

## THE MODERN/POSTMODERN CONTEXT OF SKINNER'S SELECTIONIST TURN IN 1945

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**ABSTRACT:** Although culturally prominent modernist influences account for much of Skinner's early behaviorism, the subsequent changes in his views are appropriately considered as postmodern and are indebted to other sources. These changes are strikingly apparent in his 1945 publication, "The Operational Analysis of Psychological Terms." In that publication, Skinner introduced a probabilistic three-term contingency for verbal behavior with an expanded contextualism and an increased emphasis on consequences with a clear alignment to pragmatism. Instead of reaffirming the mechanistic and necessitarian values of modernism that he had previously embraced, Skinner was aligning himself with the postmodern values of pragmatism and selectionism.

*Key words:* B.F. Skinner, Charles S. Peirce, modernism, postmodernism, pragmatism, selectionism, three-term contingency.

Philosophical modernism and literary modernism contributed to Skinner's early behaviorism, which was largely in the modernist tradition. In "The Operational Analysis of Psychological Terms," however, Skinner (1945/1972) turned to a selectionist view of behavior that belonged to a different tradition. Skinner did not acknowledge sources for these changes. But modernists such as Rudolph Carnap and Bertrand Russell, who reflected positivist views, were less favorably referred to and Skinner's views became more closely aligned with the selectionist views of Charles Darwin and C. S. Peirce. Skinner (1981) spoke of the importance of cultural selection, and he himself was the product of a selected set of cultural influences in his early years, which were sometimes self-described by their representatives as modern or modernist. Later cultural influences on Skinner, reflecting a different set of values, have been described as *selectionist* and may be included within postmodern designations. The following presents Skinner's 1945 views within these cultural contexts and makes the case for his turn away from the positivist views of modernism and toward selectionist ones. Although similar issues on Skinner's new views in 1945 have been addressed elsewhere (Moxley, 2001), this paper considerably expands the context for those views, particularly by presenting their modern/postmodern background and carries that theme through to the bare core of some common quotations. Skinner's work should then be seen as a rather remarkable confrontation of modern/postmodern issues.

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## Modernism

Many modernist positions were excessive in promise. Modernist architecture professed to be “a truly functional architecture” (cited in Janick & Toulmin, 1973, p. 252), but many of its forms were purely decorative: “[T]he outcome of this development was a stylized mode of design whose operative principles were almost exclusively *structural*, rather than functional” (Janick & Toulmin, 1973, p. 253) and, “The true aim of the style had clearly been, to quote Gropius’s words about the Bauhaus and its relation to the Machine Age . . . ‘to invent and create forms symbolizing that world’” (Banham, 1967, p. 321). We should consider then the extent to which the claims of modernism in general were symbolic and rhetorical rather than substantive. For Toulmin (1990, pp. 104 & 174), distinctively modernist claims are symbolic of a wished-for state-of-affairs.

For the beginnings of modernism, Toulmin (1990, pp. 5-22) suggested the 17th Century and the conspicuous influence of Descartes. Alternatively, Brosterman (1997, p. 6) designated the early part of the 20th Century as the period of “modernism,” and modernism, from whichever time it is started, arguably achieved its most sweeping extent in this latter span of time. Different modernisms may be distinguished for different subject areas—for example, architecture, literature, painting, politics, philosophy, and science (cf., Best & Kellner, 1997, p. 18; Frankle, 1928), and various terms—for example, *reactionary modernism*, *romantic modernism*, *antimodernism*, and *fascist modernism*—have distinguished different modernisms and responses to modernism (cf. Dasenbrook, 1992; Herf, 1984; Habermas, 1981; Wolin, 1993). The issues in modernism and responses to it have also been addressed without specific reference to modernism as a term or to postmodernism as a contrasting term for responses to it (e.g. Eiseley, 1979). Some features of modernism cut across different areas. Among modernist characteristics of artistic design, Frankl (1928) listed “The accentuation of structural necessity” and the desire to achieve simplicity by “the elimination of useless detail” (p. 57), features which were also evident in philosophy and literature. Other features were seen as more characteristic of a particular area if not confined to it. In philosophy, Toulmin (1990) said, “All the protagonists of modern philosophy promoted theory, devalued practice, and insisted equally on the need to find foundations for knowledge that were clear, distinct, and certain” (p. 70). Even if that certainty was an elusive ideal, threats to it could be avoided, and probability, contexts, and consequences were all seen as threats to a fixed and exact certainty.

### *Modernist Disapproval of Probability*

For a long time probability was not a name in good standing because truth was thought to require exactness (cf. Hacking 1975, 1987), and this position was tied to theology (e.g., Huxley, 1886/1929). The pragmatist Sidgwick (1901) commented on the contrast “between the older and the newer view of the task of science generally—between the ideal of ‘reaching certainty’ and that of gradually improving a system of knowledge which ever remains improvable,” with the older

## THE MODERN/POSTMODERN CONTEXT

view defended by the assumption that “there is no conceivable middle ground between a system of truth built upon undeniable axioms, and on the other hand perfect anarchy” (pp. 331-332). To the extent that certainty was thought to have already been achieved in the sciences, there seemed little reason to settle for less: “Now there do exist among us doctrines of solid and acknowledged certainty, and truths of which the discovery has been received with universal applause. These constitute what we commonly term Sciences . . . bodies of exact and enduring knowledge” (Whewell, 1847/1984, p. 124). T. H. Huxley (1886/1929; also cf. Frege, 1884/1980) accepted no middle ground between certainty and chance and argued that belief in an omniscient deity demanded a belief in determinism and the rejection of chance:

[I]f physical science, in strengthening our belief in the universality of causation and abolishing chance as an absurdity, leads to the conclusions of determinism, it does not more than follow the track of consistent and logical thinkers in philosophy and theology. . . . Whoever accepts the existence of an omniscient Deity as a dogma of theology, affirms that the order of things is fixed from eternity to eternity; for the fore-knowledge of an occurrence means that the occurrence will certainly happen; and the certainty of an event happening is what is meant by its being fixed or fated. (pp. 141-142)

Huxley (p. 144) appealed to Jonathan Edwards (also cf. Bacon, 1641/1996, p. 108) in support of the theology-determinism connection, as did Skinner (1983/1984, p. 403). Popper (1995) held that “Up to about 1927 physicists, with few exceptions, believed that the world was a huge and highly precise clockwork. . . . Few philosophers, with the great exception of Peirce, dared to dispute this deterministic view” (p. 7). Such opposition indicates why probability “took a very long time to emerge as a branch of quantitative study” (Barrow, 2000, p. 120; cf. Hacking, 1975). It wasn’t until “the 1890s [that] we find the first serious philosophical statement of modern indeterminism. The author was the cantankerous C. S. Peirce, and at first hardly anyone took him very seriously” (Hacking, 1975, p. 53). Modernists like Russell (1935/1941, p. 79), however, continued to find no middle ground between “unreason” in which “a solution of our troubles can only be reached by chance” and “rationality, in the sense of an appeal to a universal and impersonal standard of truth” (p. 79). For modernists, the use of probability was a confession of ignorance. The true explanation was deterministic and exact.

### ***Modernist Antipathy Toward Contexts***

Toulmin (1990) found, “[O]ne aim of 17th-century philosophers was to frame all their questions in terms that rendered them *independent of context*” (p. 21). This decontextualism or reductionism involved not only abstraction from a specific external context but also abstraction from the internal context of the particulars of events. For D’Alembert (1751/1995),

The most abstract notions . . . are often the ones which bring with them a greater illumination. Our ideas become increasingly obscure as we examine more and

## MOXLEY

more sensible properties in an object. . . . The universe . . . would only be one fact and one great truth for whoever knew how to embrace it from a single point of view. (pp. 27-29)

The fewer the sensible properties, the greater the clarity. Satirizing this view, an Aldous Huxley (1922/1939) character said:

He's getting more and more abstract every day. He'd given up the third dimension when I was there and was just thinking of giving up the second. Soon, he says, there'll be just the blank canvas. That's the logical conclusion. Complete abstraction. (p. 55)

The limits of abstraction in painting continue to be of interest. A white painting with some nonrepresentational white lines on a white background was the subject of Reza's (1988/1996) play *Art* (also cf. Branden, 2000).

The view of an underlying abstract, geometric reality also lay at the heart of Froebel's kindergarten program. Froebel studied crystallography as an assistant at the Mineralogical Museum of the University of Berlin before transferring its systematic geometric analysis to the education of young children. Crystallography and the development of atomic theory supported the view "that the world was made from tiny particles and all things under the sun were created from different combinations of the same basic units" (Brosterman, 1997, p. 22). In a series of prescribed activities, Kindergarten children were trained to see all of nature as a design from basic geometric units: "[P]erforating, the first of Froebel's occupations, was concerned with the point. It was the end of the logical sequence that began with volumes in space, systematically deconstructed . . . into planes and lines, and finally . . . pinholes on white paper" (p. 74). With the help of overlaying guides, anything pictureable could be constructed from "insubstantial pinholes." Froebel's kindergartens indicate the pervasiveness of cultural influences favoring the "abstraction of reality to its essence" (p. 122).

### ***Modernist Difficulties With Consequences***

Arguments from consequences to a hypothesis that would explain the consequences have been termed the fallacy of affirming the consequent. This fallacy is problematic in a syllogism with necessary if-then connections or when it is offered as conclusive proof for a specific instance. Arguments in terms of consequences were called teleological and accused of reversing time on the faulty analogy that syllogisms necessarily implied a sequence in time and affirming the consequent reversed this sequence (cf. Campbell, 1990, p. 4). Teleology and arguments in terms of consequences were heavily criticized even when the arguments were from past consequences, were not in syllogistic form, no time reversal was implicated, and no illogical conclusions were affirmed. *Teleology* and *final causes* were condemned terms regardless of their context (cf. Moxley, 1991, 1995).

### Philosophical Sources for Skinner's Modernist Views

The modernist quest for certainty is illustrated in Carnap's (1963) comments on *The Logical Structure of the World* in which he recalled the early assumptions of logical positivism:

We assumed that there was a certain rock bottom of knowledge, the knowledge of the immediately given, which was indubitable. Every other kind of knowledge was supposed to be firmly supported by this basis and therefore likewise decidable with certainty. (p. 57)

This view had philosophical support beyond the Vienna Circle: “[I]t was supported by the influence of Mach’s doctrine of the sensations as the elements of all knowledge, by Russell’s logical atomism, and finally by Wittgenstein’s thesis that all propositions are truth-functions of the elementary propositions” (p. 57), and it had affinities to a broader cultural context. Carnap (1929/1967) noted: “[T]here is an inner kinship between the attitude on which our philosophical work is founded and the intellectual attitude which presently manifests itself in entirely different walks of life; we feel this orientation in artistic movements, especially in architecture. . . .” (p. xviii; also cf. Galison, 1990, p. 738). A sharing of simplified geometrical relations between architecture and philosophy is also evident in Wittgenstein’s design for his sister’s house. The austere severity of the repetitive, narrow, vertical rectangles in that design (cf. Leitner, 1995)—like imprisoning bars—invites comparison with Wittgenstein’s early philosophy of logically-related elements in the *Tractatus* (Wittgenstein, 1922/1981; also cf. Janick & Toulmin, 1973). An assumed affinity was also extended to behaviorism. Identifying the unified science advanced by the Vienna circle as *physicalism*, a leading member of that circle Otto Neurath (1931/1983) saw physicalists as widely involved in purging the sciences of metaphysical tendencies and said, “In the field of psychology, the physicalists are closely allied with Watson and his behaviorists. . . .” (p. 50). Although Neurath (1936/1983, p. 164) later qualified that statement, Russell (1919) thought that Watson’s behaviorism might provide the basis for the kind of language and meaning that modernists were looking for.

