Ernst Mach and B. F. Skinner:
Their Similarities with Two
Traditions for Verbal Behavior

Roy A. Moxley
West Virginia University

Ernst Mach is most closely associated with a positivism that demanded a language of close contact with reality. Mach linked this view with the tradition of the quest for an ideal language in which meaning is a property of a word. Logical positivism and the S-R psychology of the early B. F. Skinner also participated in this ideal-language positivism. In addition, Mach showed an affinity with another tradition—a pragmatic-selectionist tradition—although that tradition and Mach's similarities with it were not as well developed. Mach showed no difficulty in jointly maintaining both of these traditions although they have been regarded as deeply incompatible. When the later Skinner adopted a pragmatic selectionism for his later views on verbal behavior, he rejected his earlier views that were aligned with S-R psychology as well as with logical positivism and its sympathizers. Nevertheless, some statements consistent with "meaning is a property of a word" remained for some time in Skinner's writing.

Key words: essentialism, Ernst Mach, meaning, positivism, pragmatism, selectionism, B. F. Skinner

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The views of Ernst Mach are helpful in understanding the development of Skinner's early and later views on verbal behavior. Day (1980) said, "An understanding of Mach is enormously important for an understanding of Skinner" (p. 227) and cited Baum (1979, personal communication) as saying, "There are several either mysterious or controversial aspects to Skinner's thinking that become understandable on reading Mach . . . [Skinner] has told me himself . . . how profoundly he was influenced by reading Mach's *Science of Mechanics*" (p. 227). Skinner (1979/1984) wrote of this influence,

I began to treat the reflex on the model of Ernst Mach's *Science of Mechanics* . . . The philosophers of the Vienna Circle . . . were taking a rather similar line and calling it logical positivism, and Russell, who had introduced me to behaviorism, had been influenced by another . . . Viennese, Ludwig Wittgenstein. Somewhere Russell had said that the term "reflex" in physiology had the same status as the term "force" in physics. (pp. 66–67)

The reflex, Mach, logical positivism,

Address correspondence to Roy A. Moxley, 604 Allen Hall, P.O. Box 6122, West Virginia University, Morgantown, West Virginia 26506 (e-mail: rmoxley@wvu.edu).

Russell, the early Wittgenstein, and physics were all connected in this influence.

However, all the views of Mach and Skinner were not all confined to one compatible tradition. One side of Mach (1905/1976) reflected the ideal-language tradition and positivism. That side looked to a unified, economical language in close contact and certain relations with reality (or as certain as they could confidently be claimed). Prescriptively, most if not all word forms were to be connected with a single, definite meaning. The early Skinner cited writers in the ideal language and positivist tradition with favor (e.g., Bacon, Mach, Russell, Carnap) and adopted positions consistent with them. The other side of Mach was biological and reflected the contexts and consequences of Darwin's natural selection and its philosophical similarities with pragmatism. In this descriptive tradition, meaning developed naturalistically and changed for different contexts and consequences. The later Skinner aligned himself more closely with that tradition, as indicated in his later favorable references to Darwin and

Peirce and unfavorable references to Russell and Carnap.

The following addresses similarities between the ideal-language positivism that Mach participated in and Skinner's early views of verbal behavior as well as between Mach's pragmatic-selectionist side and Skinner's later views of verbal behavior. Although the verification theories of positivism and pragmatism may appear to have a resemblance in their appeal to what is done at a practical level (Wilson, 1995), the pragmatist Lewis saw the difference as "very deep" (cited by Wilson, p. 135), and Peirce's (e.g., 1893/1975, 1898/1992) comments on Mach and positivism do not support their compatibility. Furthermore, the pragmatic tradition advanced probabilistic relations instead of the invariable relations advanced by ideal-language positivism.

MACH'S POSITIVISM

Mach's (1883/1960) sensationalist positivism was conspicuous in *The Science of Mechanics* as well as other writings:

Nature is composed of sensations as its elements. . . . The first and oldest words are names of "things." . . . The thing is an abstraction, the name a symbol, for a compound of elements. . . . Properly speaking the world is not composed of "things" as its elements, but of colors, tones, pressures, spaces, times, in short what we ordinarily call individual sensations. (p. 579)

This view was widely shared by others. Abbagnano (cited in Blackmore, 1972) said,

The sense-impressions spoken of by Pearson, and the sensations spoken of by Mach, Avenerius, and Petzoldt as neutral elements that constitute all the facts of the world, both physical and psychical, correspond exactly to the objects (Gegenstande) spoken of by Ludwig Wittgenstein in his *Tractatus Logico-Philosophicus* as the constituents of atomic facts and to the elementary experiences (Elementarerlebnisse) spoken of by Rudolph Carnap in *Der Logische Aufbau der Welt.* (p. 185)

If these assumed fundamental sensations were connected by logic or mathematics, then a highly certain or positive system of the world was supposed to be given.

