B. F. SKINNER
(1904-1990)

Louis M. Smith

Skinner is the most important American psychologist of the twentieth century, and arguably the most important world psychologist since, or including, Freud. His first book, *The behavior of organisms* (1938), was a major tour de force and staked out a claim for a new wave of behaviourism. The next half-century saw his position developed, elaborated, criticized and further elaborated. No issue seemed too large or too small for his observant eye and his analytic insights.

Becoming a psychologist

If one were to follow Skinner's own admonitions, a personal history analysis would be necessary to capture his 'becoming a psychologist'. His decision to study psychology resulted from an unusual and idiosyncratic set of circumstances.

Burrhus Frederic Skinner was born in the small town of Susquehanna, Pennsylvania. He graduated from Hamilton College with a major in literature. He spent his immediate postgraduate year trying to become a writer. It was a time of frustration and failure; he found that he had nothing of significance to say.

As he recounted in his autobiographical *Particulars of my life*: 'I had apparently failed as a writer, but was it not possible that literature had failed me as a method?' (Skinner, 1976*b*, p. 291).

I was foundering in a stormy sea and perilously close to drowning, but help was on the way. The *Dial* [a magazine he had long read] published some articles by Bertrand Russell which led me to his book *Philosophy*, published in 1927, in which he devoted a good deal of time to John B. Watson's behaviorism and its epistemological implications (ibid., p. 298).

Soon he was reading Watson and Jacques Loeb and critiqueing a book by Berman, *The religion called behaviorism*. The *Saturday review of literature* did not publish his book critique, 'but in writing it I was more or less defining myself for the first time as a behaviorist' (ibid., p. 299). After a series of conversations with faculty friends from Hamilton, he applied and was accepted as a Ph.D. student at Harvard University for the autumn of 1928.

The dramatic move from literature to behavioural psychology without ever having taken a psychology course might be perceived as a conversion experience. One might argue that Skinner was operating on limited data for an intellectual move that was to last for the remainder of his life—over fifty years. Something about the Russell and Watson books hit a responsive chord in his late adolescent perspective. A world-view was in the making even before the substantive theory, the world of operants, respondents, reinforcers and discriminative stimuli were discovered or constructed. It seems that Skinner's personal experience had more to do with his choice than with his considered professional experience and judgement.

The social environment, culminating in the overcoming of the Great Depression of the

1930s and winning the good war of the 1940s, changed significantly in the post-war years. Skinner wrote: 'Behaviourism appealed to me because I believed, with Watson, that a better knowledge of human behaviour would help solve our problems.'

Skinner's American small-town world before the experience of the First World War left him with a not uncommon belief in 'progress'. That disposition provided fertile soil for a theoretical position: that of behaviourism.

The world-view

The scope and particulars of Skinner's creative ideas are numerous and scattered throughout his lifetime. These ideas have their antecedents in Pavlov, Thorndike and Watson. Skinner carried the ideas to new levels of differentiation, generality and integration. His thought seemed always to express a practical, applied and technical side. Education, broadly defined, occupied him through such varied activities as designs for a baby's crib, teaching machines and programmed learning. Another cluster of ideas was derived from his creativity, inventiveness and skill as an experimental scientist.

In his early book *The behavior of organisms* (1938), the brilliance and range—and a kind of simplicity as well—of Skinner's efforts were apparent. The first chapter laid out the scope of the effort. His was to be a psychology of *all* organisms—from protozoa to human beings. At one stroke he undercut all the concerns with human beings as a special case in psychology. His white rats would represent and symbolize all organisms. And the focus was now an intact organism living in an environment, not a segmented set of dimensions nor an inferential neurological system, nor a 'mind' or other inner states—ego, id or superego. Behaviour, that is to say what organisms visibly do, defined the subject matter. And within behaviour, at least for this first book, the challenge was to typify *all* voluntary behaviour. If he could predict and control that, he had a grip on the universe. The 'Skinner Box', a small box-like apparatus under the experimenter's control, represented *all* environments, the collection of stimuli impacting on the organism. Through the experimental method, the box and the white rat—with the experimental psychologist in control—could create a database and thus a theoretical point of view.