In order to advance their quest for certainty, many modernists sought a universal, ideal, or perfect language in which each word would have one and only one true meaning, its essential meaning (Eco, 1997; Toulmin, 2001, p. 69; Rossi, 2000). After Bacon’s initial advancements in that direction (Rossi, 2000, pp. 145-150), Descartes, Comenius, Newton, Boyle, Leibniz and others gave serious consideration to an ideal language (Knowlson, 1975, pp. 9, 22, 37; Slaughter, 1982). Such a language was sought as a remedy to the vagueness and multiple senses of ordinary language, whose flexibility in contexts was not thought of as a strength. The search for an ideal language or approximations to it continued into the 20th Century. “In a logically perfect language,” said Russell (1918), “there will be one word and no more for every simple object. . . .” (p. 520); and in his introduction to Wittgenstein’s *Tractatus logico-philosophicus*, Russell (1922/1981) said,

Mr. Wittgenstein is concerned with the conditions for a logically perfect language—not that any language is logically perfect, or that we believe ourselves capable, here and now, of constructing a logically perfect language, but that the whole function of language is to have meaning, and it only fulfills this function in proportion as it approaches to the ideal language which we postulate. (p. 8)

Among the logical positivists, Carnap and Neurath saw a physical or physicalistic language as becoming a universal language. Carnap (1931/1959) said, “[*P*]hysical language is a universal language, that is, a language into which every sentence may be translated” (p. 165). Neurath 1931-32/1959) said, “[T]he physicalistic language has the capacity some day to become the universal language of social intercourse” (p. 289). In Eco’s (1997) summation, “In fact, the entire logical positivist movement was heir to the Baconian polemic against the vagaries of natural languages. . . .” (p. 313).

Assumptions that an exact certainty existed to be found were supported by a belief in an exact determinism. Russell (1914/1981) emphasized the importance of achieving a timeless picture of the universe: “Whoever wishes to see the world truly, to rise in thought above the tyranny of practical desires, must learn to . . . survey the whole stream of time in one comprehensive vision” (p. 23; also cf. 1925, pp. 1-3 on determinism; 1948/1992, pp. 412-415 on visualization and logic and Toulmin, 1958, on the historical idealization of timeless logic). Like Leibniz (cited in Cassirer, 1936/1956, pp. 11-12), D’Alembert (1751/1995, p. 29), Laplace (1814/1951, p. 4), and Du Bois-Reymond (1872/1874, p. 2) before him, Russell wanted a deterministic account in terms of a fixed structure, a pictureable vision even if inferior to a God’s eye view. In his desire for a pictureable structure, Russell (1914/1981, p. 23) was opposed to the time philosophies of evolution and pragmatism. For Russell (1914/1981): “Evolutionism, in spite of its appeals to particular scientific facts, fails to be a truly scientific philosophy because of its slavery to time, its ethical preoccupations, and its predominant interest in our mundane concerns and destiny” (p. 30).

In advancing his modernist views, Russell (1919) spoke largely in favor of the behaviorism of John Watson (1924) who accepted a stimulus and response relation of necessity in its long mechanistic tradition from Descartes to Pavlov. For Watson (1924/1970), “the behaviorist is a strict determinist,” (p. 183), and Watson’s goal was a complete determinism: “*to be able, given the stimulus, to predict the response—or, seeing the reaction take place to state what the stimulus is that has called out the reaction* [emphasis in original]” (p. 18). If it is wondered how each element would be delineated, Skinner (1938/1966), who said he (1983/1984) had been “a disciple of Watson” (p. 191), indicated this could be done by isolation or decontextualization, “[A]ll stimuli are alike in being isolable parts of the energies or substances affecting the organism” (p. 243).

Alternative views were less well publicized than the dominant views of modernism. The pragmatist Peirce (1931-1958), for example, spoke against beginning with given elements postulated as “the first impressions of sense,” because,

## THE MODERN/POSTMODERN CONTEXT

[T]here is but one state of mind from which you can “set out,” namely, the very state of mind in which you actually find yourself at the time you do “set out”—a state in which you are laden with an immense mass of cognition already formed, of which you cannot divest yourself if you would. . . . (5.416, volume and paragraph number)

This position was elaborated in more detail by Hanson (1955). Later, Werner Heisenberg (1972), the Nobel Laureate in Physics in 1932, questioned the assumption that there were always basic indivisible elements for an analysis to get down to:

“In the beginning was the particle.” We had assumed that visible matter was composed of smaller units, and that, if only we divided these long enough, we should arrive at the smallest units, which Democritus had called “atoms” and which modern physicists called “elementary particles.” But perhaps this entire approach had been mistaken. Perhaps there was no such thing as an indivisible particle. Perhaps matter could be divided ever further, until finally it was no longer a real division of a particle but a change of energy into matter, and the parts were no longer smaller than the whole from which they had been separated. (p. 133)

Heisenberg (1972) saw no need to embrace positivism and disagreed sharply with its approach to meaning: “The positivist assertion that every word has a clear meaning and that it is quite improper to use it in any other way struck me as arrant nonsense” (p. 134).

### Literary Sources for Skinner’s Modernist Views

Like Russell, Wyndham Lewis (1927/1993), the modernist painter and writer, disapproved of evolution, pragmatism, and the time philosophies. Lewis (1937/1982) wanted the structural foundations of life: “In every case the structural and philosophic rudiments of life were sought out. On all hands a return to first principles was witnessed” (p. 257). In *transition*, an international journal for experimental writing, experimentation with word forms as structural elements seemed the only criteria for publication (cf. Symons, 1987, pp. 206-214):

The “Revolution of the Word” is a movement to explore this secondary, non-utilitarian function of language . . . For these purposes words are treated as plastic media; their forms and colours may be blended according to the instinctive talent of the artist . . . Every word of the language has its own nuance; the “revolutionary in words” mixes these nuances as he will . . . composing new word-forms whenever these are necessary to render the nuance at which he aims. (Gilbert, 1929, p. 204).

In effect, the structure of words—and the associations with word-forms and parts of word forms—was no longer secondary but primary. The practical, functional use of a word in its current context and its relation to consequences was secondary. James Joyce (e.g., 1939/1999) illustrated this to excess in *Finnegan’s Wake*.

## MOXLEY

For other modernists, the structural elements of writing were to be reduced by eliminating the less essential structures. Hemingway (e.g., 1999, p. 34) distrusted adjectives and is known for his simplified style: “Hemingway’s style marks the achievement of machine values in imaginative literature” (Tichi, 1987, p. 229). Commenting on *Tarr* (1918/1990), Lewis (1963) said,

[It] was my object to eliminate anything less essential than a noun or a verb. Prepositions, pronouns, articles—the small fry—as far as might be, I would abolish. Of course I was unable to do this, but for the purposes of the *novel*, I produced a somewhat jagged prose. (pp. 552-553)

The result was a variety of experimental writing seeking the essential structures and eliminating the unessential, like the elimination of capital letters in a work by e. e. cummings (1959) or in the first letter of the title of the journal *transition*.

Although William James (1884/1992, p. 988) faulted attempts to find significance in the word forms produced in portrayals of a stream of consciousness, Gertrude Stein, who had studied with James, subsequently emulated the outcomes of her research on the stream of consciousness as found in automatic writing. Leon Solomons and Gertrude Stein (1896) coauthored a paper, “Normal Motor Automatism,” in which the authors, serving as subjects, stressed the repetition that occurred: “A *marked tendency to repetition*.—A phrase would seem to get into the head and keep repeating itself at every opportunity, and change over from day to day even . . . but there was not much connected thought.” (p. 506). One of their results was, “When he could not be the longest and thus to be, and thus to be, the strongest” (p. 506). Such an example resembled Stein’s later writing as Skinner (1934/1972), who associated the modernist writing of Stein with the modernist painting of Picasso, pointed out. A repeated structure in Stein’s writing appeared to be controlled by its recency to the previous occurrence of that structure. The previous structure, as stimulus, produced the subsequent structure, as response. Consequences had no evident role. Along with the emphasis given to word structures and associations between structures in sound and visual form, much of modernist writing may have seemed conducive to an S-R analysis.

Aldous Huxley (1922/1939, pp. 26-29) parodied contemporary authors with an affinity for automatic writing and its repetitions, and Lewis (1934/1987, p. 24) ridiculed Hemingway’s repetitions. But Burgess (1985, p. 11) saw D. H. Lawrence’s repetitions as a virtue. Lawrence (1920/1976), who often repeated words (e.g., 1915, p. 188) and sentences (e.g., 1915, p. 460), wrote:

There were two opposites, his will and the resistant Matter of the earth. And between these he could establish the very expression of his will, the incarnation of his power, a great and perfect machine, a system, an activity of pure order, pure mechanical repetition, repetition ad infinitum, hence eternal and infinite. He found his eternal and his infinite in the pure machine-principle of perfect co-ordination into one pure, complex, infinitely repeated motion, like the spinning of a wheel; but a productive spinning, as the revolving of the universe may be called a productive spinning, a productive repetition through eternity, to infinity. And this is the God-motion, this productive repetition ad infinitum. (p. 220)



## THE MODERN/POSTMODERN CONTEXT

This did not mean that Lawrence (1923/1997) approved of the modern mechanistic age and its repetitions of fundamental elements:

Man is supposed to be an automaton working in certain automatic ways when you touch certain springs. These springs are all labeled: they form a keyboard to the human psyche, according to modern psychology. . . . [Man] is said to be a creature of cause-and-effect. . . . And idealism, the ruling of life by the instrumentality of the idea, is precisely the mechanical, even automatic cause-and-effect process. The idea, or ideal, becomes a fixed principle, and life, like any other force, is driven into mechanical repetition of given motions—millions of time over and over again—according to the fixed ideal. So, the Christian-democratic world prescribes certain motions, and men proceed to repeat these motions, till they conceive that there *are* no other motions but these. And that is pure automatism. (pp. 294-295)

By portraying modernist values within their writing, whether modernist authors approved of them or not, the values of mechanism and fundamental elements became conspicuous.

### **Skinner's Modernist Affinities Before 1945**

In respect to philosophical affinities, Skinner (1987/1989, p. 110) was a charter subscriber to the journal of the Vienna Circle *Erkenntnis* (1987/1989, p. 110), which was a source of early publications by Carnap and Neurath; and Skinner (1979/1984, p. 149) saw Carnap as a behaviorist as well as seeing a close relation between behaviorism and logical positivism: "As far as I was concerned, there were only minor differences between behaviorism, operationism, and logical positivism" (p. 161). Skinner (1938/1966) also said of his scientific method, "It is positivistic. It confines itself to description rather than explanation. Its concepts are defined in terms of immediate observations. . . ." (p. 44). According to Skinner (1979/1984, p. 10), he had been converted to the behavioristic position by Bertrand Russell, "an early and important influence" (1984/1988, p. 333). After reading Russell's review of *The Meaning of Meaning* (1926), Skinner (1979/1984, p. 10) bought Watson's (1924/1970) *Behaviorism* and later Russell's (1927/1970) *Philosophy*. Russell's (1926) review of *The Meaning of Meaning* was largely about Russell's own theory of meaning which was indebted to Watson (cf. Wood, 1986/1996, p. 609). For Russell (1926), meaning was a property of a word: "I also hold that meaning in general should be treated without introducing 'thoughts,' and should be regarded as a property of words considered as physical phenomena" (p. 119). In doing so, Russell endorsed an essentialist view of meaning in which the word form itself, regardless of context, determines its meaning. The relation between the word form and the meaning was a necessary one. If the form, then the meaning.

Russell (1919) advanced his views on meaning in explicit alignment with the views of Watson:

[I]f we take some such word as “Socrates” or “dog,” the meaning of the word consists in some relation to an object or set of objects. . . . You see John, and you say, “Hullo, John”—this gives the *cause* of the word; you call “John,” and John appears at the door—this gives the *effect* of the word. . . . This view of language has been advocated, more or less tentatively, by Watson in his book on *Behaviour*. (pp. 7-8)

With a cause and effect connection between word and object, meaning was a property of a word, just as a response was a property of a stimulus. A necessary relation between word forms and meaning was implicit in accounts based on an S-R framework, the framework in ubiquitous use by Skinner until 1945.