Mach (1883/1960) thought this could be realized with language reform to "clear up ideas, expose the real significance of the matter, and get rid of metaphysical obscurities" (p. xxii). Doing so required a precise language: "I have not in every case been able to avoid the use of the abbreviated and precise terminology of mathematics. . . . The language of everyday life has not yet grown to be sufficiently accurate" (p. xxiii). For example, *cause* was a functional relation to be looked at "in a mathematical light, and make it clear to ourselves that all that is valuable to us is the discovery of *functional relations*, and that what we want to know is merely the dependence of experiences on one another" (p. 35). The goal was finding one-to-one correspondences.

Mach's (1882/1986) forecast for science shows his views on language were in the ideal language tradition and its goal of a universal real character that approached one-to-one correspondence between word and reference in reality:

There is scarcely a doubt that science itself will realise that grand old dream of the philosophers of a Universal Real Character. . . . The logical extension of what we have, joined with a use of the ideas which the Chinese ideography furnishes us, will render the special invention and promulgation of a Universal Character wholly superfluous. (p. 192)

We were well on the way to acquiring such a language, illustrated in Chinese ideographs:

Numerals, algebraic signs, chemical symbols, musical notes, phonetic alphabets, may be regarded as parts already formed of this universal character of the future. . . . In Chinese writing, we have an actual example of a true ideographic language . . . everywhere carrying *the same meaning* [italics added]. . . . But universality would not be the sole merit of such a character; since to read it would be to understand it. (Mach, 1883/1960, p. 578)

In an ideal language, each word would have an essential meaning with an unambiguous reference to reality. Meaning would therefore be a property of the form of the word. Mach (1886/1986) insisted on the importance "that

people should associate with the sign the precise idea that is designated by it," the "correct" idea (pp. 342–343).

A "universal language" with words that conveyed "the same meaning" to everyone who read them would also show the relations between them in an exact way. This meant mathematical connections: "The aim of research is the discovery of the equations which subsist between the elements of phenomena" (Mach, 1883/1960, p. 205). Background for this universal or ideal language tradition will be given next in some detail. Much of the views of Mach and the early Skinner are understandable in terms of this tradition.

The Ideal Language Tradition in which Mach Participated

During the unusual political, social, and economic instability that characterized mid-17th century Europe (Parker & Smith, 1978), the desire for more order included ways to make language itself more orderly by finding or creating an ideal language. According to Mungello (1998), the search for an ideal or universal language had its roots in efforts to recover the primitive, uncorrupted language that existed before the Tower of Babel:

By the 1670s a growing number of European scholars were arguing that it was not possible to reconstruct the Primitive Language and that they should devote their efforts instead to creating a new universal language using the criteria attributed to the Primitive Language, namely, simplicity, generality, modesty of expression, vitality, and brevity. . . . The search for a universal language was based upon a widespread linguistic premise that it was possible to discover Real Characters, that is, symbols and sounds whose representation of things and ideas was natural, or "real," rather than conventional. This meant that the representation of a word should be based upon the nature of things rather than upon human invention. Such a premise lies at the heart of the first seventeenth-century proposal for a universal language put forth by Francis Bacon. (pp. 92–93)

Bacon (1620/1960)—Skinner (1983/1984) once described himself as "thoroughly Baconian" (p. 406)—complained about words that could not be "reduced to any constant meaning" (p.

57) and identified good and bad words: "the notion of chalk and of mud is good, of earth bad" (p. 58; also cf. Rossi, 2000, pp. 145–150); and numerous prominent men gave serious consideration to proposals for an ideal or universal language (Knowlson, 1975, pp. 9, 22, 37; Slaughter, 1982).

