis of Behavior* (TEAB) published in the *Journal of Experimental Analysis of Behavior* in 1970 (Marr, 1984; Morris, Higgins & Bickel, 1982; Salzinger, 1973; Tourinho, 2004; Winokour, 1971). Despite differences between Skinnerian and Kantorian classification schemes, the conceptual features of interbehaviorism are compatible with those of Skinner's behaviorism, and taken together the two provide a firm theoretical foundation for an authentically behavioristic psychology (Moore, 1984).

## Skinner's Experimental Analysis

Starting in the 1930s, Burrhus Frederic Skinner conducted numerous studies on the principles of reinforcement in laboratory animals such as rats and pigeons and published his data in *The Behavior of Organisms: An Experimental Analysis* (1938/1966). In the preface of the seventh printing (1966) Skinner wrote:

Two other theoretico-experimental analyses of behavior compose the historical setting in which this book should be evaluated. Tolman's *Purposive Behavior in Animals and Men* preceded the *Behavior of the Organisms* by six years; Hull's *Principles of Behavior* followed it by five. The three books differed in many ways: they undertook to solve different problems, and they sought solutions in different places. My debt to Sherrington, Magnus, and Pavlov is obvious in my continuing use of the word "reflex." I held to the term even after I had begun to distinguish between emitted and elicited behavior-between "respondents" and "operants"-for I wanted to preserve the notion of reflex strength (Skinner, 1966, xi).

In 1945, Skinner's *Operational Analysis of Psychological Terms*, much of the discussion is concerned with verbal responses:

The main purpose of this discussion is to answer by example the question "What is a definition, operational or otherwise?" The psychologist must turn to "the contingencies of reinforcement which account for the functional relation between a term, as a verbal response, and a given stimulus. This is the 'operational basis' for his use of terms; and it is not logic but science." (Skinner, 1945, p. 270).

In 1950, Fred Simmons Keller and Nat Schoenfeld published *Principles of Psychology*. Skinner's work served both as the empirical core and as the organizing framework for the book. Keller and Schoenfeld wrote the book to provide their students at Columbia University with a text in the experimental analysis of behavior course they initiated in 1946 (Dinsmoor, 1989).

In 1953, Skinner published *Science and Human Behavior*. Skinner's approach retained overt behavior as an important dependent variable of psychology while acknowledging the existence and significance of unobserved behavior:

Behavior is a difficult subject matter, not because it is inaccessible, but because it is extremely complex. Since it is a process, rather than a thing, it cannot easily be held still for observation. It is changing, fluid, and evanescent, and for this reason it makes great technical demands upon the ingenuity and energy of the scientist. But there is nothing essentially insoluble about the problems which arise from this fact (Skinner, 1953, p. 15).

In 1955, Arthur W. Staats became an Instructor at Arizona State University (ASU), advancing to Professor in five years. Beginning his own human behavioral program, within a few years he also succeeded in bringing in Jack Michael, Israel Goldiamond, and Arthur Bachrach to help begin the predominant center of the time for psychological behaviorism and radical behaviorism (Staats, 1996; Staats & Staats, 1963; Holth, 2003).

In 1957, Charles B. Ferster and B. F. Skinner published *Schedules of Reinforcement* a critical element in the development of behavior analysis as a means of controlling or altering behavior. In the same year Skinner published *Verbal Behavior*, a landmark analysis in the study of language (Skinner, 1957).

In 1960, Murray Sidman, one of the distinguished behavior analysts that emerged from Columbia, wrote *Tactics of Scientific Research: Evaluating Experimental Data in Psychology*, an influential account of individual organism research methodology.

In 1961, Richard Julius Herrnstein formulated the *matching law* following an experiment with pigeons on concurrent variable interval schedules. Pigeons were presented with two buttons in a *Skinner box*, each of which led to varying rates of food reward. The pigeons tended to peck the button that yielded the greater food reward more often than the other button; however, they did so at a rate that was similar to the rate of reward. Later data showed systematic departures from strict matching, and a generalized version of the matching equation is now used to describe such data. This equation, referred to as “the generalized matching equation,” also describes data that follow strict matching (Poling, Edwards, Weeden & Foster, 2011).