In addition to the philosophical sources of modernism, Skinner was also influenced by modernist literature, and conjoint influences from modernist philosophy and literature show up in Skinner’s early work on verbal behavior. Skinner (1976/1977) said he “subscribed to the *Dial*, the *American Mercury*, Ezra Pound’s *Exile* when it appeared, and Samuel Roth’s *Two World’s Monthly*, which began to pirate Joyce’s *Ulysses*” (p. 262). Many of the reviewers of the *Dial* “had already established reputations as ‘modernists’” (Coleman, 1985, p. 80) and so had its contributors (e.g., Eliot, 1921; Lawrence, 1921; Pound, 1921). In addition, Skinner (1989), had taken his college degree in English Language and Literature, “was hoping to be a writer” (p. 121), and wrote an article on Ezra Pound, one of the leaders of the modernist movement in literature and an alumnus of Hamilton (Bjork, 1993, p. 48). In a 1927 letter, “Skinner declared his closest kinship with Ford Maddox Ford, Ezra Pound, and James Joyce” (Coleman, 1985, p. 83). With this background, it is not surprising that Skinner’s early research on verbal behavior focused on the structural forms of words in print and sound.

Skinner’s experiments in the 1930s with his verbal summator produced results that Fred Keller saw as resembling modernist writing. Skinner (1979/1984) wrote Keller that the verbal summator “*simply repeats a series of vowel sounds over and over until the subject reads something into them*” (p. 176). Keller replied, “[Auden] has experimented with some rhyming . . . of this sort: gay-guy; house-horse. Stuff that . . . is a good example of the sort of spread you get with the summator. Auden is ‘ganz modern,’ communist, and Gertrude Steinish. . . .” (p. 176). Along with literary modernists, Skinner saw promise in the generation and repetition of word forms separated from their normal functional contexts.

In addition, Skinner (1936) followed an S-R model of meaning: “In normal speech the responses ‘refer to’ external stimuli—to whatever is being ‘talked about’” (p. 103); and these stimulus and response relations could vary in strength: “A verbal response may be so weak as to be evoked by its appropriate stimulus only after a considerable period of time, as when we have difficulty in recalling a name” (p. 72). These formulations had no role for consequences. Skinner (1938/1966, pp. 7-8; also cf. 1935/1972) also implied that certain words had essential meanings when he said that certain words, regardless of context, implicated or did not implicate conceptual schemes. In avoiding words thought to implicate conceptual schemes in problematic ways, Skinner was echoing the long standing modernist interest—from Bacon to the logical positivists—in purifying

language in the direction of an essentialist ideal. Neurath (1941/1983) had long developed his own lists of proscribed words: “I started in my university days rather primitively by making a collection of ‘dangerous terms.’” (p. 217), and Skinner (1980) also found some words were dangerous: “We need to examine the contingencies from which the rules governing these expressions are ‘extracted.’ (Dangerous word!)” (p. 275; cf. Moxley, 1997).

In a later study, “A Quantitative Estimate of Certain Types of Sound-Patterning in Poetry,” Skinner (1941) presented a structural, topographical analysis of “the objective structure of a literary work” (p. 79). Texts from Swinburne and Shakespeare were used to determine the distances between repetitions of vowels, consonants, and whole words. The purpose was to show the extent to which “*a process in the behavior of the writer,*” which produces rhyme, assonance, or alliteration rests “upon a statistical proof that the existing patterns are not to be expected from chance” (p. 64). This was another focus on words as structural elements where the contexts were irrelevant.

### ***Skinner’s Early Unit for Operant Behavior***

In his pre-1945 writing, the number of terms in Skinner’s operant varied a bit but not his requirement for necessity. Four terms in a pairing of two reflexes easily led the way in frequency and diagrammatic prominence: for example, “ $s . R^0 \rightarrow S^1 . R^1$ ” (1938/1966, p. 65). Skinner (1938/1966) believed that necessity was intrinsic to all behavior, including operant behavior, and none of Skinner’s alternatives for the operant claim to dispense with the necessary relation of the reflex. Even when invariant succession was not observed, necessity was assumed to be there (e.g., Skinner, 1932, p. 32). Skinner (1931/1972) claimed that necessity was an important relation between stimulus and response: “The reflex is important in the description of behavior because it is by definition a statement of the *necessity* of this relationship” (p. 449), and Skinner (1938/1966) applied that claim to operants: “[Operants] are not obviously lawful. But with a rigorous control of all relevant operations the kind of necessity that naturally characterizes simple reflexes is seen to apply to behavior generally” (p. 26; also cf. Scharff, 1982, 1999). Skinner (1938/1966) also referred to the “mechanical necessities of reinforcement” (p. 178). In addition, Skinner took stances that lent themselves to incorporating necessity. The connections in structures looked to be necessary, and Skinner (1938/1966) presented behavior as a structural or topographical account of movement: “By behavior, then, I mean simply the movement of an organism or of its parts” (p. 6), a definition Skinner (1979/1984) later termed “misleading” (p. 202). Skinner (1938/1966) also expected the reflex’s “ultimate extension to behavior as a whole” (p. 439).

### **Postmodernism**

The broad use of the term *postmodernism* simply means *after modernism*, the only definition of post-modern in the current *Oxford English Dictionary* (1989). It

typically implies a skepticism of, or reaction against, modernist values, and it commonly indicates—not a sharp chronological break—but a cluster of ideas dispersed over time. Thus pioneering thinkers, such as Charles Darwin and C. S. Peirce, may be preceded by, be contemporary with, and be followed by culturally prominent modernist values, although their own views are more closely aligned with a postmodern selectionism. Among the different postmodernisms, some are distinguished by their enthusiastic rejection of modernism and do not appear to offer any coherent alternative. What has been called reactionary or romantic modernism has also been called simply postmodernism because it undermined the reasonableness of modernism, and an absence of constructive alternatives to modernism has been advanced as characterizing postmodernism “[w]ith positivistic defenders of science attacking postmodern discourse as a new form of irrationalism seeking to destroy critical reason and its achievements” (Best & Kellner, 1997, p. 196). Such antagonism toward any use of the term *postmodernism* invests the word form itself, *postmodernism*, with a property, *irrationalism*. This is a necessitarian Watson-Russell position on meaning that Skinner came to reject. As would be expected with a term widely used in different contexts, various distinctions may be made among different uses of the term *postmodernism* (cf. Fishman, 1999, p. 6). And sometimes a distinction more or less approximating the one we will be making is made without using the term (e.g., Eiseley, 1979). As expressed by Russell (cited in Appleman, 1979, p. 295), but not Eiseley, such a distinction had the tone of a lament. The variant of postmodernism addressed here is a pragmatic selectionism, after Darwin’s natural selection, as interpreted by Darwin, Peirce, and Skinner. As a broadly embracing concept, selectionism is related to pragmatism (cf. Peirce, 1931-1958, 2.86; Wiener, 1949), pragmatic psychology (Fishman, 1999), evolutionary epistemology (cf. Campbell, 1959, 1974, 1990), evolutionary biology and ecology (Best & Kellner, 1997, p. 196) and cybernetics (Galison, 1994). Although there are differences between different views of selectionism, the selectionism of Darwin, Peirce, and Skinner, in contrast to modernism, advances probability, contexts, and consequences.

### ***Endorsement of Probability***

An endorsement of probability is evident in postmodern science (cf. Best and Gellner, 1997, p. 196). In addition, philosophers such as Peirce and Popper championed a cosmology of ever changing tendencies or propensities. In Popper’s (1995) words:

To sum up: propensities in physics are properties of the whole physical situation and sometimes even of the particular way in which a situation changes. And the same holds of the propensities in chemistry, in biochemistry, and in biology.

Now, in our real changing world, the situation and, with it, the possibilities, and thus the propensities, change all the time. (p. 17; also cf. Fetzer, 1993)

Peirce sought to include propensities in a theory of probability:

## THE MODERN/POSTMODERN CONTEXT

Peirce's acceptance of real possibility had convinced him that the definition of "probability" should include reference to dispositions in addition to frequencies, but even though he tried many alternatives involving the *propensity* view he was never satisfied that he had got it quite right. (Houser, 1998, p. xxix)

In the Peirce-Popper cosmology, there are no fixed and unchanging underlying elements, and no fixed, stable picture of the future is to be expected. Such a view has gained in credibility. Speculations on an evolutionary cosmology are no longer unusual (e.g., Ferris, 1997, p. 173; Kragh, 1996, p. 385; Smolin, 1997). The range of conceivable feedback systems in a hierarchy of modifiable systems has also been extended from smaller to larger systems. Wächtershäuser (2000) has proposed catalytic feedback as providing the origins of life in an autotrophic metabolism of low-molecular weight constituents, and Smolin (1997) has proposed that galaxies may be self-organizing systems. Recent empirical evidence may support some of the speculations on evolutionary cosmology: "An international team of astrophysicists has discovered that the basic laws of nature as understood today may be changing slightly as the universe ages" (Glanz & Overbye, 2001, p. A1). In "A Guess at the Riddle," Peirce (1992, p. 277) had proposed this was the case.

Peirce's cosmology did not mean that truth did not exist or that truth was simply whatever was conveniently satisfying for the end at hand, but it did mean we must routinely be satisfied with truth that is less than exact. Peirce (1903/1998) said, "Every man is fully satisfied that there is such a thing as truth, or he would not ask any question. *That* truth consists in a conformity to something *independent of his thinking it to be so*, or of any man's opinion on that subject" (p. 240), and Peirce also said, "[I]f truth consists in satisfaction, it cannot be any *actual* satisfaction, but must be the satisfaction which *would* ultimately be found if the inquiry were pushed to its ultimate and infeasible issue" (p. 450, also cf. 1931-1958, 5.555-5.564). For Peirce (1898/1998), truth—especially empirical truth—could not be positively certain or exact: "In truth, positive certainty is unattainable in man" (p. 26, also cf. 1903/1998, p. 236); instead, "Truth is that concordance of an abstract statement with the ideal limit towards which endless investigation would tend to bring scientific belief" (1931-1958, 5.565). The reality of that truth was one that tended over time to increasing variety and increasing order, a progressive differentiation.

### ***An Expanded Consideration of Contexts***

The consideration of contexts was expanded in postmodernism. Speaking of the importance of contexts, the physicist David Bohm (1988) said,

An electron is ordinarily a particle, but it can also behave like waves, and light which ordinarily behaves like waves can also behave like particles; their behavior depends on the context in which they are treated. That is, the quality of the thing depends on the context. This idea is utterly opposed to mechanism,

because in mechanism the particle is just what it is no matter what the context.  
(pp. 63-64)

This turnaround in recognizing the importance of contexts has also affected the notion of objectivity (Galison, 1998).

### *Approval of Selection by Consequences*

Postmodern science also gives more consideration to consequences: “[T]he Copenhagen interpretation’ of quantum mechanics advanced by Bohr operates not with a correspondence theory of truth that tries to match theory with reality but, rather, with a pragmatic theory of truth that seeks results in experimental situations” (Best & Kellner, 1997, p 215). Jammer (1966) found that “Bohr was strongly influenced . . . by William James” (p. 176) and that there was a pronounced congeniality in their thinking (also cf. Bohr 1932/1985, p. 318). Jammer (1966) also noted that “[T]he practical, pragmatic significance of truth reverberated in Bohr’s frequent remark: ‘It is not the question at present whether this view is true or not, but what arguments we can honestly draw with respect to it from the available information’” (p. 176).