Rossi (2000) found "The views of Seth Ward—professor of astronomy at Oxford—are typical" (p. 151) of those who saw advantages in language as a kind of calculus:

With "the help of Logick and Mathematicks" all discourses could be "resolved in sentences," and these sentences into words, and—since words are either simple notions or . . . resolvable into simple notions—once you had discovered the simplest concepts and assigned symbols to them, it would be possible to develop a rigorous, demonstrative discourse which would reveal "the natures of things." (p. 151)

Mathematics was a widely invoked model for the perfection of language (Rider, 1990). Further, for Hobbes (1651/1985, pp. 110–111), reasoning itself was arithmetical, and this premise was translated into recommendations for language that were shared by others:

[Hobbes's] desire to purge language of "ambiguity," to expel metaphor and outlaw neologistic "phrasing" . . . was shared by the reforming intellectuals of the Wilkins group. . . . Wilkins counterposed the simplicity and functional clarity of his invented "philosophical [i.e., scientific] language" against the "ambiguity of words by reason of Metaphor and Phraseology." (Davies, 1987, p. 86)

Sprat (1667/1958) of the Royal Society wanted to review all the words in English for their acceptability and said the Society acted "to return back to the primitive purity, and shortness, when men deliver'd so many *things*, almost in an equal number of *words*" (p. 113).

Not everyone, however, was sympathetic to the idea that words should have univocal or essential meanings. Commenting on the reification of essences related to such thinking, Locke (1667/1975) said that the concept of "*Essences*, as a certain number of Forms or Molds, wherein all natural Things . . . are cast, and do equally par-

take, has ... very much perplexed the Knowledge of Natural Things" (3.3.17, p. 418); and he objected, "The *supposition of Essences, that cannot be known*; and the making them nevertheless to be that, which distinguishes the Species of Things, *is so wholly useless*, and unserviceable to any part of our Knowledge" (3.3.17, p. 418). Further,

To require that Men should use their words constantly in the same sense, and for none but determined and uniform ideas, would be to think, that all Men should have the same Notions, and should talk of nothing but what they have clear and distinct Ideas of. (3.11.2, p. 509)

Wittgenstein (1922) took this position quite seriously in his *Tractatus*, which was so influential among logical positivists, "Whereof one cannot speak, thereof one must be silent" (p. 189).

The Royal Society's program was also the apparent target of Swift's (1726/1967, pp. 230–231) satire. In Gulliver's voyage to Laputa, Gulliver found the professors at the Grand Academy (the Laputian equivalent of the Royal Society) engaged in projects for improving language. One project "was to shorten discourse by cutting polysyllables into one, and leaving out verbs and participles, because in reality all things imaginable are but nouns" (p. 230). Another project would have "all men to carry about them such *things* as were necessary to express the particular business they are to discourse on" (p. 230). A "great advantage" of this "was that it would serve as a universal language to be understood in all civilised nations" (p. 231).

Rivaling Swift's fancifulness, Leibniz proposed a route to a universal language through binary mathematics:

In responding to Leibniz's explanation of his binary system of mathematics, Boutvet [the China missionary] explained that the earliest forms of Chinese writing—the diagrams of Fu Xi—were composed of broken and whole lines which could represent the two basic units ("0" and "1") in a binary progression. This explanation reinforced Leibniz's belief in the possibility of fusing mathematics and language and was incorporated into his *Nouveaux essais*. (Mungello, 1998, p. 96)

In his binary system, seemingly pre-

scient for computers, Leibniz thought he had found the secret by which God had created the world "out of the units of zero (nothing) and one (God)" (p. 97).

Tooke, who was favorably commented on by Skinner, adopted a different tactic to find the perfect language: It was already contained in our natural language.

Tooke's solution ... is to let words stand for simple ideas (i.e. simple sense impressions). ... Most words are abbreviations: they stand as substitutes for one or more existing words. Thus, directly or indirectly (i.e. by means of abbreviation), every word stands for a simple idea. This is its meaning. ... To know what a word really means you must know the etymon from which it has, by processes of abbreviation and corruption been derived. (Harris & Taylor, 1989, pp. 146–149).

Not surprisingly, Tooke (1857) frequently criticized an author's use of a word: "Instances of the improper use of LEST may be found in almost every author that ever wrote in our language; because none of them had been aware of the true meaning of the word" (p. 717). Thus, those who did not know the true meaning of the words they spoke, presumably located univocally in the etymologies, were speaking in error. Tooke also held that what are called the mind's "operations are merely the operations of Language" (p. 25), a point included in Skinner's (1957, p. 343) quotation of Tooke.

