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A Biographical Memoir by

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ALTHOUGH SKINNER saw himself and was seen by others as a psychological revolutionary—the type of behaviorism he founded is called *radical behaviorism*—he was also in a sense a conservative of American culture in American psychology. His rebellion was against the nineteenth-century German academic psychology brought to this country by Hugo Munsterberg and E. B. Titchner. Skinner's behaviorism represents a reaction from this basically romantic psychology with its focus on the "inner man," possessing an inner theater where "the life of the mind" could be played out independent of life itself.

Skinner was a true descendant of the American pragmatism of William James, John Dewey, and C.S. Pierce; the fact that Skinner was a William James Lecturer at Harvard is thus satisfyingly appropriate. The core of American pragmatism predominant in Skinner's work is its brilliant clarity, its focus on "pragmatic questions," and its avoidance of mysticism—represented in psychology by self-centered introspection.

Another strain of early American culture in Skinner's behaviorism is its emphasis on engineering above theoretical science, on building machines rather than building theo-

ries. Still another quintessentially American strain in Skinner's behaviorism is its democratic optimism. Skinner, following John Watson, behaviorism's founder, believed that given the opportunity most people could make themselves into anything they wanted. There is something in Skinner of Tom Swift, a sort of gee-whiz, can-do attitude. Here is a piece of a letter from Skinner to Fred Keller (erstwhile fellow graduate student, yet-to-be lifelong colleague, collaborator, close friend throughout) about a book of Keller's. The letter was written in 1937 while Skinner himself was just finishing *The Behavior of Organisms: An Experimental Analysis*, his first and best book:

> In the midst of a busy morning I stopped to read the section on functionalism and found it grand. . . . I really didn't think you could do it, old man, it gives me a hell of a kick.

The letter is quoted by Skinner on p. 209 of *The Shaping of a Behaviorist* (New York: University Press, 1984), the second volume of Skinner's three-volume autobiography.

In his restrained scientific works, in his more relaxed popular works, and in his letters to Keller, where he let go completely, you will find a common thread, a practical, patient encouragement of both intelligence and industry and above all a tendency to identify the former with the latter. Skinner believed that behavior could and should be studied scientifically. But he believed, more than that, that life itself is a science. "If I can do it, you can do it," Skinner's work seems to say—from educating a child, to conducting a scientific experiment on a rat's behavior, to writing ten pages a day, to designing a utopian society, to enjoying old age. And he did it, Skinner implied, not because he was some sort of head-in-the-clouds genius but simply because he saw life as a subject of scientific study. As to his scientific contri-

butions, their importance is a matter of current interest and dispute and will occupy most of this memoir.

Since Skinner produced a three-volume autobiography, there is no necessity to do more than outline his life's "particulars." He was born in Susquehanna, Pennsylvania, a railroad town just below the New York border. The nearest reasonably large city is Binghamton, New York. Susquehanna is close to the snow belt below the Great Lakes and winters were cold. Old ladies wore "creepers," miniature crampons that could be folded into their boot's instep, to avoid slipping on the ice:

> In cold weather I pulled my underclothes into bed with me to warm them and put them on under the covers. Then I dressed quickly, washed, cleaned my teeth, brushed my hair, and went down to hover (with my brother and in very cold weather my mother) on the large grille between living room and dining room where the first warm air [from the furnace] had begun to rise. (*Particulars of My Life*, 1976, p. 24)

From his boyhood on, Skinner was always building and inventing things. As a very young boy he designed a system for getting oxygen from seawater (whether it worked or not, he doesn't say) and played with electric motors, magic lanterns, and stereopticons. As a young man he built model ships. *Particulars of My Life* includes a photo captioned, "The maker of ships on his [twenty-third] birthday," showing a studious-looking young man with an immense pipe sitting next to a model galleon (sails *plus* oars) of incredible complexity. You would have thought at this point that he'd grow up to be another Henry Ford or Thomas Alva Edison, and indeed there was much of the inventor in him. At one point Skinner said that his greatest contribution to psychology would be the cumulative recorder, a device (invented by Skinner while a graduate student) to record discrete actions like a rat's lever presses or a pigeon's keypecks or a

person's button pushes as a continuous cumulative line. Here is his description of its invention:

> It so happened that a short spindle, like the hub of a wheel, was attached to one side [of a pellet feeder he had constructed], and I had left it in place. It occurred to me that if I wound a thread around the spindle, it would unwind slowly as the disk turned and could be made to lower a marker on the kymograph drum. The marker would record a curve rather than a row of marks. When the rat was working rapidly, the thread would be played out rapidly and the line would be rather steep, but as the rat slowed down, the curve would grow flatter. From the slope I could estimate the speed at which the rat was working at any moment. (*The Shaping of a Behaviorist*, 1984, p. 56)

From the "cumulative record" it was possible for an experienced observer to perceive patterns in an animal's response rate as it changed over time. Skinner hoped that the cumulative recorder would become a sort of X-ray machine for psychology. When it fell out of use, he wrote an article, "Farewell My LOVELY!" (1976), lamenting its fate. Skinner's aircrib, his teaching machine, the pigeon-operated guided missile, the Skinner-box itself, are all extensions of his early inventiveness.