Skinner's view of the history of science, with special relevance to human beings, appears in several places in his writing. One of the most dramatic comments occurs in the first chapter of *Science and human behavior* (1953), his general text written for the undergraduate course he taught at Harvard—Natural Science 114.

Primitive beliefs about man and his place in nature are usually flattering. It has been the unfortunate responsibility of science to paint more realistic pictures. The Copernican theory of the solar system displaced man from his pre-eminent position at the center of things. Today we accept this theory without emotion, but originally it met with enormous resistance. Darwin challenged a practice of segregation in which man set himself firmly apart from the animals, and the bitter struggle which arose is not yet ended. But though Darwin put man in his biological place, he did not deny him a possible position as master. Special faculties or a special capacity for spontaneous, creative action might have emerged in the process of evolution. When that distinction is now questioned, a new threat arises (Skinner, 1953, p. 7).

It does not require a long stretch of the imagination to see Skinner posing himself and his theory of behaviourism in that sequence.

The general text of *Science and human behavior* extends animal data by extrapolation to all aspects of the human being. Its 450 pages and twenty-nine chapters fall into six sections: (a) the possibility of a science of human behaviour; (b) the analysis of behaviour; (c) the individual as a whole (with chapters on self-control, thinking and the self); (d) the behaviour of people in groups; (e) controlling agencies (with chapters on government and law, religion, psychotherapy, economic

control and education); and (f) the control of human behaviour (with chapters on culture and control, designing a culture and the problem of control). No issue was too large or too small for his consideration. His was a world-view, and one that could not be ignored by any psychologist—nor by more broadly-based intellectuals from other disciplines and domains.

Shortly after the Second World War, Skinner took up the issue of utopia, the good society, in his *Walden Two* (1948). It was one of those books that sold slowly at first, then generated considerable controversy, caught the wave of social conflict in the 1960s and, by the mid-1980s, had sold over 2 million copies. For a young man who spent a post-college year (1929) trying to be a writer but found he had nothing to say, it was a huge success. Now he had much to say—and many readers who wanted to hear the message.

In this utopian novel, a returning serviceman calls on his old professor, aptly named Professor Burris, and raises an old idea from an earlier university course.

'What we don't see, sir, is why we have to take up where we left off. Why isn't this a good time to get a fresh start? From the very beginning. Why not get some people together and set up a social system somewhere that will really work? There are a lot of things about the way we're all living now that are completely insane—as you used to say. . . . Why can't we do something about it? Why can't we go on doing something about it?' (Skinner, 1948, p. 3).

In the novel, another former student, also aptly named—Frazier—has not only started a community, but has written an article about it. As Skinner's alter ego, able to say things that Skinner was not yet willing at that time to say for himself, he also carries some of Skinner's other 'virtues'.

Later in the book, after a long trip through the possibilities of a technology of behaviour applied to the design of a community—from child-rearing to schooling and from family life to community organization—Skinner gave Frazier one of the most important lines in his own evolving point of view.

'Walden Two didn't require genius! I have only one important characteristic, Burris: I am stubborn. I've had only one idea in my life—a true idée fixe.'
'What idea is that?'
'To put it as bluntly as possible—the idea of having my own way. "Control" expresses it, I think. The control of human behaviour, Burris. In my early experimental days it was a frenzied, selfish desire to dominate. I remember the rage I used to feel when predictions went awry. I could have shouted at the subjects of my experiments, "Behave, damn you! Behave as you ought!" Eventually I realized that the subjects were always right. They always behaved as they should have behaved. It was I who was wrong. I had made a bad prediction' (Skinner, 1948, p. 240).

It is interesting to speculate on what the 'subjects' might have said about Frazier's intellectual and emotional behaviour. Was he too behaving as he ought, caught up in his own deterministic system? *Walden Two* remains one of the most powerful statements ever offered by a psychologist.