Stewart (1810/1994, p. 161) pointed out a fundamental defect that applied to Tooke's approach and a fundamental defect in all essentialist views of meaning. Using the term *beautiful* as an example, Stewart (1810/1855) said, "It has long been a favourite problem with philosophers, to ascertain the common quality or qualities which entitle a thing to the denomination of beautiful" (p. 192). But is a common quality needed? Stewart (1810/1855) thought not.

[Suppose] A, B, C, D, E, denote a series of objects; that A possesses some one quality in common with B; B a quality in common with C; C a quality in common with D; D a quality in common with E;—while, at the same time, no qual-

ity can be found which belongs in common to any *three* objects in the series. Is it not conceivable, that the affinity between A and B may produce a transference of the name of the first to the second; and that, in consequence of the other affinities which connect the remaining objects together, the same name may pass in succession from B to C; from C to D; and from D to E? In this manner, a common appellation will arise between A and E, although the two objects may, in their nature and properties, be so widely distant from each other, that no stretch of imagination can conceive how the thoughts were led from the former to the latter. (pp. 195–196)

As pointed out by Grave (1960, p. 232n), Stewart's account of meaning anticipated the later Wittgenstein's (1958, §§65–67) family resemblances of meaning.

The aptness of Stewart's and Wittgenstein's positions was obscured by a logical framework, which Stewart (1810/1855) saw had been imposed on the nature of language:

The speculations which have given occasion to these remarks have evidently originated in a prejudice which has descended to modern times from the scholastic ages; that when a word admits of a variety of significations, these different significations must all be *species* of the same *genus*, and must consequently include some essential idea common to every individual to which the generic term can be applied. (p. 194)

This logic of essentialism also opposed Darwin's evolution (Hull, 1989; Mayr, 1988).

There are suggestive parallels between the evolution of meaning in verbal behavior and the evolution of species in biology, and Darwin (1974, pp. 387–388) noted some of Stewart's discussion of associations in his notebook. Stewart (1810/1855) observed that circumstances in the history of language attached different meanings to the same words "which often, by slow and insensible gradations, remove them to such a distance from their primitive or radical sense, that no ingenuity can trace the successive steps of their progress" (p. 195). In evolution, different functions may get attached to an original structure which is similarly transformed by slow gradations until the steps of their progress are difficult if not impossible to trace.

Positivism participated in the ideal language tradition. Comte (Lenzer, 1998, p. 84), the father of positivism (Putnam, 1994, p. 295), regarded it as the modern philosophy of science with origins in Bacon, Descartes, and Galileo. For Comte (1855) the "Positive philosophy is distinguished from the ancient . . . by nothing so much as its rejection of all inquiring into causes, first and final; and its confining research to the invariable relations which constitute natural laws" (p. 799); "Mathematical science is the source of positivity" (p. 789); "Observed facts are the only basis of sound speculation" (p. 799); and "The ultimate perfection of the Positive system would be . . . to represent all phenomena as particular aspects of a single general fact—such as Gravitation" (p. 26). Comte (cited by Lenzer) also claimed he had achieved some kind of ideal language:

Mathematics offers the best field for the development of positive logic. . . . Its capacity for systematizing true logic will be shown more fully by our drawing from it a general improvement of the art of thinking. . . . It consists in the creation of a species of universal algebra, calculated to facilitate thought, whatever be the subject in which thought is exercised, in as great a degree as ordinary algebra facilitates our meditations upon quantity. Without here explaining this new algorithm, I simply announce that it will condense alphabetic writing, as its predecessor condensed hieroglyphical writing. (p. lxvi)

Short of employing this language, "We may content ourselves by giving a systematic form to ordinary language, and confine the word 'sign' to express the constant link connecting an objective influence with a subjective impression" (p. 418). This constant link was like an inverted reflex: "A *sign* . . . is the result of a certain constant connection, whether voluntary or involuntary, between a movement and a sensation . . . every movement reproduces objectively a particular sensation" (p. 417). For Comte, correct relations were necessary ones; he "opposed the mathematics of probability all his life" (Lenzer, 1998, p. lxvii). In Mill's (1871) assessment of Comte, "The belief in in-

variable laws ... constitutes the Positive mode of thought ... as observation and experience disclosed in one class of phenomena after another" (p. 22).