In 1966, Keller and Mariam Breland, Skinner’s students and assistants in the 40’s, published *Animal behavior*. Though never popular in the psychological community, *Animal Behavior* was widely read by contemporary biologists and ethologists. The Brelands based their new system of training on operant conditioning (Keller & Keller, 1951, 1961, 1966). Although animal training was thousands of years old, Keller and Mariam were one of the first ones in using reinforcement systematically (Bailey, 2003).

In 1974, B. F. Skinner published *About Behaviorism*, a summary statement of the philosophy of a science of behavior that has appeared before, distributed through many volumes (Schnaitter, 1975). Oriented to the general public, Skinner started the book stating that “Behaviorism is not the science of human behavior; it is the philosophy of that science” (Skinner, 1974, p. 3).

## **Applied Behavior Analysis with Special Populations**

In 1946, Sidney W. Bijou assumed his role as associate professor of psychology and director of the Institute of Child Development at University of Washington (Giraldo, 2009). He organized a laboratory to study typically and atypically developing children and populated the department

with the best faculty and graduate students available at the moment, all of them with a common interest in normal and deviant child behavior:

Sid was wildly successful in accomplishing his aims. He established a world-class (and well funded) program of basic and applied research in behavior analysis and a top-flight graduate training program and surrounded himself with a cast of faculty, graduate students, and psychologists in Seattle's community that reads like a who's who of pioneers in behavior analysis: Don Baer, Mont Wolf, Todd Risley, Betty Hart, Ivar Lovaas, Jay Birnbrauer, Hayden Mees, Bob Whaler, Rob Hawkins, Bud Wexler, Vance Hall, Jim Sherman, Eileen Allen, Howard Sloane, Barbara Etzel, Bob Orlando, Bill Hopkins, Bob Peterson, and Marion Ault, to name just a few. If applied behavior analysis has a birthplace, it would be in Seattle at the University of Washington's Institute of Child Development with Sid at the helm. (Ghezzi, 2010, pp. 176-177)

At Washington, Bijou and his team authored seminal articles, books, and book chapters on intellectual and developmental disabilities, child development, behavioral assessment, and child behavior therapy (Allen, Hart, Buell, Harris, & Wolf, 1964; Bijou, 1955/57/58/61; Bijou & Baer, 1961/65/66; Birnbrauer, Bijou, Wolf, & Kidder, 1965; Birnbrauer, Wolf, Kidder, & Tague, 1965; Bijou & Sturges, 1959; Hart, Allen, Buell, Harris & Wolf, 1964; Hawkins, Peterson, Schweid, & Bijou, 1966; Patterson, Littman, Bricker & Walker, 1967).

In 1949, Paul R. Fuller reported the first operant conditioning in a human being . The subject was an 18-year-old boy with profound mental retardation who was described in the language of the time as 'vegetative idiot'. He was unable to roll over and would only lie on his back. Fuller filled a syringe with warm sugar-milk solution and injected it into the subject's mouth every time the young man moved his right arm, which he was capable of moving but would move it infrequently. Within four sessions the young man was moving his arm to a vertical position at a rate of 3 times per minute.

In 1954, Ogden R. Lindsley, coined the term "*behavior therapy*" in his work with psychotics (Lindsley & Skinner, 1954). Lindsley also made major methodological contributions in areas such as sleep research (Lindsley, 1957), and geriatric behavior prosthesis (Lindsley, 1964b). However, his big contribution to field of behavior analysis was in education, where Lindsley created *Precision Teaching* and the *Standard Behavior Chart* (Lindsley, 1964, 1972, 1990).

In 1959, Teodoro Ayllon and Jack Michael reported the effects of operant interventions implemented by nurses in a psychiatric unit. Their report was the first to suggest the generality of operant methods across several patients and several behaviors within a hospital setting (Kazdin, 1978).

In 1961, Charles B. Ferster and Marian K. DeMyer did the first experimental analysis of the behavior of children with autism (Ferster & DeMyer, 1961a). The same year Ferster (1961) provided an early conceptual analysis of autistic behavior by explaining it in operant terms. According to Kazdin (1978), and Morris, Fouquette, Smith and Altus (2008) the research and

behavioral interpretation done by Ferster and DeMyer provided a fresh basis for studying autistic behavior from a behavioral point of view.