At Hamilton College (B.A., English literature, 1926), Skinner's main interest shifted more and more to writing. He met Alexander Wolcott, Carl Sandburg, and Robert Frost. Frost read some of his stories and wrote Skinner a long approving letter ending with: "I ought to say you have the touch of art. The work is clean run. You are worth twice anyone else I have seen in prose this year" (*Particulars*, p. 249).

After graduating from college, Skinner spent a year in Greenwich Village (not yet gentrified) trying to write. He succeeded better at living a bohemian life than at writing and came to the conclusion that, "I was interested in human behavior, but I had been investigating it in the wrong

way." He began to read in biology and psychology: Loeb, Watson, Pavlov, Thorndike. He became a convinced Watsonian behaviorist.

Having decided to become a scientist, Skinner gave up his bohemian life, but he never dropped his cultural interests. He remained a friend of writers and musicians throughout his life. He was to make his reputation attacking romanticism in psychology, but his taste in music was for Mahler, Bruckner, and other late romantic composers. On the advice of the president of Hamilton College, Skinner applied to Harvard's psychology department and was accepted. At that point he had no conception of what psychology was like there.

I met Skinner ("was exposed to" is probably more apt than "met") in 1962, when I was just beginning my academic career as a graduate student and he was in the final years of his professorship at Harvard. (It was just a few years before he stopped teaching, but he wrote some of his most popular books and published occasional research papers throughout his "retirement" years.) In those days there were only two full professors of psychology at Harvard, Skinner and S. S. (Smitty) Stevens. Jerome Bruner and George Miller were university professors, busy with developing the Cognitive Center, and the other big names at Harvard were in the social relations department (a result of undoubtedly baroque political intrigues much above the head of a graduate student). The pro-seminar, the first big hurdle for graduate students, was directed during the first semester by Stevens. The German system had been passed to Harvard's department from Wundt to Titchner to Boring to Stevens as teacher to student, and whatever its merits or demerits it succeeded in terrifying all of us. I recall actually feeling my hair stand on end before my first pro-seminar presentation. Skinner was away somewhere during the fall and made his appear-

ance, only at the start of the spring semester, with a six-pack of beer—the world's oldest desensitization device. I do not say that Skinner's technique with graduate students got better results than Smitty's. It probably didn't. Smitty's terrorism was interwoven with a deep personal concern while Skinner could not, in the few short weeks available to him, penetrate our awe. We saw him as a figure, not as a human being. In his autobiography Skinner repeatedly refers to his father's problem in getting people to warm up to him (they called him "bumpy"):

> My father apparently never knew how he looked to other people. Every successful step in becoming a self-made man intensified his zeal in improving himself and he saw no reason why everyone should not improve—why Susquehanna should not be a self-made town—but few of its citizens agreed with him. (*Particulars*, pp. 38-39)

It is an irony (not lost on Skinner) that on a much grander scale he himself was to have the same difficulty.

When I came to Harvard, E. G. Boring (long since "emeritized") was a sweet octogenarian who took each incoming graduate student to dinner at the Harvard Club so we could meet psychology's grand old man. Evidently things were different in 1928. Boring was chairman and behaviorism was derided or ignored.

Skinner found a sympathetic adviser in the Biology Department in the person of W. J. Crozier. Crozier was to Skinner as the biologist Jacques Loeb had been to Watson, a source of support for a biologically based psychology divorced from introspection. Crozier, like Loeb, was interested in the behavior of organisms as a whole in response to environmental forces. Crozier (and Skinner in turn) believed that he was studying *reflexes*. The status of the concept of the reflex was much more of an issue then than now, and Skinner plunged himself into the middle of it.

In 1896 John Dewey had written a remarkably prescient essay titled "The Reflex Arc Concept in Psychology." In that article Dewey had argued that the concept of the reflex as such had no meaning *within* an organism. Nervous connections in the brain and even at peripheral levels are so incredibly complex Dewey argued that nowhere in this network could one even conceivably identify coherent, self-contained, isolable structures (organs and suborgans) that could have *stimuli* leading to them and *responses* emanating from them. A whole organism, on the other hand, is indeed a coherent identifiable system that can have identifiable inputs (stimuli) and outputs (responses). The concept of a reflex is therefore applicable to whole organisms and not to parts of the nervous system. Dewey published his article in the *Psychological Review*, then as now very widely read by psychologists. But it had no effect on what was to become an overwhelming tide of reflex-based theories of the nervous system.