Real-life applications

Skinner was not only an experimentalist and a utopian. Many of his ideas were translated into practical applications and these were reported in speeches and articles. Several were brought together into the several editions of *Cumulative record* (1959, 1961, 1972). Intellectually, these applications were held together as part of a diverging intellectual strand. In several places in his autobiographical statements, Skinner comments that he is a 'Baconian' scientist: 'I have "studied nature not books"', and 'I get my books out of life, not out of other books' (Skinner, 1967, p. 409).

In the mid-1940s, with the birth of his second child, Skinner turned his attention to the behavioural engineering task of improving the infant's environment and the mother's mental health

with the invention of an 'air crib', described in the *Ladies Home Journal* as a 'baby in a box'. Applying what might be called vintage Skinnerian thinking, he commented:

We began by going over the disheartening schedule of the young mother, step by step. We asked only one question: Is this practice important for the physical and psychological health of the baby? When it was not, we marked it for elimination. Then the 'gadgeteering' began (Skinner, 1972, p. 567).

Skinner attended to problems of warmth and freedom of movement of the infant by installing temperature controls in the air crib. Except for a diaper, the child played free of clothes, rashes and sores, with minimal crying and fussing. The filtered air going into the compartment eliminated many minor health problems. The 'mattress cover' was initially a simple roller-towel arrangement which could be changed by drawing new toweling through. Daily routines for child and mother were possible in the nearly soundproof environment of the crib. 'The compartment does not ostracize the baby. The large window is no more of a social barrier than the bars of a crib' (Skinner, 1961, p. 425). In addition to the health and happiness of the child and the mother in this particular situation, and the need to try out the crib with other children and mothers, one is left with the thought: what about other kinds of child behaviour and helping parents to cope?

Skinner makes an important concluding theoretical point: 'One case is enough, however, to disprove the flat assertion that it can't be done' (ibid., p. 426). In a way Skinner was questioning much of traditional psychological research methodology.

In a delightful address to the American Psychological Association in 1959 Skinner presented 'Pigeons in a pelican', his study using pigeons as 'organic control' mechanisms for guided missiles in the context of the Second World War and the devastation of Europe by Hitler's armies. Working in his laboratory at the University of Minnesota and with space, facilities and engineers at General Mills Corporation, Skinner attacked the problems of training pigeons for this task. The accompanying hardware was developed with the help of engineers. Through careful training, pigeons learned to track silhouettes of ships and peck at the image. These continuing pecks produced signals for small motors which controlled the flight apparatus of the missile. The pigeons were eminently successful. Skinner had less success with physicists, mathematicians and generals who thought it a crackpot idea, even after observing it in action accomplishing everything Skinner claimed for it. *Walden Two* was written during the next year after the pigeon project was ended.

At the time, Skinner had returned to Harvard University and had begun teaching a course in 'Human behaviour'. The students called the course 'Pigeons', for the good reason that it dealt mainly with experiments and data from studies of pigeons. In Skinner's words, 'I talked about people with principles derived from pigeons' (1983, p. 26). He was constructing a point of view which took great leaps from his experimental data into stories and problems about the human condition. He based his efforts on the following rationale:

My treatment of human behavior was largely an interpretation, not a report of experimental data. Interpretation was a common scientific practice, but scientific methodologists had paid little attention to it (ibid., p. 27).

Skinner continued: 'I chose examples of behavioral processes from history and literature' (ibid.). These included references to superstition, to aversive conditioning and response generalization. He was constructing a human world-view by extrapolating from his behavioural concepts to vivid literary illustrations. The human world was understandable—reducible?—to his more 'fundamental' concepts. And that is part of the power of any science.

Skinner on education

Skinner tells stories about each of his major intellectual efforts in his 1,000-page, three-volume

autobiography (1976*b*, 1979, 1983). In the third volume, after a brief account of his own education and some of the contrasts raised in *Walden Two*, Skinner presents several paragraphs regarding his daughters' educational experiences. He was disturbed by the amount of homework required of his older daughter and wrote to the school director. Then he commented about a significant day:

On November 11, 1953 I made a positive move. It was Father's Day at Shady Hill, and with a few other fathers I sat in the rear of Debbie's fourth-grade arithmetic class. The students were at their desks solving a problem written on the blackboard. The teacher walked down the aisles, looking at their work, pointing to a mistake here and there. A few students soon finished and were impatiently idle. Others, with growing frustration, strained. Eventually the papers were collected to be taken home, graded, and returned the next day (1983, p. 64).