Without an explicit reference to an ideal language, the astronomer Herschel (1830/1987) echoed Bacon's complaint about words without a constant meaning:

Worst of all, some, nay most [words] have two or three meanings; sufficiently distinct from each other to make a proposition true in one sense and false in another. ... Surely those who thus attach two senses to one word, or superadd a new meaning to an old one, act as absurdly as colonists who distribute themselves over the world, naming every place they come to by the names of those they have left, till all distinctions of geographical nomenclature are confounded, and till we are unable to decide whether an occurrence stated to have happened at Windsor took place in Europe, America, or Australia. ... in this double or incomplete sense of words ... we must look for the origin of a very large portion of the errors into which we fall. (p. 21)

Familiarity with a language that had strict, univocal meanings would remedy this:

The study of the abstract sciences, such as arithmetic, geometry, algebra ... being free from these sources of error and mistake, accustom us to the strict use of language as an instrument of reason [and] give us that proper and dignified carriage of mind which could never be acquired by having always to pick our steps among obstructions and loose fragments, or to steady them in the reeling tempest of conflicting meanings. (pp. 21–22)

Such views obviously did not inhibit Herschel from using metaphorical language to express them.

Complaints about deviations from essential unambiguous meanings continued into the 20th century along with a continuing interest in an ideal or perfect language. Eco (1995) points out,

In *The Philosophy of Logical Atomism* (1918–1919), Russell noted that in a perfectly logical language, the relations of a word to its meaning would always be one to one (excepting words used as connectives). When he later wrote *Principia mathematica* with Whitehead, he noted that, although their language only possessed a syntax, it could, with the addition of a vocabulary, become a perfect language. ... Wittgenstein, renewing Bacon's complaint concerning

the ambiguity of natural languages, aspired to create a language whose signs were univocal (*Tractatus logico-philosophicus*, 191–2, 3.3255ff) and whose propositions mirrored the logical structure of reality itself (4.121). Carnap proposed constructing a logical system of objects and concepts such that all concepts might be derived from a single nucleus of prime ideas (*Der logische Aufbau der Welt*, 1922–5). In fact the entire logical positivist movement was heir to the Baconian polemic against the vagaries of natural languages. (pp. 312–313)

In his approving preface to the early Wittgenstein's (1922) *Tractatus*, Russell (1922/1981) emphasized the logical quality of an ideal language: "A logically perfect language has rules of syntax which prevent nonsense, and has single symbols which always have a definite and unique meaning" (p. 8); and he argued that we should try to approach this ideal if we are to speak meaningfully: "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).

Russell's views and those of Wittgenstein's *Tractatus* were seen as connected to those of Mach and the Vienna Circle, a group of philosophers of science, "whose members may be considered as direct successors and continuators of Mach" (Menger, 1960, p. xvii). The group published a manifesto in 1929 that mentioned three "leading representatives of the scientific world conception" (Ayer, 1982, p. 130): Einstein, Russell, and Wittgenstein; and Ayer (1959) said, "As empiricists and positivists they named Hume, the philosophers of the enlightenment, Comte, Mill, Avenarius and Mach" (p. 4). Ayer gave the famous quote from Hume as characterizing their views:

"When we run over libraries, persuaded of these principles, what havoc must we make? If we take in our hands any volume, of divinity or school metaphysics, for instance; let us ask, *Does it contain any abstract reasoning concerning quantity of number?* No. *Does it contain any experimental reasoning concerning matter of fact and existence?* No. Commit it then to the flames; for it can contain nothing but sophistry and illusion." This quotation is ... an excellent statement of the positivist's position. (p. 10)

On this criterion, Skinner's mathematical and experimental work would be saved but not his interpretive work. *Verbal Behavior* would be consigned to the flames.

For logical positivists the ideal language was physicalistic language. Neurath (1931–1932/1959), another member of the Vienna Circle, said, "The physicalistic language has the capacity some day to become the universal language of social intercourse" (p. 289), and "Only *physicalistic statements* have a meaning, i.e., can become part of unified science. . . . The physicalistic language, *unified language*, is the Alpha and Omega of all science" (p. 293), and this language would form the basis of a unified science. Carnap (1934) agreed: "[Our] theory is that the physical language is the universal language and can therefore serve as the basic language of Science" (p. 95). In the monograph Skinner (1938/1966, p. 429) cited, Carnap (1934) said,   .

