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PRINCIPLES OF PSYCHOLOGY (KELLER & SCHOENFELD, 1950) TURNS 70 YEARS OLD: MEMORIES OF AN EPOCH

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Abstract

Having studied in the Conditioning program at Queens College from the City University of New York (1972-1981) places me in an unique position to celebrate the 70th birthday of *Principles of Psychology.* Different from my sporadic contact with Fred Keller, I was in continuous contact with Nat Schoenfeld. During this period I read for the first time their wonderful book. Since an impersonal analysis of the text is impossible I decided to share a few memories from that epoch. One was my obsession to understand the premises of Nat´s thinking of psychology. I concluded that almost invariably he strived to integrate the known independent variables of behavior on continua that allowed for quantitative variation to produce new knowledge. My second memory is related to the latter and was my discovery of his systematization of established knowledge. This is evident in *Principles of Psychology,* which emphasizes that behavior analysis is a view of the whole of psychology. The textbook organizes the established knowledge as variations of reinforcement and extinction, with each chapter adding

In relation to my studies in the U.S. I wish to express mi gratitude to Emilio Ribes for having helped me to obtain a scholarship from CONACYT when UNAM abruptly suspended in 1973 its scholarship program and therefore my first scholarship. Address correspondence to cbruner@unam.mx

new knowledge to the preceding one. The power of such strategy is evident in the last three chapters on motivation, emotion and social behavior, which are not common themes in behavior analysis.

Key words: *Principles of Psychology,* Introduction to psychology, Keller and Schoenfeld, Queens College of CUNY, systematization of established knowledge

To think of *Principles of Psychology* (Keller & Schoenfeld, 1950) unavoidably makes me think of my doctoral studies in the Conditioning program at Queens College of the City University of New York (1972-1981). Almost 40 years have passed since then and of course I do not trust the fidelity of my memories. It is possible that the contents of this paper may be a mix of real events and after-the-fact elaborations.

I originally wished to have Thom Verhave as my tutor. Kindly, he assigned me a place in his laboratory where I remained until the end of my studies. However, since my arrival at the university I was attracted to Nat Schoenfeld´s thinking. Nat was the chairman of the Conditioning program and taught at least one seminar for graduate students each semester. During these seminars I realized that Nat´s thinking was fundamentally different from the thinking of my other teachers in the program. I cannot say with precision what such difference was except for the ease with which he isolated the heart of different psychological problems. Nat´s thinking intrigued me to the point that I tried to approach him following the same strategy that Cattell followed with Wundt (cf. Boring. 1950): I appointed myself as his assistant for his graduate course on experimental psychology. Much of what follows describes my search for the variables that controlled his thinking.

I did not arrive to the Conditioning program totally blank. I had read a considerable number of books on operant behavior, including Honig´s (1966), which I knew almost by heart. I remember having read the paper by Schoenfeld, Cumming and Hearst (1956), on a classification of schedules of reinforcement different from that by Ferster and Skinner (1957). However, due to my lack of sophistication I did not realize its importance for behavior theory. The paper simply gave me the impression that both classifications would compete for accep-

tance in the Experimental Analysis of Behavior (EAB). Far from thinking that my doctoral studies were to endow me with a special view of the EAB, I believed that I was to add more amazing discoveries to those that I had learned before arriving at Queens College.

As a graduate student I was required to teach at least one undergraduate course per semester. Thus I offered to teach Introductory Psychology. To select a textbook, I read for the first time *Principles of Psychology* by Keller and Schoenfeld (K&S for brevity), only to find that it was not suitable because of its behavioristic bias. Instead I had to select another textbook of a more eclectic nature. At that time I simply thought that K&S was a cute book, unaware of the impact that later on was to have on my view of EAB.

Before returning to my involvement with K&S I would like to go back to my regular studies in the conditioning program. Since *Stimulus Schedules* (Schoenfeld & Cole, 1972) was still hot out of the press, the students were enthusiastic to review the "red book" in one of our seminars with Nat. I thought that by memorizing the book I would increase my standing before Nat. I do not know if I managed to impress him but certainly the careful reading of the book helped me to understand Nat´s thinking. The "red book" made me aware of the importance of relating the different schedules of reinforcement proposed by Ferster and Skinner (1957); that it was possible to transit from one schedule to another using the same independent variable (also called "the t system", for time). Here was a clue to Nat´s thinking of EAB (and also to the whole of psychology). I discovered that Nat invariably tried to accommodate the independent variables of behavior in continua, thus allowing for a system of behavior (also referred by Nat as Behavior Theory). Sidman (1960) called this approach as the "Method of Quantitative Contiguities". Paraphrasing Sidman, a scientific discovery that is not related to the established knowledge is "standing firmly at mid-air". In addition, I also learned that other researchers in EAB did not follow the same approach.

By no means I wish to suggest that I was the only student at the program that understood Nat´s view of our field. But just maybe I was

the only one that was obsessed about it. Unfortunately I found myself preaching in the middle of the dessert, given that most of my friends at other universities favored what Sidman called the "Method of Functional Contiguities" (see also Cabrer et al., 1975 for a similar distinction).