In the best tradition of interpretative asides in qualitative research, Skinner commented further:

I suddenly realized that something had to be done. Possibly through no fault of her own, the teacher was violating two fundamental principles: the students were not being told at once whether their work was right or wrong (a corrected paper seen twenty-four hours later could not act as a reinforcer), and they were all moving at the same pace, regardless of preparation or ability (ibid.).

After a comment or two, he states: 'A few days later, I built a teaching machine' (ibid., p. 65). Seeing the issue as one of contingencies of reinforcement and the means of presenting the reinforcements, Skinner began the teaching-machine movement, and programmed learning was soon to follow. At the time, he makes an important choice of words as he describes the student's behaviour: 'The student composes rather than selects the answers' (ibid.).

The story is, in fact, more complicated than this because he had made earlier attempts to mechanize his laboratory equipment so that the research would be more efficient. There were also other antecedents: lawyers and patents, philosophical critiques from Max Black and Israel Scheffler, correspondence with Sidney Pressey, and reprints from Pressey's work in the 1920s and 1930s on an early form of apparatus for testing and teaching.

Skinner had the ability to observe behaviour in complex natural settings, immediately seeing the relevance of major concepts and principles from his theoretical position, and then to devise and build technological equipment to remedy the situation. Any social scientist would envy his 'eye', his 'creativity', his 'grounded theory' and his qualitative action research.

But Skinner was not only 'hi-tech'. In one of his most delightful essays, 'How to teach animals', Skinner described how to turn a child's toy—a cricket or metal snapper which gives a high-pitched sound—into a conditioned reinforcer by pairing it with the presentation of small pieces of food to a hungry animal, a pet dog for instance. Once that relationship is established, then the reinforcement can be given immediately (less than one second for full power of effect) to any behaviour that one wants the animal to learn. One can teach the animal to attend to the cupboard, to walk with a raised head, or if one prefers more 'intellectual' behaviour, the animal, such as a pigeon, can be taught to read, that is, it pecks when presented with a 'peck' card and does not peck when presented with a 'do not peck' card. Playing short tunes on a piano and playing modified ping-pong are also within the learning range of a pigeon. Without missing a beat, as it were, Skinner hinted at extrapolations to young children who do or do not do what their parents want or do not want—'annoying behaviour'. Careful observation makes clear the reinforcing contingencies operating in the parent's behaviour and the simple changes that can be introduced to get the desired responses.

Concomitantly, the technological successes, like everything he touched, came with a series of essays, and later became the book *The technology of teaching* (1968), which brought his theoretical perspective to the classical problems of teaching and learning. In the initial chapter, 'The etymology of teaching', he analyzed the great metaphors that have been developed to account for the changes from an uneducated individual to an educated individual. In the final chapter, 'The

behaviour of the establishment', he discussed aspects of school organization and administration. In between, he took up 'The science of learning and the art of teaching', 'The technology of teaching', 'Motivation, creativity, discipline and self-control'. To each of these topics he brought his mode of thinking—what is it that the individual must 'do' to qualify as being motivated, self-controlled and creative, and then what is it that the teacher-experimenter must do to make those end behaviours more probable? All in all, it was a major work on educational psychology for teachers.

If one removes the cant and the stereotyped images of Skinner, the master-experimenter with his 'boxes' and his white rats and his pigeons, and if one adopts the stance and perspective of a qualitative action researcher seeking to improve his own teaching and his student's learning, one discovers a fellow teacher working on a difficult practical problem, inventing creative tactics, and then trying to conceptualize what one is trying to do. Consider the following descriptive account from *A matter of consequencies*:

One could teach high-jumping simply by raising the bar a millimeter after each successful jump, and I had once programmed a bit of verbal behavior in essentially that way when Debbie [his daughter] brought home a worksheet in arithmetic. There were twenty or thirty problems designed to teach the equivalence of different expressions for the same operation. Debbie was to add, for example, when she saw 'the sum of ... and ...', or '... plus ...' or '... added to ...'.But the blanks contained two- or three-digit numbers, and in her concern for correct calculation, she was *missing the point* about equivalence. I wrote the expressions on a sheet of paper in ink and inserted the figures 2 and 3 in the blanks in pencil. Debbie had no trouble with 'the sum of 2 and 3', '2 plus 3', or '2 added to 3'. She obviously knew what the expressions meant. Then I erased the numbers and put in slightly larger ones, and again she had no trouble. After two or three revisions, she did the original sheet effortlessly (1983, p. 95) [Emphasis added].