All sentences of psychology may be formulated in physical language. . . . This is a sub-thesis of the general thesis of Physicalism . . . that physical language is a universal language, that is, a language into which every sentence may be translated. . . . If the physical language, on the grounds of its universality, were adopted as the system language of science, all science would become physics. (pp. 165–166)

"All science" included psychology. Mach (1882/1986) had pointed out, "The method of physiological psychology is none other than that of physics" (p. 210).

Lists of good or bad words had been a conspicuous feature of the ideal-language tradition since Bacon, and Carnap (1932/1959) listed some metaphysical terms to avoid:

Like the examined examples "Principle" and "God," most of the other *specifically metaphysical terms are devoid of meaning*, e.g. "the Idea," "the Absolute," "the Unconditioned," "the Infinite," "the being of being," "non-being," "thing in itself," "absolute spirit," "objective spirit," "essence," "being-in-itself," "being-in-and-for-itself," "emanation," "manifestation," "articulation," "the Ego," "the non-Ego," etc. (p. 67)

Neurath (1932–1933/1959) gave a

rather vague guideline on how to proceed:

What is originally given to us is our *ordinary natural language* with a stock of imprecise, unanalyzed terms. We start by purifying this language of metaphysical elements and so reach the *physicalistic ordinary language.* In accomplishing this we may find it very useful to draw up a list of proscribed words. (p. 200)

Like a censor, Neurath would blacken out or prohibit the use of words on his list.

Neurath (1931/1983, p. 50) also saw his views allied to the S-R views of Watson's behaviorism, and he (1931–1932/1959) saw physicalistic language as unifying all of science:

The views suggested here are best combined with a *behavioristic* orientation. One will not then speak of "thought," but of "speech-thought," i.e., of *statements as physical events.* . . . only physicalistic statements have a meaning, i.e., can become part of unified science. . . . The physicalistic language, unified language, is the Alpha and Omega of all science. (p. 292)

In this unification, the physicalistic language would apply to all the sciences in "building up a uniform scientific language with a uniform terminology" (Neurath, 1936/1983, p. 133). The quest for a unified language of science culminated in the *International Encyclopedia of Unified Science* with Neurath as editor-in-chief and Carnap and Morris as associate editors. Undertaken in the late 1930s, this project was interrupted by the war, and the original enthusiasm for it was never recovered (Reich, 1994, p. 175).

During this time, Carnap (1936–1937/1950) said the Vienna Circle had modified its view on achieving certainty, which he saw as moving it closer to pragmatism:

The connection between meaning and confirmation has sometimes been formulated by the thesis that a sentence is meaningful if and only if it is verifiable, and that its meaning is the method of its verification. . . . But from our present point of view, this formulation, although acceptable as a first approximation, is not quite correct . . . *no complete verification is possible* but only a process of gradually increasing *confirmation.* . . . It seems to me that there is agreement on the main points between the present views of the *Vienna Circle* . . . and those of

Pragmatism, as interpreted e.g. by *Lewis*. This agreement is especially marked with respect to the view that every (synthetic) sentence is a hypothesis, i.e. can never be verified completely and definitively. One may therefore expect that the views of these two empiricist movements will continue to converge to each other in their further development. (pp. 421–428; cf. Giere, 1999, pp. 217–236)

However, even if logical positivism increasingly accepted probability, there were still differences remaining in other areas such as meaning and its formulation.

Peirce on Mach and Positivism

A critic of positivism, Peirce (1893/1975) reviewed Mach's *The Science of Mechanics* and said, "Considered as a history of mechanics, the work is admirable" (p. 187), but he warned, "The reader should be upon his guard against Mach's very inaccurate reasoning" (p. 188). For one thing, Mach made too much of sensations as foundational. Peirce said, "As for *immediate* experience, the individual sensation, it is the affair of an instant; it is transformed before it can be recognized; it is known to us as immediate only inferentially" (p. 189). And, despite Mach's warnings against metaphysical assumptions, Peirce (1898/1992) found that Mach himself entertained a metaphysics:

Mach belongs to that school of soi disant [so-called] experiential philosophers whose aim is to emancipate themselves from all metaphysics and go straight to the fact. This attempt would be highly laudable,—were it possible to carry it out. But experience shows that the experimentalists are just as metaphysical as any other philosophers, with this difference however, that their preconceived ideas not being recognized by them as such, are much more insidious and much more apt to fly in the face of all the facts of observation. (p. 225)