Once I saw that the key to understand Nat´s thinking consisted in viewing the independent variables of EAB as quantitative variations of variables already known, I read K&S again. This time, I realized that Nat had followed the same approach in writing K&S. At this point I would like to clarify that I understand that K&S resulted from a collaboration between Nat and Fred Keller and that I still do not know how much each contributed to the book. Unfortunately I did not have Fred as a teacher and only met him sporadically. I thought of Fred as a genuine gentleman full of knowledge, but was not able to probe the way he thought. I can only guess that Nat and Fred must have viewed psychology in a similar way and that together produced an excellent book. As for excellence I hope that I will persuade my reader that reason assists me.

The first line on the first page of K&S declares its three main purposes: 1) to familiarize the reader with a number of well-established psychological principles; 2) to show the reader how these principles relate one to the other; and 3) suggest to the reader how these principles can be applied to the analysis of human daily life. In the following page K&S elaborate further on the same idea mentioning that the approach of the book is biological (in that the same principles apply to different evolutionary levels); is also experimental (in that the principles originate from laboratory investigations and not from casual observations of the behavior of organisms); and most important, that is systematic (in that the interrelations between experimental facts will be one of the main points of the book).

It goes without saying that K&S is an introduction to psychology, but from the standpoint of EAB. Furthermore, its description of EAB is based on the independent variables of behavior. It is important to notice this fact because many colleagues seem to believe that EAB is a

specialty within psychology. By contrast, K&S plainly state that EAB is a view of the whole of psychology and therefore differs from traditional psychology by relating its different "processes" and applications to simple variations of variables already established within EAB. Obviously, the established knowledge of EAB that K&S refers to in 1950 is based on the book by Skinner (1938), *The Behavior of Organisms* (B of O, for brevity). Furthermore, the organization of such facts is rather similar in both K&S and B of O. So much indeed that my peers in the program and I thought of K&S as a simplified version of B of O.

In my second reading of K&S, I realized that the sequence of its chapters follow a wonderful succession. I imagine that Chapter 1 could start by saying … in the beginning there was the reflex …, meaning that scientific psychology was born with the discovery of the Laws of the Reflex (cf. Sherrington, 1906). That is, that in the beginning, the lawfulness of behavior was revealed using isolated parts of the subjects (e.g., the neuromuscular preparation with frogs). Chapter 2 describes that the discovery of the reflex encompasses complete organic systems and is not limited to specific inputs but also occurs with arbitrary stimuli (as in respondent behavior; e.g., Pavlov, 1927). After emphasizing that behavior originates from the environment, in Chapter 3 operant behavior is contrasted with respondent behavior explaining that the effects of stimulation are not limited to antecedent conditions but may also follow an act. The idea is introduced that operant behavior may either increase in frequency with a "reward" or decrease if the consequence does not occur (e.g., Thorndike, 1911). Thus, the concepts of reinforcement and extinction are introduced, which is important because from here on the contents of the book are organized as interactions between reinforcement and extinction. The long Chapter 4 takes advantage of the familiarity with the operations of reinforcement and extinction and reveals the systematic character of K&S: it explains the different schedules of response-intermittent reinforcement as the interaction of reinforcement and extinction. Chapter 5 is another example of the systematic character of the book. It explains that once behavior is reinforced, concurrent stimuli increase its frequency while if withheld

its frequency is decreased. Thus stimulus discrimination and in passing generalization are introduced. Chapter 6 illustrates a different effect of reinforcement and of extinction. While reinforcement reduces variations in the form of the response, extinction increases the occurrence of behavior that was not reinforced (i.e., of course, the terms response stereotypy and variability are introduced). As an example of the interaction of reinforcement and extinction, a practical application of these operations is suggested: the "shaping" of new behavior (in animals and men) is described. Chapter 7 explains that an operant response may assume different lengths, from a simple, repetitive act to a long sequence that ends with primary reinforcement. Each sequence may include responses not directly reinforced. Long response sequences occur when each link results in the presentation of a discriminated stimulus that elicits the occurrence of the subsequent response and so on. Chapter 8 describe that stimuli from the environment assume several functions at once and that one of these functions is to endow the discriminated stimulus with the efficacy of a reinforcer. The double function of stimuli as discriminated and reinforcers maintains the integrity of behavioral chains, discussed in the previous chapter.

K&S´s treatment of the classical facts of EAB ends in Chapter 8. All chapters include examples of the relevance of these different phenomena to daily life and also mention other experimental findings adequate for a psychology introductory book. In addition to an elegant style, the chapters follow each other rather fluidly and use a language adequate for undergraduate students. The last three chapters show that it is possible to integrate some topics of traditional psychology to EAB. Chapter 9 deals with motivation (e.g., Young, 1936) and among other facts, it explains that reinforcer deprivation is a necessary condition for its efficacy. Chapter 10, deals with emotion (Young, 1943), explaining that any experimental operation, (like reinforcement), has multiple effects, including those that are traditionally called emotional but are nevertheless subject to operational definition (e.g, fear as when the rat freezes when first introduced into the experimental chamber). Its treatment of social behavior in Chapter 11 is an excellent example

of the extension of the principles of EAB to a theme that had been treated traditionally according to a set of its own principles (e.g., Klineberg, 1940). Among other social phenomena, the description of "individual differences" as the shaping of group-desirable behavior using reinforcement and extinction (i.e., universal principles used to explain differences between individuals) is wonderful.