'Missing the point' is a phrase that any teacher might use. The teacher translates that into a behaviouristic scheme and devises tactics to correct the situation—and the 'misunderstanding'.

Hardly pausing for breath, Skinner then offered other examples and introduced an array of concepts useful for a teacher thinking about helping students learn: models, shaping, priming, prompting, vanishing and fading. If a teacher already has a broad range of teaching strategies and tactics, then he/she will always be on the look-out for additional elements to add to the intellectual and practical repertory. Skinner seems to provide those additions as creatively as any teacher.

Another example comes from Epstein's (1980) edited volume of Skinner's notebooks. Each excerpt has a brief title and the time of writing is unfortunately only partially clarified since Skinner wrote, edited and rewrote many of the notes. Consequently it is difficult to trace the development of his thinking over time. Consider one of the more provocative notes entitled 'When does helping help?':

Watching myself with Lisa, I have been more impressed by this point. In my concern for helping a child, I destroy the contingencies which would teach her to save herself. For example, I push branches aside which are getting against her face and deprive her of the chance to learn to avoid branches. I pull on a sock and deprive her of the chance to learn to do it herself (Epstein, 1980, p. 12).

Other major works

For over two decades Skinner worked on his *Verbal behavior* (1957). In a fundamental sense, it was an intensive analysis of 'man thinking' and social behaviour. It extended his behaviourist position to the most difficult domains of human activity and aroused considerable controversy.

His *Beyond freedom and dignity* (1971) continued and solidified the arguments begun in *Walden Two* and *Science and human behavior* on human nature, the technology of behaviour and the design of cultures. Essentially, he asked questions regarding the achieving of balance in the dilemma between the values of freedom and dignity, on the one hand, and cultural survival on the other. He opted for the latter in the face of the population explosion, the possibility of a nuclear

holocaust, world famine and global pollution. Solutions exist in 'vast changes in human behaviour' to be brought about by 'a technology of behaviour'. It is an intriguing extension of his earlier intriguing arguments.

In his *About behaviorism* (1976*a*), Skinner rewrote much of his early general text for an intellectual but non-technical audience. The book begins with twenty broad and common generalizations about behaviourism which he believed to be false (pp. 4-5). Generalization No. 1: 'It [behaviourism] ignores consciousness, feelings, and states of mind'. Number 10: 'It works with animals, particularly with white rats, but not with people, and its picture of human behaviour is therefore confined to those features which human beings share with animals'. And No. 20: 'It is indifferent to the warmth and richness of human life, and it is incompatible with the creation and enjoyment of art, music, and literature and with love for one's fellow men'. The book takes up his position regarding these 'false claims'.

Critics and criticism

All in all, his is an impressive record. One needs to think historically of Wilhelm Wundt, William James and Sigmund Freud to find a psychologist who was as influential, not only in the domain of psychology but in the general intellectual world.

However, the kind of criticism one provokes attests to the quality and the importance of one's thought. A half-dozen major critiques have been launched about one aspect or another of Skinner's thought. The English magazine *Punch* did a one-page satire on teaching machines and programmed learning (see below). Joseph Wood Krutch, the distinguished literary critic of Columbia University, wrote a critique of *Walden Two*, calling it an 'ignoble Utopia', in *The measure of man* (1953). Michael Scriven (1956) read his 'A study of radical behaviorism' at a Minnesota philosophy of science symposium. Noam Chomsky (1959) of the Massachusetts Institute of Technology published a long linguistic criticism of Skinner's *Verbal behavior* in *Language*. Carl Rogers, the creator of non-directive counseling and client-centered therapy, debated with Skinner on issues of freedom and control in human behaviour and action. By any intellectual standard, that is an impressive array of individuals who took Skinner seriously enough to joust with him. Further, such commentary suggests another facet of his influence on the intellectual life of the twentieth century.