Selectionism, or at least some variants of it, focuses on probabilistic, functional relations; contexts; and consequences; and commonly, if not always, integrates these characteristics in an account of change in a recursive process with variation (cf. Hacking, 1987; Galison, 1990, 1994, 1998; Moxley, 1996; Toulmin, 1982, 1990). C. S. Peirce (1931-1958, 2.86) expressed the central organizational feature of this change as an AB-because-of-C relation. The relation between the conditions (A) and the particular events of interest (B) is because of consequences (C).

### **Skinner’s Adoption of Selectionist Views in 1945**

Instead of his previous emphasis on word structures and the meaning attached or not attached to them, Skinner’s (1945/1972) theory of verbal behavior now emphasized functional relations and the determiners (or contingencies) that accounted for the use of a word: “Meanings, contents and references are to be found among the determiners, not among the properties, of response” (p. 372). Skinner (1945/1972) presented these determiners in a probabilistic three-term contingency:

There are three important terms: a stimulus, a response, and a reinforcement supplied by the verbal community. . . . The significant interrelations between these terms may be expressed by saying that the community reinforces the response only when it is emitted in the presence of the stimulus. The reinforcement of the response “red,” for example, is contingent upon the presence of a red object. (The contingency need not be invariable.) (p. 373)

This seems to be Skinner’s first presentation of a probabilistic three-term contingency (cf. Andery, Micheletto, & Serio, 1999), and it is for verbal behavior.

## THE MODERN/POSTMODERN CONTEXT

A few pages later, Skinner restated his new formulation with significant relations, “[T]he contingencies of reinforcement . . . account for the functional relation between a term, as a verbal response, and a given stimulus” (p. 380). The causal or explanatory role of “account for” is not given to the antecedent stimulus as it is in S-R accounts; instead the causal role is given to consequences. In addition, this causality is not the necessary, if-then cause-and-effect causality of S-R accounts, but a probabilistic causality. No necessity is claimed. This is a major change in conceptual units for Skinner, and Skinner does not forecast this change in his pre-1945 work on the operant unit, either for verbal or nonverbal behavior. Although Skinner did not identify a source for this formulation, he had previously indicated a possible one.

Skinner (1979/1984, p. 41) said his growing library, apparently by the late 1920s, included *Chance, Love and Logic* by C. S. Peirce (1923/1998). This book contained the essay, “How to Make Our Ideas Clear.” In that essay, Peirce (1878/1992) said,

[W]hat a thing means is simply what habits it involves. Now, the identity of a habit depends on how it might lead us to act . . . What the habit is depends on *when* and *how* it causes us to act. As for the *when*, every stimulus to action is derived from perception; as for the *how*, every purpose of action is to produce some sensible result. Thus we come down to what is tangible and practical, as the root of every real distinction of thought, no matter how subtle [sic] it may be; and there is no distinction of meaning so fine as to consist in anything but a possible difference of practice. (p. 131)

There are three distinct steps in Peirce’s account of meaning: 1) a stimulus to act, 2) an act, and 3) a sensible result, which are against the background of Peirce’s probabilism. Peirce’s account of meaning is basically an analysis of meaning in terms of a probabilistic three-term contingency.

Peirce (e.g., 1907/1998, pp. 418 & 432; 1985, p. 912) often used three-term formulations, but not always with the same terms. In other formulations of habit, Peirce (1907/1998) used *conditions*, *act*, and *result* (p. 418), which was restated in terms of *conditions*, *action*, and *motive* (p. 418). Peirce (1985) also addressed the habit of *belief* in terms of *occasion*, *act*, and *consequence* (p. 912), and he (1907/1998) restated this formulation in terms of *circumstances*, *act*, and *motives* (p. 432). This gives the following three sets of terms for his habits: (A) *stimulus/conditions/occasion/circumstances*, (B) *action/act*, and (C) *result/motive/motives/consequence*. These terms are similar if not identical to some of the alternative terms that Skinner used for the contingencies of operant behavior (cf., Moxley, 1996, p. 155). Skinner (1938/1966, pp. 37, 41; 1947, p. 36; 1950/1972, p. 72; 1956, p. 82; 1961, p. 206; 1977/1978, p. 115), for example, often used *act* or *action* in place of *behavior*.

In addition, Peirce (1931-1958) generalized three-term probabilistic relations as cutting across the discovery of the laws of nature, the improvement of inventions, and natural selection in an AB-because-of-C formulation: “[S]o we now meet with a Rational Threeness which consists in A and B being really paired

by virtue of a third object, C” (2.86). Darwin’s (1859/1958) three terms—*conditions of life*, *variation*, and *selection*—fit this formula: “Natural *Selection* [emphasis added], or the Survival of the Fittest . . . implies only the preservations of such *variations* as arise and are beneficial to the being under its *conditions of life* [emphasis added]” (p. 88). (A) the conditions of life and (B) the variations of organisms adapted to it exist because of (C) selection by consequences for previous AB (conditions of life-variations) relations. In Skinner’s 1945 formulation, the relation between the stimulus and its response is also because of consequences (reinforcement) for previous AB (stimulus-response) relations. The selectionist views of Darwin, Peirce, and Skinner share this fundamental formulation.

Significantly, Skinner (1945/1972, p. 380) presented the relations in his three-term contingency in the way that Peirce had presented them: Skinner’s phrasing on page 380, although reversing Peirce’s sequence, has relations that agree with Peirce’s general AB-because-of-C-formulation. For Skinner, “[T]he contingencies of reinforcement” (C) “account for the functional relation between . . . a verbal response” (B) and “a given stimulus” (A). Converting this back into Peirce’s sequence of phrases, the AB relation (between stimulus and response) is because of C (the contingencies of reinforcement).

To avoid confusion, Skinner’s selectionism should not be equated with the selectionism of Donald T. Campbell (e.g., 1956, 1959, 1960, 1974, 1990), who has been credited with precedence for some of Skinner’s selectionist views (cf. Honig, 1984/1988). Campbell (1956) was initially “Inspired by Ashby’s (1952) Design for a Brain” (1990, p. 7) in which a mechanical Homeostat showed a conspicuous failure to “store old solutions for reuse when the same problem repeats itself” (p. 109). Campbell (e.g., 1990) commonly used the phrasing “blind-variation-and-selective-retention (BVSR)” (p. 7) for his basic selectionist formulation, which can be seen as a close match to Darwin’s abbreviated “variation and selection” references for his full formulation of the conditions of life, variation, and selection. By analogy, Campbell’s formulation would be closer to Darwin’s if Darwin’s conditions of life were understood as belonging to a more complete blind variation and selective retention. Although his formulation may be understood that way, Campbell (1959, also cf. 1960, p. 381; Bain, 1876, pp. 318-319, Baldwin, 1915, p. 175) offered a different three-part formulation whose mechanisms suggest a physiological level:

The common features of an inductive knowledge process as illustrated in evolution and learning are these: 1. a mechanism for variation (of structures, or responses, etc.) 2. a selection process whereby certain variations are preserved and others lost according to stable criteria (differential survival in evolution, pleasure-pain reinforcement in learning) and 3. a mechanism for preserving or propagating the surviving variations (the genetic mechanism in evolution, memory in learning). (p. 163)

This position has been cast as “a three-step process of *variation*, *selection*, and *retention*” (Donahoe & Palmer, 1994, p. 18). The terms or categories of this



formulation only partially coincide with the terms in the formulations of Darwin, Peirce, and Skinner. *Retention* is not an equivalent counterpart of *setting*, and there is no AB-because-of-C relation between the *setting* (A) and the *behavior* (B) because of *consequences* (C). On the significance of seeing reinforcement as strengthening the setting-behavior relation rather than simply strengthening behavior, see DeGrandpre (2000). Campbell's early presentations of selectionism also occur after Skinner's (cf. Catania & Harnad, 1984/1988, p. 49). In addition, the applicability of Campbell's evolutionary epistemology to behavior has been questioned (cf. Skagestad, 1978; Thagard, 1980).

It is far more plausible to credit Peirce rather than Campbell for both precedence and influence on Skinner. In addition to Skinner's AB-because-of-C formulation for operant behavior, Peirce could also have been the source for the close connection that Skinner (e.g., 1953, p. 430, 1984/1987, 1981) found between his own three-term contingency for operant behavior and natural selection. Peirce (1986) saw a close parallel between habit (what Skinner would call operant behavior) and natural selection: "Habit plays somewhat the same part in the history of the individual that natural selection does in that of the species; namely, it causes actions to be directed toward ends" (p. 46). Before 1945, Skinner (1938/1966) had referenced Darwin critically for attributing "mental faculties to some subhuman species" (p. 4). After 1945, Skinner increasingly identified similarities between his views and those of Darwin's natural selection.

The fact that Skinner did not attribute Peirce as a source or a close relation for his views in 1945 would not be the first time that Skinner did not reveal as much about the central sources or relations for his views as he might have. Reviewing *The Behavior of Organisms*, Hilgard (1939) said Skinner gave little notice "to the systems of other psychologists with which his work is coordinate. The statements about Lewin, Hull, and Tolman on these pages are intelligent, but cursory. . . . Thorndike, another close relative, is ignored in this comparison" (p. 124). Accepting this criticism, Skinner (1979/1984) wrote to Thorndike in 1939, "Hilgard's review of my book [*The Behavior of Organisms*] in the *Bulletin* has reminded me of how much of your work in the same vein I failed to acknowledge. . . . It has always been obvious that I was merely carrying on your puzzle box experiments but it never occurred to me to remind my readers of the fact" (p. 233). Interestingly, Skinner (1937) had previously credited Thorndike's precedence for the study of operant behavior: "All conditioned reflexes of Type R are by definition operants. . . . The behavior characteristic of Type R was studied as early as 1898 (Thorndike)" (pp. 492-496). What Skinner remembered in 1937 he forgot in his 1938/1966 book.

Given Russell's (1927/1970) reformulation of Thorndike's law of effect as a probabilistic three-term contingency, which Skinner probably read even if he didn't attribute significance to it (Skinner was still committed to S-R units at the time), we can now see a Thorndike-Russell-Peirce heritage for Skinner's operant. Thorndike's law of effect was in terms of situation, response, and satisfaction (or dissatisfaction), but situation and response, an S-R relation, were the only objectively observed terms. Russell reformulated satisfaction as "the animal tends

to behave so as to make [results] recur” and “the animal tends to repeat acts” with “certain results” (pp. 37-38). This left a probabilistic three-term contingency, which must have some repetition to show a tendency to recur. In as much as Skinner (1976/1977, p. 299) refers to pages 33 and 34 that he had previously marked in Russell’s (1927/1970) book and quotes from pages 33, 34, and 36, we may reasonably assume that Skinner had probably read Russell’s reformulation on pp. 35-36 of Thorndike’s law of effect even though Skinner badly misrepresented what Russell said (cf. Moxley, 1998b, p. 75). According to Skinner (1976/1977), “Russell, again following Watson, was trying to interpret the Law of Effect as an example of the substitution of stimuli” (p. 299). Yet on that very same page Skinner quotes Russell as saying “I do *not* [emphasis added] agree with Watson in thinking this principle [the substitution of stimuli] alone sufficient” (p. 9). Memory can play tricks, but in this case the “trick” persisted even when the original events were rechecked and a refuting passage quoted. Russell, however, did not give the AB-because-of-C relations that Peirce gave, nor anything like Peirce’s extended contexts and explanations for addressing verbal behavior. Once Skinner accepted Peirce’s formulation, Skinner may have seen how easily he could adapt Russell’s reformulation of Thorndike’s law of effect to nonverbal behavior.

Skinner also expressed a curious relation to Peirce. Although Skinner did not reference Peirce in 1945 as a source for his ideas, he (1979) spoke favorably of him later in a published interview:

The method of [Peirce] was to consider all the effects a concept might conceivably have on practical matters. The whole of our conception of an object or event is our conception of effects. That is very close, I think, to an operant analysis of the way in which we respond to stimuli. . . . [Peirce] was talking about knowledge shaped by consequences. (p. 48)

Similar to the situation with Thorndike, this admission may be considered as a belated acknowledgement of the “very close” relation between Peirce’s views and an operant analysis. It is perhaps indicative of Skinner’s reserve in crediting sources or anticipators for his new views after 1945 that he revealed this relation only when asked.