In 1964, Montrose M. Wolf, Todd Risley, and Hayden Mees presented a report in the first issue of *Behavior Research and Therapy* entitled, “*Application of Operant Conditioning Procedures to the Behavior Problems of an Autistic Child.*” Dicky was a 3 year-old boy with autism who displayed temper tantrums and self-injury and who was at risk for blindness caused by failing to wear corrective lenses after a cataract operation. This article introduced the earliest applied behavior analysts, then called "behavior modifiers", to the reversal design, discrete trial, time-out procedure, and set the stage for what would come to be called "social validity." (<http://www.baam.emich.edu/baammainpages/behavioralhistory.htm>):

In the 1970s, Lovaas started in the University of California at Los Angeles (UCLA) the Young Autism Project, which stressed early intervention (Giraldo, 2012). The subjects in the study were between the ages of two and four. The curriculum emphasized language development, social interaction, and school integrations skills. After 2 to 3 years of treatment, 47% of the intensive-treatment experimental group (9 of the 19 children) versus 2% of the comparison group (1 of 40 children) were reported to have achieved “normal functioning “ (Lovaas, 1987; McEachin, Smith & Lovaas, 1993).

In 1993, Catherine Maurice published *Let Me Hear Your Voice*, an autobiographical case study of two of her children diagnosed with autism and the progress they made with Lovaas/ABA therapy. Lovaas work opened new windows of opportunity for the development of new programs and treatments approaches to autism and other intellectual and developmental disabilities based in ABA methodology.

In 1982, Brian A. Iwata, Michael F. Dorsey, Keith J. Slifer, Kenneth E. Bauman, and Gina S. Richman presented the first comprehensive and standardized methodology for identifying operant functions of aberrant behavior. According to Mace (1994) the methodology lessened the field's reliance on default technologies and promoted analysis of environment-behavior interactions maintaining target responses as the basis for selecting treatments. It also contributed to the integration of basic and applied research.

In 1985, Ed Carr and Mark Durand contributed to the experimental analysis of aggression and self-injury behavior by reducing behavior problems through functional communication training (see Cooper, Heron, & Heward, 2007; Fisher, Piazza, & Roane, 2011; Mayer, Sulzer-Azaroff, & Wallace, 2012, for a complete review of ABA applications with special populations).

## **Behavioral Pharmacology**

Behavioral pharmacology emerged as a discipline when researchers began applying strategies and tactics of EAB to the analysis of drugs effects (Poling & Byrne, 2000). I. V. Zavadskii, who

worked in Pavlov's laboratory between 1907 and 1909, performed a study that has many of the characteristics of modern behavioral pharmacology (Laties, 1979).

In 1937, B. F. Skinner and W. T. Heron used EAB methodology to study the effects of caffeine and amphetamine on the operant behavior in rats.

In 1955, Peter B. Dews published an article presenting data, with pigeons as subjects, indicating that the effects of pentobarbital sodium can be determined by the rate of occurrence of the response in the absence of the drug (rate-dependent). In 1956, the New York Academy of Sciences sponsored a conference called *Technique for the Study of the Behavioral Effects of Drugs*, chaired by Skinner and Dews. As a result of this conference more researchers started adopting EAB methods for analyzing the behavioral effects of drugs (Poling & Byrne, 2000; Thompson and Schuster, 1968).

In 1961, Charles B. Ferster and Marian K. DeMyer (Ferster & DeMyer, 1961b) published a one-page report in *the Journal of the Experimental Analysis of Behavior* titled, "Increased Performances of an Autistic Child with Prochlorperazine Administration." It may be the first and only report of basic behavioral pharmacology research using both operant apparatus and measures and a within-individual replication design to analyze the behavior of a child with autism (Morris & Fouquette, 2009).

In 1962, Lindsley published "*Operant conditioning techniques in the measurement of psychopharmacologic response*". In 1969, Bernard Weiss and Victor G. Laties published a volume dedicated to behavioral pharmacology and toxicology. As a consequence, this branch of behavioral pharmacology, termed behavioral toxicology, grew rapidly (Evans & Weiss, 1978; Weiss & Laties, 1975).