Mach's assumptions about the value of an ideal universal language with logical or mathematical connections to fundamental sensations would be another example of Mach's metaphysics. Peirce (1931–1958) also disagreed with the positivist principle that no hypothesis is admissible that is incapable

of verification by direct observation of the hypothesis:

[Comte] ought on [that] principle to forbid us to suppose that a fossil skeleton had ever belonged to a living ichthyosaurus. ... The same doctrine would forbid us to believe in our memory of what happened at dinnertime today. ... Of course with memory would have to go all opinions about everything not at this moment before our senses. You must not believe that you hear me speaking to you, but only that you hear certain sounds while you see before you a spot of black, white, and flesh color. ... A man would have to devote years to training his mind to such habits of thought, and even then it is doubtful whether it would be possible. And what would be gained? (5.597, vol. & par.)

Peirce did not see a close relation between positivism and pragmatism.

SKINNER'S EARLY VIEWS ON VERBAL BEHAVIOR

Mach, Russell, Carnap, Neurath, and Skinner shared some interesting similarities in their views on meaning. Skinner (1935) distinguished words by their defining properties while acknowledging that different people may have different defining properties for the same word:

Suppose that it be casually observed that a child hides when confronted with a dog. Then it may be said, in an uncritical extension of the terminology of the reflex, that the dog is a stimulus and hiding a response. It is obvious at once that the word *hiding* does not refer to a unique set of movements nor *dog* to a unique set of stimulating forces. In order to make these terms validly descriptive of behavior it is necessary to define the classes to which they refer. ... It is not at all certain that the properties we should thus find to be significant are those now supposedly referred to by the words *dog* and *hiding*. ... The experimenter ... may have some private set of properties resulting from his own training which will serve. Thus the word *hiding* may always be used *by him* in connection with events having certain definite properties, and his own results will be consistent by virtue of this definition *per accidens*. But ... if no more accurate supplementary specification is given, the difficulty will become apparent whenever his experiments are repeated by someone with another set of *private defining properties* [italics added]. (pp. 58–59)

On this account, meaning would be a property of a word, not the property of a unique instance of a word but the property of a word as a class of in-

stances with defining properties that could vary from person to person. Skinner accepted defining properties for words, but he did not believe everyone would have the same defining property. After adopting a different account of verbal behavior, Skinner (1989) said of his 1935 position: "The paper was too strongly tied to the concept of the reflex" (p. 124). In respect to claiming defining properties for words, Skinner (1979/1984) said he "had been converted to the behavioristic position by Bertrand Russell" after reading Russell's review of *The Meaning of Meaning* by Ogden and Richards (1923/1989) (p. 10). In the review that converted Skinner, Russell (1926) said, "I also hold that *meaning in general should be . . . regarded as a property of words* [italics added] considered as physical phenomena" (p. 119). For Russell, a word had a fixed meaning regardless of context, and something about his approach appealed to the early Skinner.

Skinner (1983/1984) indicated elsewhere that his early ventures into verbal behavior were in terms of S-R pairings, "I remember the great cardboard sheets fastened together with rings in my room in Winthrop House on which I classified 'verbal reflexes.' I tried to identify S's and R's in reading, repeating, responding to speech, and so on" (pp. 239–240). In addition, the formulations that Skinner used for his publications on verbal behavior before 1945 were stimulus and response formulations. Skinner (1936) said, "In normal speech the responses 'refer to' external stimuli—to whatever is being 'talked about' " (p. 103). These stimulus and response relations had a connection that 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)—but these responses did not vary in where the connection went so as to allow a different meaning in different contexts. These

S-R formulations presented no conspicuous role for consequences.

Like Mach and the logical positivists, the early Skinner was interested in mathematical formulas and inclined to introduce them in his early research. In addition to his 1931 affirmation of the importance of the necessity of the reflex, Skinner presented formulas such as "$R = f(S, A)$" (1931, p. 452); "$N = Kt^n$" (1932, p. 28); and "$N = K \log t + C + ct$" (1933, p. 341). He (1940a) also expressed mathematical relations for his subsequently abandoned concept of the reflex reserve: "The slope of the extinction curve is a function of the drive of such a sort that curves obtained at different drives can be accurately superimposed by multiplying one curve by a constant representing the ratio of the drives" (p. 423). And Skinner (1947) expected that "A proper theory . . . would characterize the behavior of an individual in such a way that measurement would be feasible if he were the only individual on earth . . . by determining the values of certain constants in equations describing his behavior" (p. 39).

