[Column 10 Set 2] Exploring More Mysteries of Living: Tools and Methods Tackle Behavior Laws

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Why these Columns? Because human behavior causes global problems, and solving these problems requires changes in human behavior… So *everyone* benefits from knowing something about the natural science of human behavior that these columns describe. See the 72 columns of the first set, in the *Explaining Mysteries of Living* book or on **BehaviorInfo.com**, for the *basics* of this science.

Before answering more ancient questions, another direction beckons us. Appreciating answers to additional ancient questions benefits from some increased familiarity with the usual experimental research equipment and designs that have produced the data in this science. Studying this data has led, and leads, to the knowledge, skills, and practices that enable not only problem–solving interventions but also interpretatively providing some scientific answers to various ancient questions.

So, how does the natural science of behavior make discoveries? How does it apply those discoveries to bring practical benefits to people? What experimental equipment and methods does it employ in its basic and applied research? The next several columns consider the answers to these questions in terms of the standard research equipment and procedures of both the classic behavior–research laboratory and the practical research for applied settings and interventions.

For example the researchers in this natural science of behavior founded the *Journal of The Experimental Analysis of Behavior* in the 1950s. It was the first experimental journal in this science and is filled with experimental research examples from the start.

In part, B. F. Skinner's early exposure to biology in graduate school, in the 1930s, induced him to study behaviors as a completely natural phenomena. He was one of the first to follow this path. And it evoked an exercise of the inventing skills that his environment had already been conditioning, as you can check out in his three–volume autobiography.

To study behavior, simple behavior at first, researchers would need not only appropriate procedures but also an environmental space that was shielded from extraneous variables while still containing adjustable stimuli. Researchers would also benefit from some

device that automatically collected, recorded, and displayed data on response occurrences, preferably over time.

Skinner invented both of those machines, while experimental procedures were already available. Initially the most suitable procedures for studying behavior involved adapting a variety of different single–subject designs for basic and applied research. We call the environmental space an "operant chamber" and the automatic data collector a "cumulative recorder" (and its records we call cumulative records).

First, consider the environmental space, the operant chamber. While this column covers the operant chamber, the next column covers the cumulative recorder. Later columns cover some single–subject designs as methods for basic experimental and applied research.

Note that columns get along poorly with graphics. But without graphics the descriptions in columns can easily read rather dryly. While we can live with that, you are not confined to it. The reference directs you to resources containing great graphics that can enhance the value of your reading for the next several columns.

Operant chambers are so named, because their design lends them explicitly to studies of various *operant* behaviors. These are behaviors that *operate* on the environment by producing stimulus changes whose occurrence alters the observed rate of these behaviors; we say "whose," because these stimuli can be people.

Behaviorological laboratories can make and use a variety of operant chambers for studying operant behavior. Beyond certain vital features, however, rather little needs to be typical of such chambers. They can range from less than a cubic foot of space to the size of a small bedroom, office, or larger space, constructed or already in place. They can feature bare surfaces quite devoid of stimuli beyond those we explicitly need for an experiment or, if the point is to study typical human behaviors in a recognizable human space, they might contain all the stimuli that are typical of a bedroom or office as well as those we explicitly need for an experiment.

The complexity of experimental controls, data recording, and analysis may increase, but our assumptions about the thoroughness of how the laws of nature govern behavior continue. In spite of all the fun that accompanies such complexities, our experimental chamber description here will remain on the level of simpler equipment for simpler experiments.

B. F. Skinner invented the *operant experimental chamber* early in his career. For many decades, people have referred to this chamber as "the Skinner box." However, Skinner disliked that name, and never used it. What led to this name? Past professors provided a fun account, although Skinner's autobiographies and other writings may shed more accurate light on the question.

Still, as the story goes, some students, who were studying under other professors, were running rats in mazes for their research, a rather complicated and time–consuming procedure both on a day–to–day basis and for how long (perhaps weeks or more) before you could analyze a publishable data set. These students, however, observed Skinner (and his students) putting experimental animals into an operant chamber, turning the equipment on, going to lunch and, upon their return an hour later, analyzing a possibly

publishable data set. To no one's surprise, these maze–using students exclaimed to their professors, "We want to use 'Skinner's boxes'!" In any case, this name stuck.

By the way, do not confuse the operant chamber (AKA the Skinner box) with the "Aircrib." This specially constructed and normally used crib, which we also know as the Baby–Tender or, jokingly, as the Heir Conditioner, offers particularly beneficial features for a normal infant.

Skinner's wife asked him to invent something to make having another child even more enjoyable than their first child, and he came up with the Aircrib, which no one has ever used for experimentation. (For some details, see the Appendix, by Skinner, in the book in the reference. A book that I wrote with Carl Cheney, on aircribs, is a free download, with color photos, from www.behaviorology.org.)

Returning to the operant chamber, regardless of size it is in essence a controllable mimic of the larger environment, a mimic that researchers can simplify in ways that afford them nearly complete control over most independent–variable aspects of the larger environment. They exert most of this control merely through excluding most of the larger environment from the chamber. These chambers sit in light and sound proof housings, and contain their own lighting, their own sound speakers, and so on with respect to any other sense modality that a particular experiment might require.

More importantly, these chambers contain three essential items. (1) They contain however many or few stimuli the experiment requires for evoking or eliciting responses. (2) They contain whatever response manipulanda the experiment requires to ensure that arbitrary though standardized responses are possible and recordable when the stimuli evoke or elicit them. And (3) they contain access ports, along with audio, visual, and other sense–modality stimulus displays, for the delivery of whatever type of reinforcer or punisher the experiment requires.

The chamber design enables control over the temperature, humidity, sound, and other conditions, because any of them might affect experimental outcomes. Controlling all these variables, at least by keeping them constant, protects the subject and the results from any extraneous stimuli that the experimenter or the apparatus might produce.

The chamber design also provides a relatively stimulus–clean environmental background against which the independent variables of the study can operate. But what collects the data that we require for analyzing the environment–behavior relationships that are developing, maintaining, or disintegrating within the chamber walls under the experimental contingencies? The next column answers this question.

The BOOKS page at www.behaviorology.org provides a full description of the book that contains the first set of columns, *Explaining Mysteries of Living,* including where and how to obtain it. This BOOKS page also has a full description of the book, *Running Out of Time—Introducing Behaviorology to Help Solve Global Problems;* its Chapters 6, 8, and 9 feature much more detail and extensive graphics that clarify equipment and procedures.

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