Evidently, *Principles of Psychology* was so successful that some students of Nat and Fred at Columbia University wrote their own books following the same strategy. Verhave (1966) compiled a set of readings by different authors as a complement to the chapters of K&S. Millenson (1967) wrote *Principles of Behavior Analysis* (1967) as an updated version of K&S (see Verhave & Sherman, 1968 for a review of Millenson´s book). I should say that having studied with Nat and his students Brett Cole and Thom Verhave makes me proud of my academic family (see *The Academic Family Tree*, 2020).

When I returned to Mexico, EAB was a mandatory course within the excellent undergraduate program at the School of Psychology of the National University of Mexico and taught this subject during many semesters. I used Millenson´s book as the classroom text, partly because it was a bit more modern than K&S but mainly because it had been translated to Spanish. However, as a "trick up my sleeve" I taught my classes following closely the chapters of K&S (using more up to date examples, of course). The fact that many of my former undergraduate students followed me to the doctoral level shows that my strategy was successful.

It is a shame that I must finish this paper by mentioning that EAB is no longer taught at the undergraduate level courtesy of the "cognitive revolution". However, K&S continues inspiring much of the research conducted in my laboratory and has generated numerous honor theses and doctoral dissertations. Invariably following the approach centered on the independent variable, some of our investigations have included themes from clinical (e.g., Bruner & Vargas, 1994) and social psychology (Bruner & Acuña, 2004). The cognitive fellows have sometimes referred to me as a "dinosaur" but whether they like it or not I made

a career out of psychology and much of my success is due to having studied at depth K&S.

References

Boring, E. G. (1950). *A History of Experimental Psychology*. Appleton Century Crofts.

Bruner, C., & Acuña, L. (2004). The influence of the enemies of science on undergraduate students. *Mexican Journal of Behavior Analysis, 21*, 143-156.

Bruner, C. A., & Vargas, I. (1994). The activity of rats in a swimming situation as a function of water temperature. *Physiology and Behavior, 55*(1), 21-28. http://dx.doi.org/10.1016/0031-9384(94)90004-3

Cabrer, F., Daza, B. C., & Ribes-Iñesta, E. (1975). Behavior theory: New concepts or new parameters? *Mexican Journal of Behavior Analysis, 1*(2), 191-212.

Ferster, C. B., & Skinner, B. F. (1957). *Schedules of Reinforcement*. Appleton Century Crofts. https://doi.org/10.1037/10627-000

Honig, W. K. (Ed). (1966). *Handbook of Operant Behavior*. Appleton Century Crofts.

Keller, F. S., & W. N. Schoenfeld (1950). *Principles of Psychology.* Appleton Century Crofts.

Klineberg, O. (1940). *Social Psychology*. Holt.

Millenson, J. R. (1967). *Principles of Behavior Analysis.* Macmillan.

Pavlov, I. P. (1927). *Conditioned Reflexes*. Oxford University Press.

Schoenfeld, W. N., & Cole, B. K. (1972). *Stimulus Schedules: the t-tau Systems.* Harper & Row.

Schoenfeld, W. N., Cumming, W. W., & Hearst, E. (1956). On the classification of reinforcement schedules. *Proceedings of the National Academy of Sciences, 42*(8), 563-570. https://doi.org/10.1073/pnas.42.8.563

Sherrington, C. S. (1906). *The Integrative Action of the Nervous System*. Oxford University Press.

Sidman, M. (1960). *Tactics of Scientific Research*. Basic Books.

Skinner, B. F. (1938). *The Behavior of Organisms*. Appleton-Century-Crofts.

The Academic Family Tree (2020). Recovered on May 11th 2020 from The Academic Family Tree website: https://neurotree.org/neurotree/tree.php?pid=9554

Thorndike, E. L. (1911). *Animal Intelligence: Experimental Studies*. Macmillan.

Verhave, T. (1966). (Ed). *The Experimental Analysis of Behavior: Selected Readings*. Appleton Century Crofts.

Verhave, T., & Sherman, G. (1968). Principles of Textbook Analysis: A Review of J. R. Millenson´s Principles of Behavioral Analysis. *Journal of the Experimental Analysis of Behavior, 11*(5), 641-649. https://doi.org/10.1901/jeab.1968.11-641

Young, P. T. (1936). *Motivation and Behavior*. Wiley.

Young, P. T. (1943). *Emotion in Men and Animal*. Wiley.

W.N. Schoenfeld (left), C.A. Bruner (middle) y F.S. Keller (right).