Watson's earlier behaviorism (derived from Loeb and possibly Dewey) reflected Dewey's attitude. Watson, however, fell under the influence of Pavlov, who in turn had been deeply influenced by Sechenov's *Reflexes of the Brain*, the very antithesis of Dewey's admonition to American psychologists. The behaviorists, Thorndike and after him Hull, were essentially followers of the Watson-Pavlov line. Thorndike's famous "law of effect" refers to the strengthening by reinforcement (or weakening by punishment) of the very "reflexes of the brain" that Sechenov was talking about. This issue is important in understanding Skinner because internal reflexes underlie the "S-R psychology" and the "theories of learning" from which Skinner was to take such pains to disassociate himself (often not successfully). Thorndike's internal connections and Hull's r_g–s_g connections are, Skinner argued, precomputer-age versions of the *internal repre-*

sentations of modern cognitive psychology. Skinner's very first publications, beginning with his thesis on "the concept of the reflex" and some of his more recent publications, "Why I Am Not a Cognitive Psychologist" (1977) and "Whatever Happened to Psychology as the Science of Behavior?" (1987), reiterate Dewey's argument. The recent computer-based "cognitive revolution" in psychology disturbed Skinner because he regarded it as a resurgence in a more complex guise of the S-R psychology he had originally fought so hard against.

Not that Skinner ever placed any faith in Dewey's philosophical argument. He does not indicate that he read it. (His book collection began with Bertrand Russell's *Philosophy*, Watson's *Behaviorism*, and Pavlov's *Conditioned Reflexes*.) Philosophy generally interested Skinner only when it seemed to confirm his already conceived ideas. He was much more inclined to accept the arguments of biologists and physiologists (like Pavlov) themselves; he was especially influenced by Sherrington, whose *Integrative Action of the Nervous System* Skinner bought while a graduate student: "I read it with enthusiasm. . . . This, I was sure, was the way to study behavior!" (*Shaping*, p. 17). Sherrington conceived of the nervous system as bringing into focus a diverse stimulus array in what he called a "final common path." Skinner's thesis analyzed available evidence to demonstrate that the focus of a reflex, its final common path, could not possibly be within the organism but must be at the boundary line between the organism and its environment. A reflex, Skinner argued, is thus not a neurological entity at all but a correlation between an environmental stimulus and the organism's *overt* behavior.

Although Skinner was furiously conducting experiments throughout graduate school and afterward as a National Research Council fellow and a junior fellow at Harvard, his

thesis was mostly theoretical. Nonexperimental theses were (and are) frowned upon by the psychology department, but it seems they didn't know what else to do with him.

In those days the premier tool for studying animal behavior was the maze. The first mazes used were the most complicated (the original was modeled after the famous Hampton Court shrubbery maze), but they had been getting simpler. But no maze was simple enough for Skinner: "I don't like the maze as a scientific instrument," he said. "The animal's behavior was composed of too many different 'reflexes' and should be taken apart for analysis" (*Shaping*, p. 32). Here are pieces of Skinner's description of a stage in the development of the Skinner box:

> I built a narrow rectangular track about three feet long, and mounted it like a seesaw: it tilted slightly as the rat ran from one end to the other [like a large lever that the rat walks on]. I made a food dispenser by drilling a ring of holes in a disk of wood. Pieces of food were put in the holes, and each time the rat ran around the track, the tilt turned the disk and dropped a piece into a cup. (*Shaping*, p. 56)

The Behavior of Organisms was published in 1938 after Skinner had married Yvonne (Eve) Blue and taken an assistant professorship at the University of Minnesota. It was there he first began to use pigeons as subjects. When World War II came, he designed a pigeon-operated guided missile (contemptuously rejected, although it worked). *Behavior of Organisms* sold slowly at first, although it was favorably reviewed and it gave Skinner a national reputation.