Skinner’s accurate rendering of Peirce’s position during an interview suggests a careful study of Peirce, and Skinner need not have read Peirce extensively in order to have a basic introduction to his pragmatism. Ayer (1968) found that “The Fixation of Belief” and “How to Make Our Ideas Clear,” two essays contained in the book that Skinner bought, “lay down the central lines which Peirce continued to follow. . . . [A]ll his later philosophy, at least in its pragmatic aspect, is a development or modification of the ideas which they contain” (p. 7). In addition, Skinner (e.g., 1979/1984, pp. 92, 151, 213, 281) had discussions with the pragmatist W. V. Quine and Ivor Richards; and *The Meaning of Meaning* by Ogden and Richards (1923/1989), which Skinner (1979/1984, pp. 92, 213) bought and discussed with Richards, had selections from Peirce in Appendix D. Ketner (1998) indicated that C. K. Ogden was the likely source for how Peirce’s views came to appear in that book:

## THE MODERN/POSTMODERN CONTEXT

When he was a student at Cambridge, Ogden was a protégé of Lady Welby, who introduced him to Peirce's work. . . . [In a letter to Peirce] she remarked, "I have found you, I think, a disciple at Cambridge. . . . The name of the recruit is C. K. Ogden, and he is at Magdalene College." (p. xiii, n14)

Ogden's influence may also have resulted in the sympathetic accounts of pragmatic views of meaning that can be found elsewhere in the book.

### *Skinner's Introduction of Probability in 1945*

In 1945, Skinner sharply departed from his previous requirement of necessity when he used the term *contingency* for the three-term formula of operant behavior. In conjunction with that formula, what was new here was not simply the use of the term *contingency*, which Skinner (1937/1972, p. 490) had previously applied to both operant and respondent behavior, but the use of the term *contingency* for probability in stating, "The contingency need not be invariable" (p. 373). The term *contingency* was singularly appropriate for addressing probabilistic relations in as much as the historical use of the term has indicated anywhere from chance to close relations between events—a full range of probability—with a more common than not reference to low probability. Its extension to necessary relations is less common. The term was commonly opposed to necessity (cf. Simpson & Weiner, 1989).

Later, Skinner (1973) abandoned phrasing with a conceivable role for necessity: "Human behavior is controlled . . . by changing the environmental conditions of which it is a function. The control is probabilistic. The organism is not forced to behave in a given way; it is simply made more likely to do so" (p. 259). There is no role here for *necessity*. The issue is "*more likely*." In place of necessity, Skinner (1974) affirmed an irreducible element of probability in the contingencies for any behavior, including verbal behavior:

The truth of a statement of fact is limited by the sources of the behavior of the speaker, the control exerted by the current setting, the effects of similar settings in the past, the effects upon the listener leading to precision or to exaggeration or falsification, and so on. There is no way in which a verbal description of a setting can be absolutely true. (p. 136)

The contingencies of the behavior in its setting (current and past) and its consequences (effects) must be probabilistic to some degree, and this includes the verbal behavior of scientists.

Although Skinner did not go into detail on his theoretical conception of probability, he (1979/1984) apparently accepted some form of frequency theory: "Probability may be inferred from frequency of emission" (p. 383). Skinner (1984/1988) extrapolated this notion of probability to instances which resisted a frequency analysis:

The notion of probability is usually extrapolated to cases in which frequency analysis cannot be carried out. In the field of behavior we arrange a situation in

which frequencies are available as data, but we use the notion of probability in analyzing and formulating instances or even types of behavior which are not susceptible to this analysis. (p. 93)

This covered behaviors that are unique occurrences in the life of the individual.

When Skinner broke with the requirement of necessary relations at some level of the operant, he was also breaking with the physicalistic views of the logical positivists for purifying language (e.g., Neurath 1932-1933/1959, p. 200): “The physicalism of the logical positivist has never been good behaviorism, as I pointed out twenty years ago (Skinner, 1945/1972)” (Blanshard & Skinner, 1966-1967, p. 325). It is noteworthy that Skinner identifies 1945 as the time of this break. At that time, Skinner broke with the necessary relations of “adherents of the ‘correspondence school’ of meaning” (1945/1972, p. 376), and he (1979/1984, p. 335) rejected the views on meaning by Watson and Russell, designated allies of the logical positivists. This included a specific rejection of Russell’s meaning-as-a-property-of-a-word view. Skinner (1974) said, “Meaning is not properly regarded as a property of a response or a situation but rather of the contingencies responsible for both the topography of behavior and the control exerted by stimuli” (p. 90). Put another way,

Technically, meanings are to be found among the independent variables in a functional account, rather than as properties of the dependent variable. When someone says he can see the meaning of a response, he means that he can infer some of the variables of which the response is usually a function. (Skinner, 1957, p. 14, also cf. Skinner, 1953, pp. 36, 88)

After 1945, Skinner was advancing a probabilistic three-term contingency view of meaning if not always consistently (Moxley, 1998a).

### ***Skinner’s Expanded Consideration of Contexts in 1945***

In reference to whatever would come under the heading of private events, Skinner (1945/1972, p. 383) introduced the term *radical behaviorism* for the first time (Day, 1987, p. 19). In its narrower sense, *radical behaviorism* indicates the inclusion of private events in Skinner’s behaviorism. In its broader sense, the term is “often used to refer to the integrated conception of behaviorism associated directly with the thought and work of B. F. Skinner” (Day, 1980, p. 206). Skinner (1945/1972) stated his interest in addressing “a wider range of phenomena than do current streamlined treatments, particularly those offered by logicians (e.g., Carnap) interested in a unified scientific vocabulary” (p. 372). Carnap’s orientation is cited to indicate a difference from Skinner’s behaviorism instead of a similarity to it, as Skinner (1979/1984, pp. 149 & 161) had previously done. In addition, Skinner (1945/1972) used embracing concepts such as “circumstance” and “condition,” which indicated an interest in addressing more antecedent variables than “discriminative stimulus.” Unlike Watson, who refused to accept imaging,

## THE MODERN/POSTMODERN CONTEXT

Skinner (1945/1972) invited its acceptance, “Verbal behavior which is ‘descriptive of images’ must be accounted for in any adequate science of behavior” (p. 378).

Skinner’s views here have an interesting parallel with Peirce’s (e.g., 1911/1998, p. 457, 1907/1998, pp. 412-413) acceptance of images, his acceptance of thought as action, and his acceptance of potential behavior. Peirce (1907/1998) gave an example from personal experience to illustrate how imagined habits could “have power to influence actual behavior in the outer world” (p. 413):

I well remember when I was boy, and my brother Herbert . . . was scarce more than a child, one day, as the whole family were at table, some spirit from a “blazer,” or “chafing-dish,” dropped on the muslin dress of one of the ladies and was kindled; and how instantaneously he jumped up, and did the right thing, and how skillfully each motion was adapted to the purpose. I asked him afterward about it, and he told me that since Mrs. Longfellow’s death he had often run over in imagination all the details of what ought to be done in such an emergency. It was a striking example of a real habit produced by exercises in the imagination. (p. 413)

Henry Wadsworth Longfellow’s second wife died in 1861 after accidentally setting her dress on fire. Herbert imagined the conceivable actions that would quickly extinguish the fire and mentally rehearsed the actions that would be successful. Overt actions may have appeared at the muscular level for the first time when the opportunity presented itself.

In addition, Skinner saw thought as action or a rule for action in ways that were strikingly similar to Peirce’s views. In “How to Make Our Ideas Clear,” Peirce (1878/1992) said:

[S]ince belief is a rule for action, the application of which involves further doubt and further thought, at the same time that it is a stopping-place, it is also a new starting-place for thought. That is why I have permitted myself to call it thought at rest, although thought is essentially an action. . . . The essence of belief is the establishment of a habit; and different beliefs are distinguished by the different modes of action to which they give rise. (pp. 129-130)

Belief was a rule for action, and thought was essentially an action.

As Peirce (1931-1958, 5.397) did, Skinner (1974) also considered potential behavior as a kind of action or as rules for action:

[O]ur knowledge *is* action, or at least rules for action . . . There is room in a behavioristic analysis for a kind of knowing short of action and hence short of power. One need not be actively behaving in order to feel or to introspectively observe certain states normally associated with behavior. (pp. 139-140)

Skinner’s first sentence of the above—when he says that “knowledge is action, or at least rules for action”—echoes in reverse order Peirce’s (1878/1992) “belief is a rule for action” and “thought is essentially an action” (p. 129).

Continuing his expansion of contextual considerations, Skinner (1984/1988, p. 471; 1986/1987, p. 201) expressed dissatisfaction with the term *discrimination*

for identifying all the variables he wanted to address with the first term of his three-term contingency. After exploring other terms, Skinner increased the frequency in which he used *setting* as the first term in his three-term contingency; for example, “Operant conditioning is studied in the laboratory by arranging complex and subtle relations among setting, behavior, and consequence” (1983/1997, p. 156, also cf. 1973, pp. 257-258, 1984/1988, p. 215 & p. 265, 1987/1989, p. 62). By using a highly inclusive term such as *setting* as the first term, Skinner brought the three-term contingency of *setting*, *behavior*, and *consequences* into closer alignment with Darwin’s (1859/1958) *conditions of life*, *variation*, and *selection*.

### ***Skinner’s Emphasis on Consequences in 1945***

Skinner’s three-term contingency in 1945 made consequences more conspicuous than they ever could be with his previous reflexological framework, and Skinner established what was for him a new role for consequences. In the 1930s, there was little to place Skinner in the pragmatic tradition. In 1945, Skinner advanced a pragmatic epistemology that stressed the importance of consequences:

The ultimate criterion for the goodness of a concept is not whether two people are brought into agreement but whether the scientist who uses the concept can operate successfully upon his material—all by himself if need be . . . this does not make agreement the key to workability. On the contrary, it is the other way round. (1945/1972, p. 383)

In addition, “[M]odern logic . . . can scarcely be appealed to by the psychologist” (Skinner, 1945/1972, p. 292). Rules do not underlie contingencies. Probabilistic contingencies underlie rules. This view extends to logic, and if it “invalidates our scientific structure from the point of view of logic and truth-value, then so much the worse for logic, which will also have been embraced by our analysis” (Skinner, 1945/1972, p. 380). As verbal behavior, logic was subject to Skinner’s probabilistic three-term contingency analysis. Skinner’s position in “The Operational Analysis of Psychological Terms” was referred to with approval by Dewey and Bentley (1947). This was the first time Skinner had expressed such overtly pragmatic views.

Skinner continued to emphasize the priority of establishing effects rather than truth: “So far as I am concerned, science does not establish truth or falsity; it seeks the most effective way of dealing with subject matters” (Skinner, 1984/1988, p. 241); and Skinner (1981) presented a general account for explanations in terms of consequences that replaced the causal explanations of classical mechanics:

Selection by consequences is a causal mode found only in living things, or in machines made by living things. It was first recognized in natural selection, but it also accounts for the shaping and maintenance of the behavior of the individual and the evolution of cultures. In all three of these fields, it replaces explanations based on the causal modes of classical mechanics. (p. 501)

## THE MODERN/POSTMODERN CONTEXT

Skinner saw shared similarities between the newer explanations for feedback mechanisms, natural selection, and operant behavior—in contrast to the older explanations of classical mechanics. His allegiance was now with these newer accounts.

In sum, that allegiance—in terms of probability, contexts, and consequences—can be seen as closely aligned, if not heavily indebted, to the views of Peirce: “The philosophy of radical behaviorism is a descendant of the pragmatism of C. S. Peirce” (Staddon, 2001, p. 96).