### *The Father of Behavioral Pharmacology*

Joseph Vincent Brady, the so-called "*Father of Behavioral Pharmacology*" received the P. B. Dews Lifetime Achievement Award in Behavioral Pharmacology in 2004 from the American Society for Pharmacology and Experimental Therapeutics (ASPET). His contributions to behavioral pharmacology span more than 50 years and range from early studies using the Estes-Skinner's conditioned emotional response procedure (Estes & Skinner, 1941) to examine drug effects and various physiological processes in experimental animals to the implementation of mobile methadone treatment services and to small group behavioral analyses in simulated space environments (Barrett, 2008).

In the late 50s, while at the Walter Reed Institute, Brady performed the experiment "Ulcers in Executive Monkeys" that suggested a link between stress and peptic ulcers, establishing the idea that stress was a physical illness. Larry Stein, in his obituary for Brady, mentioned some of his accomplishments while at Walter Reed:

At Walter Reed, Joe collaborated with psychologist Murray Sidman and anatomist Walle Nauta and others to produce a series of studies on the limbic system, endocrines, and behavioral stress. At the same time, with the appearance of the antipsychotic drugs, chlorpromazine and reserpine, Joe began his program in behavioral pharmacology... Brady had an academic appointment at the University of Maryland, which sponsored his own successful program project grant. This funding initiated the important drug self-administration research of students Charles Schuster and Travis Thompson, and later Nancy Ator, Roland Griffiths, George Koob and others. Meanwhile, at Walter Reed, Joe benefited “from a recruiting system you can’t beat—the Korean War... We drafted in all these guys and had a whole lab full of PhDs. Larry Stein was one of them, John Boren, George Heise, [Eliot Hearst, Bernard Beer], Dick Herrnstein” (2). This Army duty effectively served as a post-doctoral fellowship and, after discharge, many of Brady’s recruits were sent off to jobs in academia or the pharmaceutical industry. Joe’s position as the pivotal recruiting agent in industrial psychopharmacology started in the early 1950s after he had presented a seminar at Eli Lilly—research director K.K. Chen was impressed by the precision of Joe’s behavioral methods and asked him to help Lilly set up an in-house laboratory. Karl Beyer at Merck had a similar request, and within a few years nearly all of the major drug firms had followed suit. Thanks largely to Brady, sophisticated behavioral screening methods, such as the “conflict” procedure of Irving Geller (a Brady-trained Ph.D.) for anti-anxiety agents, soon became the gold standard for psychotherapeutic drug discovery ([www.acnp.org/asset.axd?id=cf28bfa2-d942-41ef-b30b-6cbb80f8e074](http://www.acnp.org/asset.axd?id=cf28bfa2-d942-41ef-b30b-6cbb80f8e074))

In 1957, the Soviet Union launched the satellite *Sputnik*, and the space race was on. The Soviets’ triumph jarred the American people and sparked a vigorous response in the federal government to make sure the United States did not fall behind its communist rival. Joseph Brady became responsible for training monkeys for the space program, in particular Ham, the first monkey in space. The training of Ham was performed in a similar way to his earlier studies on executive monkeys. Years later, Brady founded the Programmed Environment Research Center as well as the Division of Behavioral Biology in the Department of Psychiatry and Behavioral Sciences at the Johns Hopkins University School of Medicine. Based upon his seminal work in programmed environments (Findley, Migler & Brady, 1963), he continued to explore the potential application of behavioral management principles to long-duration space flight (Brady, 2007; Emurian & Brady, 2007). One of Brady’s most lasting contributions was developing a framework for ethical decision making to protect the rights of the people who participate in scientific research (Thompson, 2012).

## **Professional and Organizational Developments**

### *The Society for the Experimental Analysis of Behavior*

The Society for the Experimental Analysis of Behavior (SEAB) was formed in 1957. Its Certificate of Incorporation (dated October 29, 1957) states that:

“The purpose and objects of this corporation shall be to encourage, foster, and promote the advancement of the science of experimental analysis of behavior; the promotion of research in the said science and the increase and diffusion of knowledge of the said science by the conduct of a

program of education by meetings, conferences and symposia, and by the publication of journals, papers, periodicals and reports.” (<http://seab.envmed.rochester.edu/society/>).