The brief satirical piece in *Punch* (Heathorn, 1962) was not directed specifically at Skinner; it was rather a commentary on teaching machines which were being touted as a solution to problems of education and learning. It depicted a new, almost magical device called 'Built-in Orderly Organized Knowledge', known by the acronym 'B.O.O.K.'. It contained no wires, no electrical circuits or mechanical parts to break down. It would fit easily in the hands of children or adults and 'can be conveniently used sitting in an armchair by the fire'. It had remarkable features: a number of sheets of paper, each identified by numbers in sequence so that they could not be used in the wrong order, a lock-in device called a binding to keep them in order, and even accessories such as 'BOOKmark' to pick up the programme where the learner left off at the prior session. This spoof lays stress on the power of the earlier Gutenberg innovation, and looks critically at the sense of innovations and the logical rationales presented. It is clever enough to make one wonder now whether the computer will contain the power to supplant B.O.O.K. The point here is simpler, that the technology fostered by B. F. Skinner was conspicuous enough to draw comment from the well-known British humour magazine.

Conclusions

A kind of absurdity exists in trying to write, much less to sum up a life as creative and brilliant as B.

F. Skinner's eight decades. But, from this brief profile, several general comments seem warranted.

As much, and usually more, than any psychologist of the twentieth century, Skinner attacked intellectually the totality of the world of the behaviour of living organisms. Though much of his experimental work involved 'white rats and pigeons', they served, for him, only as examples of the totality of living individuals, including human beings. A comprehensive world view was both his goal and his accomplishment. His view was highly contested by both the scientific community of psychology and the larger world of intellectuals and informed citizens.

The world-view was also a way of thinking, a kind of generalized problem-solving. He was both a realist and a determinist in that he assumed there was a world out there and that it had a lawful order waiting to be discovered. And once that order was discovered, it could be put to the useful purpose of improving the human condition. A basic premise is that the environment of the individual—the stimulus conditions—were the ultimate controllers of an individual's behaviour. Perhaps most controversial, both internally to the consistency of his own point of view and externally in debate with other psychologists and scholars, was the role of the 'self' in these discussions and debates. At times he eschewed any notion of personality structures or habit systems, believing only in the environment—fractured into stimuli—and in behaviour analyzed into responses. At other times, from early discussions in *Science and human behavior* (1953) to later ones in 'behavioural self-management' in *Upon further reflection* (1987), an individual's ability to monitor himself was of major significance.

In his mode of analysis employed in the 'baby in a box'; his technical achievements and interpersonal frustrations in 'pigeon in a pelican'; his case study of scientific method; his concerns over the instruction in mathematics his daughter and classmates were receiving and his design of alternative methods; his concerns about managing himself and continuing his intellectual life in his later, post-retirement years—these all show him at his creative, and often humorous, best. He seemed to be saying: What is going on here? What are we trying to achieve? And what is a more sensible and humane way of doing what we want to do? All this was imbued with his conception of behaviouristic psychology.

Stated in perhaps more elegant form is Dews' (1970) summary comment in the 'Preface' to the Skinner *Festschrift* volume.

Most men who have profoundly assisted the development of science have required four types of skills. First, the ability to recognize and to define important problems susceptible to scientific elucidation, and to define them clearly; that is, to see distant goals clearly and to formulate strategy. Second, the tactical ability to conceive and conduct experiments sufficiently limited in scope to be rigorous, but advancing science according to the general strategy. Third, the innovative ingenuity and technical skill needed for the actual conduct of elegant experiments. Fourth, the ability to see how the results of experiments contribute to understanding, and to use the results to guide future experiments. [. . .] Skinner has all four skills in unusual measure (1970, p. ix).

Although Skinner never addressed the approach that has come to be known as 'the reflective practitioner', and he, and individuals from that perspective, might want to disavow such a membership, he is an example *par excellence*.

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