### Skinner’s Shift to Interpretation

Skinner’s selectionist turn was furthered by his shift from experimentation to interpretation and application. Historically, experimentation for the sake of theory has supported a theoretical reasoning that contrasts with the practical reasoning of interpretation for application. Jonsen and Toulmin (1988, p. 20) have traced the differences between the two reasonings to Aristotle’s distinction between *episteme* and *phronesis*, scientific understanding and practical wisdom. In the classical accounts, the theoretical fields were “idealized, atemporal and necessary” (p. 26) and well-illustrated in geometry:

1. They were “idealized” in the following sense. Concrete physical objects, cut out of metal in the shapes of triangles or circles, can never be made with perfect precision . . . so that they exemplify the truths of geometry only approximately. The idealized “straight lines” and “circles” of geometry, by contrast, exemplify such truths with perfect exactness.
2. They were “atemporal” in the following sense. Any geometrical theorem that is true at one time or on one occasion will be true at any time and on any occasion. . . .
3. Finally, theoretical arguments were “necessary” in a twofold sense. The arguments of Euclidean geometry depended for their validity both on the correctness of the initial axioms and definitions and on the inner consistency of the subsequent deductions. . . . (p. 27)

In modeling science on Euclidian geometry, scientists gave more prominence to antecedent postulates than to empirical consequences. In his scientific endeavors, for example, Descartes completely disregarded empirical consequences in some of his claims for natural laws (cf. Losee, 1972).

Practical arguments differed from theoretical ones by being *concrete*, *temporal*, and *presumptive*:

1. [T]he truth of practical statements rests on direct experience: abstraction or idealization do not protect them from experiential challenges.
2. Truths of practical experience . . . do not hold good “universally” or “at any time”: rather, they hold “on occasion” or “at this or that time moment” . . .
3. The presumptive conclusion is . . . open to doubt . . . reasonable conclusions based on the soundest presumptive arguments may, in practice, be upset. (Jonsen & Toulmin, 1988, pp. 27-28)

Empirical consequences played a role here: “[T]he consequences of the rival views will show up in fact, making it clear just how ‘objectively’ serious the differing implication of those judgments really were” (p. 41). Exact certainty, idealized decontextualization, and a neglect of consequences were opposed to probability, contextualization, and conspicuous consequences. This parallels the opposition between modernist and selectionist values.

In recent times the differences between theory and practice are seen in a closer relation, similar to the increasing closeness seen between science and technology (Moxley, 1989), and Jonsen and Toulmin (1988) see theoretical and practical reasoning represented along a spectrum:

At one extreme, some branches of mathematics still aspire to the classical ideal of geometry. Their goal is full “axiomatization,” by which theorems are linked into a single “deductive system” or piece of cohesive intellectual knitting. Moving along the spectrum, the branches of physics that have cosmological ambitions (e.g. particle physics or unified field theory) still refer in practice to concrete objects and situations and so are dependent on laboratory experiment and astronomical observation. The disciplines of biology lie further along the spectrum: biological theory does not aspire to the abstractness or universality of physical and chemical theory: rather, biologists select a specific “subject matter” and objects of study, using taxonomic keys and other identification techniques.

[T]oward the practical end of the spectrum are those activities the preeminent concern of which is to *change* the world rather than to *understand* it. Prime among these is clinical medicine: here we shall pay closest attention to the ways in which general physiological explanations . . . and clinical knowledge of particular cases . . . blend in the course of clinical practice . . . [T]his provides a powerful model . . . for analyzing the manner in which “theoretical” and “practical” considerations blend in the field of ethics as well. (p. 36)

Some blending might also be found in applying modern/postmodern distinctions.

By 1945, Skinner had begun to shift away from writing about laboratory experiments to writing about interpretations for application. That interpretation, Skinner’s radical behaviorism, can more easily be seen to follow from Peirce’s selectionist pragmatism than to follow from Skinner’s pre-1945 analyses of his experimental work, which was more closely aligned with the modernist values of positivism. Historically, practical endeavors have supported a focus on probability, contexts, and consequences. Reaching to the practical end of the above spectrum, Skinner’s radical behaviorism is not only a philosophy of behavior in an evolutionary, selectionist direction but a way of changing the world.

### **Skinner’s Explanation of His New Views**

Among the texts that Skinner (1989, pp. 121-122; Devine, Dissel, & Parrish, 1986, pp. 233-234) identified as influences upon him, none are plausible sources for the probabilistic three-term contingency, the acceptance of private events, or the overt emphasis on pragmatic principles that appeared in “The Operational



## THE MODERN/POSTMODERN CONTEXT

Analysis of Psychological Terms” (1945). At best, the texts Skinner identified can be seen as sources for some of Skinner’s earlier views, not for the new views he introduced later on. One reason that Skinner (Devine et al. 1986) gave for not identifying more than a half dozen “books that have been most important in leading me to my present position as a behaviorist” (p. 233) was the creativity that might be found in his work: “[A]fter all, if anything I have done is ‘creative,’ should we expect to find it in anything I have read” (p. 234)? The period from 1945 onward offered an extended opportunity for creativity to occur, and Skinner implies that any creativity that did appear beyond his experimental work was simply the product of interpretation and application. Speaking of how he wrote *Verbal Behavior*, Skinner (1979/1984) said

I had collected a lot of experimental data on verbal behavior—on how people learn strings of nonsense syllables, or the nonsense names of nonsense figures, and I had my own results on verbal summation, alliteration, and guessing. They began to clutter up the manuscript without adding much in the way of validation. They threw the book as a whole badly out of balance because I could not find experiments for the greater part of the analysis. I was still the empiricist at heart, but I did not think it would betray that position if my book were not a review of established facts. I was interpreting a complex field, using principles that had been verified under simple, controlled conditions. (p. 282; also cf. p. 150)

Skinner might have said that his previous experimental data on verbal behavior did not fit well in *Verbal Behavior* because that data had been collected and interpreted according to a modernist, reflexological framework which he had since rejected. Instead, Skinner credited the principles he had found from examining the data of his experimentation, and he did not address obvious objections to the adequacy of this account. For example, When was Skinner’s AB-because-of-C formulation dictated to him by his data when all the data from his previous experimentation had already been interpreted by him within a reflexological S-R framework? But this would have meant giving credit to others, and Skinner advanced the image of himself as a scientist who derived his principles and theory from the data of his empirical experimentation. Credit to others for helpful ideas, or for coordinate ideas that might look as though they could have been helpful, was not to be expected in the development of this image.

### Conclusion

Skinner’s emerging selectionism in 1945 was a turning point, but it has been obscured because it was not accompanied by an abrupt and complete abandonment of all of his modernist views (Moxley, 1999b). Skinner’s (1948) *Walden Two*, for example, is in the modernist tradition as are typical literary Utopias since Thomas More (cf. Gervereau, 2000; Kumar, 2000; Moxley, 1999a; Rouvillois, 2000). Literary Utopias have tended to emphasize fixed values rather than evolutionary ones: “Utopia pits itself against evolutionary principles; it is the antipode of

Darwinism” (Gervereau, 2000, p. 361). Nevertheless, over time, Skinner’s modernist views show a proportional decline as his postmodern selectionist views replaced them (cf. Moxley, 1997, 1998b, 1998a, 1999a, 1999b, 2001). Credit for this change may very well belong in part to Skinner’s reading and discussion of the views of C. S. Peirce.

### References

- Andery, M. A., Micheletto, N., & Serio, T. M. (1999, May). *Meaning and verbal behavior in Skinner’s work until 1957*. Paper presented at the meeting of the Association for Behavior Analysis, Chicago, IL.
- Appleman, P. (Ed.). (1979). *Darwin: A Norton critical edition* (2nd ed.). New York: W. W. Norton.
- Ashby, W. R. (1952). *Design for a brain*. New York: Wiley.
- Ayer, A. J. (1968). *The origins of pragmatism: Studies in the philosophy of Charles Sanders Peirce and William James*. San Francisco, CA: Freeman, Cooper & Co.
- Bacon, F. (1996). A confession of faith. In B. Vickers (Ed.), *Francis Bacon* (pp. 107-112). Oxford, England: Oxford University Press. (Original work published 1641)
- Bain, A. (1876). *The emotions and the will* (3rd. ed.). New York: Appleton.
- Baldwin, J. M. (1915). *Mental development in the child and the race: Methods and processes* (3rd. ed.). New York: Macmillan.
- Banham, R. (1967). *Theory and design in the first machine age* (2nd ed.). New York; Praeger.
- Barrow, J. D. (2000). Chance and determinism. In his *Between inner space and outer space: Essays on science art and philosophy* (pp. 120-125). Oxford, England: Oxford University Press.
- Best, S., & Kellner, D. (1997). *The postmodern turn*. New York, NY: The Guilford Press.
- Bjork, D. W. (1993). *B. F. Skinner: A life*. New York: Basic Books.
- Blanshard, B., & Skinner, B. F. (1966-1967). The problem of consciousness—a debate. *Philosophy and Phenomenological Research*, 27, 317-337.
- Bohm, D. (1988). Postmodern science and a postmodern world. In D. R. Griffin (Ed.), *The reenchantment of science: Postmodern proposals* (pp. 57-68). Albany, NY: State University of New York Press.
- Bohr, N. (1985). Light and life. In A. P. French & P. J. Kennedy (Eds.), *Niels Bohr: A centenary volume* (pp. 311-319). Cambridge, MA: Harvard University Press. (Original work published 1932)
- Branden, W. J. (2000). White on white. *Critical Inquiry*, 27, 90-121.
- Brosterman, N. (1997). *Inventing kindergarten*. New York: Abrams.
- Burgess, A. (1985). *The life and work of D. H. Lawrence: Flame into being*. New York: Arbor House.
- Campbell, D. T. (1956). Adaptive behavior from random response. *Behavioral Science*, 1, 105-110.
- Campbell, D. T. (1959). Methodological suggestions from a comparative psychology of knowledge processes. *Inquiry*, 2, 152-182.

## THE MODERN/POSTMODERN CONTEXT

- Campbell, D. T. (1960). Blind variation and selective retention in creative thought as in other knowledge processes. *Psychological Review*, 67, 380-400.
- Campbell, D. T. (1974). Evolutionary epistemology. In P. A. Schilpp (Ed.), *The philosophy of Karl Popper* (Vol. I, pp. 413-463). La Salle, IL: Open Court.
- Campbell, D. T. (1990). Epistemological roles for selection theory. In N. Rescher (Ed.), *Evolution, cognition, and realism: Studies in evolutionary epistemology* (pp. 1-19). Lanham, MD: University Press of America.
- Carnap, R. (1963). *The philosophy of Rudolph Carnap* (P. A. Schilpp, Ed.). La Salle, IL: Open Court.
- Carnap, R. (1967). *The logical structure of the world* (R. A. George, Trans.). Berkeley, CA: University of California Press. (Original work published 1929)
- Cassirer, E. (1956). *Determinism and indeterminism in modern physics* (O. T. Benfey, Trans.). New Haven, CT: Yale University Press. (Original work published 1936)
- Catania, A. C., & Harnad, S. (Eds.). (1988). *The selection of behavior: The operant behaviorism of B. F. Skinner: Comments and consequences*. Cambridge, MA: Cambridge University Press. (Original work published 1984)
- Coleman, S. R. (1985). B. F. Skinner, 1926-1928: From literature to psychology. *The Behavior Analyst*, 8, 77-92.
- Cummings, E. E. (1959). 100 Selected poems. New York: Grove Press.
- D'Alembert, J. (1995). *Preliminary discourse to the encyclopedia of Diderot* (R. N. Schwab, Trans.). Chicago, IL: University of Chicago Press. (Original work published 1751).
- Darwin, C. (1958). *The origin of species*. New York: Mentor. (Original work published 1859)
- Dasenbrook, R. W. (1992). Paul de Man: The modernist as fascist. In R. J. Golsan (Ed.), *Fascism, aesthetics, and culture* (pp. 229-241). Hanover, NH: University Press of New England.
- Day, W. F., Jr. (1980). The historical antecedents of contemporary behaviorism. In R. W. Rieber & K. Salzinger (Eds.), *Psychology: Theoretical-historical perspectives* (pp. 203-262). New York: Academic Press.
- Day, W. F. (1987). What is radical behaviorism? In S. Modgil & C. Modgil (Eds.), *B. F. Skinner: Consensus and controversy* (pp. 13-39). Philadelphia, PA: Falmer Press.
- DeGrandpre, R. J. (2000). A science of meaning: Can behaviorism bring meaning to psychological science? *American Psychologist*, 55, 721-739.
- Devine, C. M., Dissel, C. M., & Parrish, K. D. (Eds.). (1986). *The Harvard guide to influential books: 113 Distinguished Harvard professors discuss the books that have helped to shape their thinking*. New York: Harper & Row.
- Dewey, J., & Bentley, A. (1947). "Definition." *The Journal of Philosophy*, 44, 282-306.
- Donahoe, J. W., & Palmer, D. C. (1994). *Learning and complex behavior*. Boston, MA: Allyn and Bacon.
- Du Bois-Reymond, E. (1874). The limits of our knowledge of nature. *Popular Science Monthly*, 5, 17-32. (Original work published 1872)
- Eco, U. (1997). *The search for the perfect language*. Oxford, England: Blackwell.
- Eiseley, L. (1979). The intellectual antecedents of the descent of man. In his *Darwin and the mysterious Mr. X* (pp. 209-219). New York: E. P. Dutton.
- Eliot, T. S. (1921). London letter. *The Dial*, 71, 452-455.
- Ferris, T. (1997). *The whole shebang: A state-of-the-universe(s) report*. New York: Simon & Schuster.