In 1958, *The Journal of the Experimental Analysis of Behavior* (JEAB) was founded to meet the needs of those who had been attracted to the behavior analytic approach but were unhappy with the lack of a journal specializing in that rapidly growing area. JEAB's first editorial board was composed by:

- Charles B. Ferster, Indiana University Medical Center, [Executive Editor]
- Douglas G. Anger, Upjohn Co. [Apparatus Editor]
- James E. Anliker, Harvard Medical School
- Nathan H. Azrin, Aberdeen Proving Grounds
- Donald S. Blough, National Institute of Mental Health
- John J. Boren, Merck Sharpe and Dohme
- Joseph V. Brady, Walter Reed Army Institute of Research
- Peter B. Dews, Harvard Medical School
- Richard J. Herrnstein, Walter Reed Army Institute of Research
- Fred S. Keller, Columbia University
- O. R. Lindsley, Harvard Medical School [Secretary-Treasurer]
- William H. Morse, Harvard Medical School
- William N. Schoenfeld, Columbia University
- Murray Sidman, Walter Reed Army Institute of Research
- B. F. Skinner, Harvard University
- Thom Verhave, Ely Lilly Co.

In 1967, the SEAB commissioned Natan Azrin to determine if an applied journal on behavior analysis would be feasible and popular (Matson & Neal, 2009). In 1968, the first number of the *Journal of Applied Behavior Analysis* was published with Montrose W. Wolf as the first editor of the new publication. Wolf co-authored with Baer and Risley a seminal article that formally defined applied behavior analysis and set the standards for its practice, the so-called “7 dimensions of ABA”: 1) Applied: changing behaviors of social significance; 2) Behavioral: behaviors must be measurable, observable and in need of improvement; 3) Analytic: demonstration that the intervention was responsible for the change in the target behavior (functional relationship); 4) Technological: procedures are written with detail and clarity, able to be repeated; 5) Effective: interventions improved the target behavior in a meaningful, significant way; 6) Conceptually Systematic: description of procedures should be written in relevant and accepted principles; 7) Generality: behavior should be demonstrated across different environments, materials, situations, people, other behaviors and time (Baer, Wolf & Risley, 1968).

#### *APA Division 25*

In 1966, the *American Psychological Association* created *Division 25* dedicated to behavior analysis.

*Division 25: Behavior Analysis* promotes basic research, both animal and human, in the experimental analysis of behavior; it encourages the application of the results of such research to human affairs, and cooperates with other disciplines whose interests overlap with those of the Division. The Division publishes *Division 25 Recorder*, a newsletter distributed two times a year to all members and affiliates, who also receive *Behavior Analysis & Therapy*, published quarterly. (<http://www.apa.org/about/division/div25.aspx>)

### *Association of Behavior Analysis International*

The Association for Behavior Analysis International (ABAI) has been the primary membership organization for those interested in the philosophy, science, application, and teaching of behavior analysis. ABAI evolved from *The Midwestern Association of Behavior Analysis*, started by Jerry Mertens, Neil Kent, Marge Peterson, Richard Mallott, and others in 1974 ([old.dickmalott.com/behaviorism/worddocs/history\\_ABA.doc](http://old.dickmalott.com/behaviorism/worddocs/history_ABA.doc)).

### *Organizational Behavior Management (OBM)*

Organizational Behavior Management (OBM) is a sub-discipline of ABA. Skinner's applications of behavioral principles to instructional design served as a starting point for the use of the science of behavior in the workplace. The *Journal of Organizational Behavior Management (JOBM)* began publication in 1977 and is the main outlet for the field today. By 1977 over 40 articles on OBM had been published in other journals and at least one OBM consulting firm had been established. Aubrey Daniels was the first editor of *JOBM*. *Performance Management*, *Behavioral Systems Analysis*, and *Behavior-Based Safety* are the three more common area of OBM ([http://www.obmnetwork.com/what\\_is\\_obm/definition\\_description\\_common\\_applications](http://www.obmnetwork.com/what_is_obm/definition_description_common_applications)).