What was so remarkable about *The Behavior of Organisms*? Today it would be called, I suppose, a deconstruction of the concept of the reflex. In his thesis Skinner had argued that a reflex is a correlation between an external stimulus and an overt response. But what about the many cases where no external stimulus correlates with a given act—from playing

a flute to taking a job to going to the movies to virtually all of verbal behavior? These acts, normally classified as voluntary, seem to have no external origin. The standard answer, stemming from Descartes, is that their stimulus is *internal*. It comes from "the will." But Skinner had already argued that there are no internal events that could conceivably function as "stimuli." Skinner's solution was to claim that voluntary behavior is controlled not by antecedent stimuli at all but by environmental *consequences*. And to remove all reference to internal forces like the will, Skinner called these acts *operants*. At first Skinner conceived of an operant as merely another form of reflex. But soon he dropped the notion of reflex and began to speak of operant behavior as a function of an organism's *history of reinforcement*. If a person performs a given voluntary act—a woman goes to law school, for instance—Skinner looked to its cause and source of control, not within her, not in the structure or contents of her nervous system, but in her history of reinforcement. The important questions are: which of her past actions (verbal and otherwise) were rewarded, which punished, and when? No doubt a history of reinforcement is a theory just as a hypothetical mentalistic or cognitive or physiological system inside her would be a theory. But a history of reinforcement is a theory *not* about events in an inaccessible and unobservable *place* but about events in a possibly recoverable and repeatable *time*. *The Behavior of Organisms* contained not only this argument (revolutionary then and still startling in its implications when seriously held) but a series of experiments that demonstrated a hitherto unique degree of behavioral prediction and control.

On the basis of his book, Skinner won a Guggenheim Fellowship in 1944. He was then hired as chairman at Indiana University. At this point he began to attract students and followers, and it could be said that a Skinnerian school

was forming. After the war (1947), he went back to Harvard for a year as William James Lecturer. Evidently that was a sort of tryout since he was hired one year later as a professor. At Harvard he built "the pigeon lab," an automated laboratory where experiments were controlled by relay equipment (mostly telephone circuit equipment). In my day *all* psychology graduate students had to learn to construct a simple circuit and use it to "shape" a pigeon's peck at a translucent disk (a "key") by successive approximations. The tall vertical relay racks in the pigeon lab formed a sort of maze themselves. Dick Herrnstein, Skinner's successor as Edgar Pierce Professor and my own thesis adviser, tells the story of when as a graduate student he was standing in a corner of the pigeon lab practicing saying "Fred" instead of "Professor Skinner" when he heard "Yes, Dick" from another corner—and his problem was solved.

At Harvard, honors, awards, and honorary degrees came to Skinner. His name appeared on lists of best-known psychologists, best-known scientists, best-known Americans, best-known living people, best-known people of all time. But with this recognition came criticism, misunderstanding, and vituperation to a degree unusual for a scientist and from sources usually less violent. Some people, with a gift for quick intimacy, might have broken through the glass wall that this sort of fame can build around its object. But Fred Skinner, son of "bumpy" Will Skinner, succeeded only fitfully. In my own contact with him, sadly, the wall stood. There were several points at which it might have been breached. One of them was when I had just become an assistant professor at Harvard and Skinner had just retired from teaching. He would have been willing to conduct a small graduate seminar provided I would nominally teach the course and handle the grading and other administrative affairs. When you become an assistant professor in the

same department where you were a graduate student, people tend to treat you like a graduate student. This plus my own lack of confidence resulted in an abnormal and largely self-defeating concern about status. I had written to the dean formally canceling one of my classes in retaliation for a parking ticket and now I indignantly refused to act as Skinner's TA. As I look back on the incident I see it as an attempt by Skinner to form a closer relationship with a colleague. Had he even implied such an intention I would have jumped at the chance, but I was too immature and Skinner was too "bumpy." His request to me was conveyed formally through the department chairman—and so the course was not taught.

Among his peers Skinner's very clarity worked against him. He was seen by romantics as a sort of Frankenstein meddling in mysteries better left untouched. The linguist Noam Chomsky's famous criticism of Skinner's book *Verbal Behavior* (1957) seems from the present perspective to have missed the point. It is a complaint by a Cartesian structuralist against a pragmatic functionalist, nothing more.

What then is Skinner's lasting contribution? Not, I think, his utopian vision of a self-experimental society, nor the educational technology, nor a highly successful mode of psychological therapy based on behavioral consequences, nor the Skinner box and a host of other useful inventions, nor his contribution to pharmacological testing, nor the journals and societies based on his work, nor the individuals he has influenced, nor the fact that he has put his stamp indelibly on the face of American psychology, although all of these flow from his central conception. That conception and Skinner's most lasting contribution is in my opinion more philosophical than psychological. It is nothing less than a new way to look at life; in other words (words to

which he would strenuously object), a new way to conceive of the soul.

But I should not call his vision of the soul entirely new. The ancient Greeks, Aristotle in particular, conceived of souls as modes of living, as patterns of overt behavior of organisms, more or less complicated depending on species and individuals within species. Psychology for them was the identification and manipulation (the prediction and control) of these patterns of behavior, including one's own. To Skinner we owe the renaissance of this conception.

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