- Fetzer, J. H. (1993). Peirce and propensities. In E. C. Moore (Ed.), *Charles S. Peirce and the philosophy of science: Papers from the Harvard sesquicentennial congress* (pp. 60-71). Tuscaloosa, AL: The University of Alabama Press.
- Fishman, D. B. (1999). *The case for pragmatic psychology*. New York University Press.
- Frankl, P. T. (1928). Just what is this modernistic movement? *Arts and Decoration*, 29(1), 56-57, 108, 117-118.
- Frege, G. (1980). *The foundations of arithmetic* (2nd ed., J. L. Austin, Trans.). Evanston, IL: Northwestern University Press. (Original work published 1884).
- Galison, P. (1990). Aufbau/Bauhaus: Logical positivism and architectural modernism. *Critical Inquiry*, 16, 709-752.
- Galison, P. (1994). The ontology of the enemy: Norbert Wiener and the cybernetic vision. *Critical Inquiry*, 21, 228-266.
- Galison, P. (1998). Judgment against objectivity. In C. A. Jones & P. Galison (Eds.), *Picturing science producing art* (pp. 327-359). New York: Routledge.
- Gervereau, G. (2000). Utopia challenged by its representations. In R. Schaer, G. Claeys, & L. T. Sargeant (Eds.), *Utopia: The search for the ideal society in the Western world* (pp. 357-367). New York: Oxford University Press.
- Gilbert, S. (1929). Functions of words. *Transition*, 18, 203-205.
- Glanz, J., & Overbye, D. (2001, August 15). Anything can change, it seems, even an immutable law of nature. *The New York Times*, pp. A1, A18.
- Habermas, J. (1981). Modernity versus postmodernity. *New German Critique*, 22, 3-14.
- Hacking, I. (1975). *The emergence of probability*. Cambridge, England: Cambridge University Press.
- Hacking, I. (1987). Was there a probabilistic revolution 1800-1930? In L. Krüger, L. J. Daston, & M. Heidelberger (Eds.), *The probabilistic revolution* (Vol. 1., pp. 45-55). Cambridge, MA: The MIT Press.
- Hanson, N. R. (1955). Causal chains. *Mind*, 64, 289-311.
- Heisenberg, W. (1972). *Physics and beyond* (A. J. Pomerans, Trans.). New York: Harper & Row.
- Hemingway, E. (1999). *Ernest Hemingway on writing* (L. W. Phillips, Ed.). New York: Touchstone.
- Herf, J. (1984). *Reactionary modernism*. Cambridge, England: Cambridge University Press.
- Hilgard, E. R. (1939). [Review of Skinner's book *The Behavior of Organisms*]. *Psychological Bulletin*, 36, 121-125.
- Houser, N. (1998). Introduction. In N. Houser, J. R. Eller, A. C. Lewis, A. D. Tienne, C. L. Clark, & D. B. Davis (Eds.), *The essential Peirce: Selected philosophical writings: Vol. 2 (1893-1913)* (pp. xvii-xxxviii). Bloomington, IN: Indiana University Press.
- Honig, W. K. (1988). On the stabilization of behavioral selection. In A. C. Catania & S. Harnad (Eds.), *The selection of behavior: The operant behaviorism of B. F. Skinner: Comments and consequences* (pp. 48-49). Cambridge, MA: Cambridge University Press. (Original work published 1984)
- Huxley, A. (1939). *Crome yellow*. New York: Harper & Row. (Original work published 1922)
- Huxley, T. H. (1929). Science and morals. In his *Evolution and ethics and other essays: Collected essays: Vol. IX* (pp. 117-146). New York: D. Appleton. (Original work published 1886).
- James, W. (1992). On some omissions of introspective psychology. In G. E. Myers (Ed.), *William James: Writings 1878-1899* (pp. 986-1013). New York: The Library of America. (Original work published 1884)

## THE MODERN/POSTMODERN CONTEXT

- Jammer, M. (1966). *The conceptual development of quantum mechanics*. New York: McGraw-Hill.
- Janik, A., & Toulmin, S. (1973). *Wittgenstein's Vienna*. New York: Touchstone.
- Jonsen, A. R., & Toulmin, S. (1988). *The abuse of casuistry: A history of moral reasoning*. Berkeley, CA: University of California Press.
- Joyce, J. (1999). *Finnegan's wake*. London, England: Penguin. (Original work published 1939)
- Ketner, K. L. (1998). Introduction to the Bison books edition. In M. R. Cohen (Ed.), *Chance, love, and logic: Philosophical essays: Charles Sanders Peirce* (pp. v-xiii). Lincoln, NE: University of Nebraska Press.
- Knowlson, J. (1975). *Universal language schemes in England and France 1600-1800*. Toronto, Canada: University of Toronto Press.
- Kragh, H. (1996). *Cosmology and controversy: The historical development of two theories of the universe*. Princeton, NJ: Princeton University Press.
- Kumar, K. (2000). Utopia and anti-Utopia in the twentieth century. In R. Schaer, G. Claeys, & L. T. Sargeant (Eds.), *Utopia: The search for the ideal society in the Western world* (pp. 251-267). New York: Oxford University Press.
- Laplace, P. S. (1951). *A philosophical essay on probabilities* (F. W. Truscott & F. L. Emory, Trans.). New York: Dover. (Original work published 1814)
- Lawrence, D. H. (1915). *The rainbow*. New York: Random House.
- Lawrence, D. H. (1921). Sea and Sardinia. *The Dial*, 71, 441-451.
- Lawrence, D. H. (1976). *Women in love*. New York: Penguin Books. (Original work published 1920).
- Lawrence, D. H. (1997). *Kangaroo*. London, England: Penguin. (Original work published 1923)
- Leitner, B. (1995). *The architecture of Ludwig Wittgenstein*. London, England: Academy Editions.
- Lewis, W. (1963). *The letters of Wyndham Lewis* (W. K. Rose, Ed.). Norfolk, CT: New Directions.
- Lewis, W. (1982). *Blasting and bombardiering*. London, England: John Calder. (Original work published 1937)
- Lewis, W. (1987). *Men without art* (S. Cooney, Ed.). Santa Rosa, CA: Black Sparrow Press. (Original work published 1934)
- Lewis, W. (1990). *Tarr*. Santa Rosa, CA: Black Sparrow Press. (Original work published 1918)
- Lewis, W. (1993). *Time and Western man*. Santa Rosa, CA: Black Sparrow Press. (Original work published 1927)
- Losee, J. (1972). *A historical introduction to the philosophy of science*. Oxford, England: Oxford University Press.
- Moxley, R. A. (1989). Some historical relationships between science and technology with implications for behavior analysis. *The Behavior Analyst*, 12, 45-57.
- Moxley, R. (1991). Should behavior analysts accept Imam's sense of teleology? *The Behavior Analyst* 14, 225-228.
- Moxley, R. (1995). Myths of meaning: Response to Reese (1994). *The Behavior Analyst*, 18, 363-365.
- Moxley, R. A. (1996). The Import of Skinner's three-term contingency. *Behavior and Philosophy* 24, 145-167.
- Moxley, R. A. (1997). Skinner: From determinism to random variation. *Behavior and Philosophy*, 25, 3-28.

## MOXLEY

- Moxley, R. A. (1998a). Skinner: From essentialist to selectionist meaning. *Behavior and Philosophy* 25, 95-119.
- Moxley, R. A. (1998b). Why Skinner is difficult. *The Behavior Analyst*, 21, 73-91.
- Moxley, R. (1999a). H. G. Wells and B. F. Skinner on the superorganism. *The Behavior Analyst* 22, 131-148.
- Moxley, R. A. (1999b). The two Skinners: Modern and postmodern. *Behavior and Philosophy*, 27, 97-125.
- Moxley, R. A. (2001). Sources for Skinner's pragmatic selectionism in 1945. *The Behavior Analyst*.
- Neurath, O. (1959). Protocol sentences. In A. J. Ayer (Ed.), *Logical positivism* (pp. 199-208). New York: The Free Press. (Original work published 1931-32)
- Neurath, O. (1983). Physicalism: The philosophy of the Viennese circle. In R. Cohen & M. Neurath (Eds.), *Otto Neurath: Philosophical papers 1913-1946* (pp. 48-51). Dordrecht, Holland: D. Reidel. (Original work published 1931)
- Neurath, O. (1983). Physicalism and the investigation of knowledge. In R. Cohen & M. Neurath (Eds.), *Philosophical papers 1913-1946* (pp. 159-171). Dordrecht, Holland: D. Reidel. (Original work published 1936)
- Neurath, O. (1983). Universal jargon and terminology. In R. S. Cohen & M. Neurath (Eds.), *Otto Neurath: Philosophical papers 1913-1946* (pp. 213-229). Dordrecht, Holland: D. Reidel. (Original work published 1941)
- Ogden, C. K., & Richards, I. A. (1989). *The meaning of meaning*. New York: Harcourt Brace Jovanovich. (Original work published 1923)
- Peirce, C. S. (1931-1958). *Collected papers of Charles Sanders Peirce* (C. Hartshorne, P. Weiss, & A. Burks, Eds., Vols. 1-8). Cambridge, MA: Belknap.
- Peirce, C. S. (1985). Hume's arguments against miracles, and the idea of natural law. In C. Eisele (Ed.), *Historical perspectives on Peirce's logic of science* (pp. 904-912). New York: Mouton.
- Peirce, C. S. (1986). Logic. Chapter I. Thinking as cerebration. In *Writings of Charles S. Peirce: A chronological edition: Vol. 4: 1879-1884* (pp. 45-46). Bloomington, IN: Indiana University.
- Peirce, C. S. (1992). How to make our ideas clear. In N. Houser & C. Kloesel (Eds.), *The essential Peirce: Selected philosophical writings: Volume 1 (1867-1893)* (pp. 124-141). Bloomington, IN: Indiana University Press. (Original work published 1878)
- Peirce, C. S. (1992). A guess at the riddle. In N. Houser & C. Kloesel (Eds.), *The essential Peirce: Selected philosophical writings: Volume 1 (1867-1893)* (pp. 245-279). Bloomington, IN: Indiana University Press.
- Peirce, C. S. (1998). The first rule of logic. In N. Houser, J. R. Eller, A. C. Lewis, A. D. Tienne, C. L. Clark, & D. B. Davis (Eds.), *The essential Peirce: Selected philosophical writings: Volume 2 (1893-1913)* (pp. 42-56). Bloomington, IN: Indiana University Press. (Original lecture delivered 1898)
- Peirce, C. S. (1998). Pragmatism as the logic of abduction. In N. Houser, J. R. Eller, A. C. Lewis, A. D. Tienne, C. L. Clark, & D. B. Davis (Eds.), *The essential Peirce: Selected philosophical writings: Volume 2 (1893-1913)* (pp. 226-241). Bloomington, IN: Indiana University Press. (Original work published 1903)
- Peirce, C. S. (1998). Pragmatism. In N. Houser, J. R. Eller, A. C. Lewis, A. D. Tienne, C. L. Clark, & D. B. Davis (Eds.), *The essential Peirce: Selected philosophical writings: Volume 2 (1893-1913)*, pp. 398-433. Bloomington, IN: Indiana University Press. (Original work written 1907)
- Peirce, C. S. (1998). A sketch of logical critics. In N. Houser, J. R. Eller, A. C. Lewis, A. D. Tienne, C. L. Clark, & D. B. Davis (Eds.), *The essential Peirce: Selected*