### *The Society for the Quantitative Analyses of Behavior (SQAB)*

The Society for the Quantitative Analyses of Behavior (SQAB) was founded in 1978 by Michael L. Commons and John. A. Nevin to present symposia and publish material which bring a quantitative analysis to bear on the understanding of behavior. This international society holds its annual meeting in conjunction with ABAI. Talks at SQAB focus on the development and use of mathematical formulations to characterize one or more dimensions of an obtained data set, derive predictions to be compared with data, and generate novel data analyses (<http://www.sqab.org/AShortHistory.pdf>).

### *The Behavior Analysis Certification Board (BACB®)*

The Behavior Analyst Certification Board®, Inc. (BACB®) is a nonprofit 501(c)(3) corporation established in 1998 to meet professional credentialing needs identified by behavior analysts, governments, and consumers of behavior analysis services. The BACB program is based on the successful Behavior Analysis Certification Program developed by the State of Florida in the early 1990s. Similar programs were established in California, Texas, Pennsylvania, New York and Oklahoma. All of these programs transferred their certificants and credentialing

responsibilities to the BACB® and closed. The BACB® announced that after the first round of examinations in 2013, there are now over 13,000 certificants worldwide. (<http://www.bacb.com>).

### *Association of Professional Behavior Analysts (APBA)*

The Association of Professional Behavior Analysts (APBA) was founded in 2007 to address the professional needs of certified behavior analysts. The founding Board of Directors included Jon S. Bailey, Judy Favell, Richard M. Foxx, Gina Green, James M. Johnston, (founding President), Raymond G. Romanczyk, Dennis Russo, and Jerry Shook. APBA works closely with the BACB. APBA also works to build cooperative relationships with other organizations in the field of behavior analysis, as well as those in related fields (<http://www.apbahome.net/about.php>).

## **Reflexions About Our Future**

In the late 70's, seminal discussions about basic and applied behavior analysis started with an article by Sam Deitz (1978) *Current status of applied behavior analysis: Science versus technology*, followed by Frank Epling and David Pierce (1980) *What Happened to Analysis in Applied Behavior Analysis*. Pierce and Epling complained that the ABA meetings and JABA seemed to be less concerned with contingencies of reinforcement (basic science) and more focused on clinical issues of treatment, helping clients, evaluations and outcome. Don Baer (1981) acknowledged the technical drift of ABA but considered it a positive and natural progression of the field. In *Upon Further Reflection* (2012) Pierce reiterated that the field of ABA has continued to drift in the technical and clinical direction, possibly due to the powerful monetary contingencies in the treatment of autism and other disabilities. Concerned with this non apparent divorce, Murray Sidman (2011) wrote:

I have written before about the importance of applied behavior analysis to basic researchers. That relationship is, however, reciprocal; it is also critical for practitioners to understand and even to participate in basic research. Although applied problems are rarely the same as those investigated in the laboratory, practitioners who understand their basic research background are often able to place their particular problem in a more general context and thereby deal with it successfully. Also the procedures of applied behavior analysis are often the same as those that characterize basic research; the scientist-practitioner will appreciate the relation between what he or she is doing and what basic experimenters do, and as a consequence, will be able to apply therapeutic techniques more creatively and effectively (Sidman, 2011, p. 973).

In order to secure our future we have to address 5 areas of concern: (1) the small size and limited power of the discipline, (2) the growing focus of applied behavior analysis on autism spectrum disorders and little else, (3) the esoteric nature of much basic research, (4) the proliferation of “applied” research that really isn't applied, and (5) the widespread use of imprecise and potentially harmful technical language (Poling, 2010). The future of behavior analysis will depend on our ability to bridge the gap between applied behavior analysis and the experimental analysis of behavior. Without good foundations the house can collapse.

Finally, it's important to mention that in the last 100 years behavior analysis expanded across the globe. For example, ABAI maintains a mutually beneficial relationship with 81 affiliated chapters in Asia, Australia, Europe, and North and South America. These chapters often hold conferences, sponsor lectures, and offer continuing education opportunities. In 2012, ABAI affiliated chapters reported having more than 20,000 members—nearly 8,000 in the United States and more than 12,000 outside the United States (<http://www.abainternational.org/chapters.asp>).

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