## THE MODERN/POSTMODERN CONTEXT

- philosophical writings: Volume 2 (1893-1913)* (pp. 451-462). Bloomington, IN: Indiana University Press. (Original work published 1911)
- Peirce, C. S. (1998). *Chance, love, and logic* (M. Cohen, Ed.). Lincoln, NE: University of Nebraska Press. (Original work published 1923)
- Popper, K. R. (1995). *A world of propensities*. Bristol, England: Thoemmes.
- Pound, E. (1921). Paris letter. *The Dial*, 71, 456-463.
- Reza, Y. (1996). "Art" (C. Hampton, Trans.). New York: Faber and Faber. (Original work published 1988)
- Rossi, P. (2000). *Logic and the art of memory: The quest for a universal language*. Chicago, IL: The University of Chicago Press.
- Rouvillois, F. (2000). Utopia and totalitarianism. In R. Schaer, G. Claeys, & L. T. Sargeant (Eds.), *Utopia: The search for the ideal society in the Western world* (pp. 316-332). New York: Oxford University Press.
- Russell, B. (1918). The philosophy of logical atomism. *The Monist*, 28, 495-527.
- Russell, B. (1919). On propositions: What they are and how they mean. *Aristotelian Society, Supplementary Volume II*, 1-43.
- Russell, B. (1925). *What I believe*. New York: E. P. Dutton.
- Russell, B. (1926). Review of *The meaning of meaning*. *Dial*, 81, 114-121.
- Russell, B. (1941). The ancestry of fascism. In his *Let the people think* (pp. 61-79). London: Watts. (Original work published 1935)
- Russell, B. (1970). *An outline of philosophy*. London: George Allen & Unwin. (Original work published 1927)
- Russell, B. (1981). Mysticism and logic. In his *Mysticism and logic* (pp. 9-30). Totowa, NJ: Barnes & Noble. (Original work published 1914)
- Russell, B. (1981). Introduction. In L. Wittgenstein, *Tractatus logico-philosophicus* (C. K. Ogden, Trans., pp. 7-23). London: Routledge & Kegan Paul. (Original work published 1922)
- Russell, B. (1992). *Human knowledge*. London: Routledge. (Original work published 1948)
- Scharff, J. L. (1982). Skinner's concept of the operant: From necessitarian to probabilistic causality. *Behaviorism*, 10(1), 45-54.
- Scharff, J. L. (1999). Skinner's reinforcement theory. *Behavior and Philosophy*, 27, 1-17.
- Sidgwick, A. (1901). *The use of words in reasoning*. London: Adams and Charles Black.
- Simpson, J. A., & Weiner, E. S. C. (1989). *The Oxford English Dictionary* (2nd ed.). Oxford, England: Clarendon Press.
- Skagestad, P. (1978). Taking evolution seriously: Critical comments on D. T. Campbell's Evolutionary Epistemology. *The Monist*, 61, 611-621.
- Skinner, B. F. (1932). Drive and reflex strength. *The Journal of General Psychology*, 6, 22-37.
- Skinner, B. F. (1936). The verbal summator and a method for the study of latent speech. *The Journal of Psychology*, 2, 71-107.
- Skinner, B. F. (1937). The distribution of associated words. *The Psychological Record*, 1, 71-76.
- Skinner, B. F. (1941). A quantitative estimate of certain types of sound-patterning in poetry. *The American Journal of Psychology*, 54, 64-79.
- Skinner, B. F. (1947). Experimental psychology. In W. Dennis, B. F. Skinner, R. R. Sears, E. L. Kelly, C. Rogers, J. C. Flanagan, C. T. Morgan, & R. Likert (Eds.), *Current trends in psychology* (pp. 16-49). Pittsburgh, PA: University of Pittsburgh Press.
- Skinner, B. F. (1948). *Walden two*. New York: Macmillan.
- Skinner, B. F. (1953). *Science and human behavior*. New York: The Free Press.

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- Skinner, B. F. (1956). Critique of psychoanalytic concepts and theories. In H. Feigl & M. Scriven (Eds.), *The foundations of science and the concepts of psychology and psychoanalysis* (Vol. I, pp. 77-87). Minneapolis, MN: University of Minnesota Press.
- Skinner, B. F. (1957). *Verbal behavior*. New York: Appleton-Century-Crofts.
- Skinner, B. F. (1961). Concept-formation in philosophy and psychology. In S. Hook (Ed.), *Dimensions of mind* (pp. 204-207). New York: Collier Books.
- Skinner, B. F. (1966). *The behavior of organisms*. New York: Englewood Cliffs, NJ: Prentice-Hall. (Original work published 1938)
- Skinner, B. F. (1972). The concept of the reflex in the description of behavior. *Cumulative record* (3rd ed., pp. 429-457). New York: Appleton-Century-Crofts. (Original work published 1931)
- Skinner, B. F. (1972). Has Gertrude Stein a secret? In his *Cumulative Record* (3rd ed., pp. 357-369). New York: Appleton-Century-Crofts. (Original work published 1934)
- Skinner, B. F. (1972). The generic nature of the concepts of stimulus and response. In his *Cumulative record* (3rd ed., pp. 458-478). New York: Appleton-Century-Crofts. (Original work published 1935)
- Skinner, B. F. (1972). Two types of conditioned reflex: A reply to Konorski and Miller. In his *Cumulative record* (3rd ed., pp. 489-497). New York: Appleton-Century-Crofts. (Original work published 1937)
- Skinner, B. F. (1972). The operational analysis of psychological terms. In his *Cumulative record* (3rd ed., pp. 370-384). New York: Appleton-Century-Crofts. (Original work published 1945)
- Skinner, B. F. (1972). Are theories of learning necessary? In his *Cumulative record* (3rd ed., pp. 69-100). New York: Appleton-Century-Crofts. (Original work published 1950)
- Skinner, B. F. (1973). Answers for my critics. In H. Wheeler (Ed.), *Beyond the punitive society* (pp. 256-266). San Francisco: Freeman.
- Skinner, B. F. (1974). *About behaviorism*. New York: Alfred A. Knopf.
- Skinner, B. F. (1977). *Particulars of my life*. New York: McGraw-Hill. (Original work published 1976)
- Skinner, B. F. (1978). The experimental analysis of behavior (a history). In *Reflections on behaviorism and society* (pp. 113-126). Englewood Cliffs, NJ: Prentice-Hall. (Original work published 1977)
- Skinner, B. F. (1979). Interview with B. F. Skinner. *Behaviorists for Social Action*, 2, 47-52.
- Skinner, B. F. (1980). *Notebooks* (R. Epstein, Ed.). Englewood Cliffs, NJ: Prentice-Hall.
- Skinner, B. F. (1981). Selection by consequences. *Science*, 213, 501-504.
- Skinner, B. F. (1984). *The shaping of a behaviorist*. Washington Square, NY: New York University Press. (Original work published 1979)
- Skinner, B. F. (1984). *A matter of consequences*. New York: New York University Press. (Original work published 1983)
- Skinner, B. F. (1987). The evolution of behavior. In his *Upon further reflection* (pp. 65-74). Englewood Cliffs, NJ: Prentice-Hall. (Original work published 1984)
- Skinner, B. F. (1987). Some thoughts about the future. In his *Upon further reflection* (pp. 193-206). Englewood Cliffs, NJ: Prentice-Hall. (Original work published 1986)
- Skinner, B. F. (1989). Whatever happened to psychology as the science of behavior? In his *Recent issues in the analysis of behavior* (pp. 59-71). Columbus, OH: Merrill. (Original work published 1987)
- Skinner, B. F. (1989). The behavior of organisms at 50. In his *Recent issues in the analysis of behavior* (pp. 121-135). Columbus, OH: Merrill.



## THE MODERN/POSTMODERN CONTEXT

- Skinner, B. F. (1997). Appendix. In B. F. Skinner & M. E. Vaughan, *Enjoy old age* (pp. 155-157). New York: W. W. Norton. (Original work published 1983)
- Slaughter, M. M. (1982). *Universal languages and scientific taxonomy in the seventeenth century*. Cambridge, England: Cambridge University Press.
- Smolin, L. (1997). *The life of the cosmos*. New York: Oxford University Press.
- Solomons, L. M., & Stein, G. (1896). Normal motor automatism. *Psychological Review*, 3, 492-512.
- Staddon, J. R. (2001). *The new behaviorism: Mind, mechanism, and society*. Philadelphia, PA: Psychology Press.
- Symons, J. (1987). *Makers of the new: The revolution in literature, 1912-1939*. London, England: André Deutsch.
- Thagard, P. (1980). Against evolutionary epistemology. *PSA; Proceedings Of the Biennial Meeting Of the Philosophy Of Science Association*, 1, 187-196.
- Tichi, C. (1987). *Shifting gears: Technology, literature, culture in modernist America*. Chapel Hill, NC: The University of North Carolina Press.
- Toulmin, S. (1958). *The uses of argument*. Cambridge, United Kingdom: Cambridge University Press.
- Toulmin, S. (1982). *The return to cosmology: Postmodern science and the theology of nature*. Berkeley, CA: University of California Press.
- Toulmin, S. (1990). *Cosmopolis: The hidden agenda of modernity*. Chicago, IL: University of Chicago Press.
- Toulmin, S. (2001). *Return to reason*. Cambridge, MA: Harvard University Press.
- Wächtershäuser, G. (2000, August 25). Life as we don't know it. *Science*, 289(5483), 1307-1308.
- Watson, J. B. (1924). *Psychology from the standpoint of a behaviorist* (2nd ed.). Philadelphia, PA: Lippincott.
- Watson, J. B. (1970). *Behaviorism*. New York: W. W. Norton. (Original work published 1924)
- Whewell, W. (1984). Selected writings on the history of science (Y. Elkana, Ed.). Chicago: University of Chicago Press. (Original work published 1847)
- Wiener, P. P. (1949). *Evolution and the founders of pragmatism*. Cambridge, MA: Harvard U. Press.
- Wittgenstein, L. (1981). *Tractatus Logico-Philosophicus* (C. K. Ogden, Trans.). London, England: Routledge & Kegan Paul. (Original work published, 1922)
- Wolin, R. (Ed.). (1993). *The Heidegger controversy*. Cambridge, MA: The MIT Press.
- Wood, W. S. (1996). Bertrand Russell's review of the meaning of meaning. In A. C. Catania & P. N. Himeline (Eds.), *Variations and selections* (pp. 609-610). Bloomington, IN: Society for the Experimental Analysis of Behavior. (Original work published 1986)