The early Skinner made favorable comments on Carnap and shared similarities with Carnap and Neurath. In an early letter to Fred Keller, Skinner wrote, "Latest behaviorist: Carnap" (1979/1984, p. 149). Skinner (1987/1989b, p. 110) said he had been a charter subscriber to *Erkenntnis*, the journal of the Vienna Circle; was personally acquainted with Carnap and Feigl, another member of the Circle; and saw 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" (1979/1984, p. 161). Skinner (1938/1966) also said of his method, "It is positivistic" (p. 44); and he apparently accepted the desirabiliy of a unified language of science: "One of the objectives of science is presumably the statement of all knowledge in a single 'language' (38)" (p. 427). Skinner's reference is to Carnap's (1934) *The

Unity of Science, in which Carnap, like Neurath, proposed the physicalistic language as a universal language for science and translated what he saw as metaphysical and other problematic expressions into this language. Similarly, Skinner (e.g., 1983/1984, pp. 191–193) made translations to replace *mentalistic* words, his term for what he saw as vague, ambiguous, or otherwise problematic words related to mind. Skinner said, "I thought it was important to translate mentalistic expressions 'into behavior' " (p. 191), and "carried on with what I called 'The Dictionary,' a collection of behavioristic definitions of words referring to feelings or states of mind" (p. 192). Neurath (1941/1983) had said, "I started in my university days rather primitively by making a collection of 'dangerous terms' " (p. 217) and Neurath (1932–1933/1959, p. 200) had suggested a similar practice for others. Skinner (1980b) also found some words were dangerous: " 'extracted' (Dangerous word!)" (p. 275) and made a list of dangerous or prohibited words (1938/1966, pp. 7–8).

In an early note, Skinner considered meaning as essence under a reflex account: "If all thought can be attributed to processes of perception and reflex, 'meaning' in all its wider sense may prove to be an expanded aspect of '*essence*' [italics added]" (1979/1984, p. 353). Skinner's (1938/1966) examples of words—to be rejected or retained—had meanings that were an essential property of the word form:

The sole criterion for the rejection of a popular term is the implication of a system or of a formulation extending beyond immediate observations. We may freely retain all terms which are descriptive of behavior without systematic implications. Thus, the term "try" must be rejected because it implies the relation of a given sample of behavior to past or future events; but the term "walk" may be retained because it does not. The term "see" must be rejected but "look toward" may be retained, because "see" implies more than turning the eyes toward a source of stimulation or more than the simple reception of stimuli. (pp. 7–8)

Skinner is saying that the word forms

at issue have essential meanings in implying or not implying conceptual schemes (i.e., implicate or do not implicate a context for their use). Criticizing Skinner's view of context-free meanings for some words, Midgley (1978, pp. 109–110) made the point that the meaning of all words depends on the contexts in which they occur and that the routine use of words in the vernacular is naturally theory laden (cf. Hanson, 1955). Wright (1976, pp. 88–90) also found that Skinner (1953, p. 90) was mistakenly rigid about the meaning of words.

What is curious about the development of Skinner's verbal behavior is that he continued to advance some essentialist positions on meaning even after he adopted an opposing pragmatic-selectionist view of meaning in terms of the contexts and consequences of a changing world. Even after he changed from an ubiquitous S-R formulation for behavior—a pair of S-R reflexes for his diagrams of the operant in 1938—to a probabilistic three-term contingency formulation for the operant in 1945 and thereafter, Skinner continued to seek purges of some word forms and extended this concern to some seemingly innocuous words and phrases. The phrase *extracted from* was to be avoided when others talked about rules. Skinner (1989) said, "Cognitive psychologists confuse matters by arguing that rules are in the contingencies and must be *extracted from* [italics added] them" (p. 41), and he assigned an essential meaning to the phrase *extracted from* as used by a critic. Skinner (1984/1988) said of a critic's statement about rules *extracted from* the contingencies of reinforcement: "It is a mistake to say 'extracted from' since the rules are not in the contingencies. They are descriptions of contingencies" (p. 265). Yet Skinner did not apply this prohibition to his own usage. He said, "Rules can be extracted from the reinforcing contingencies" (1969, p. 124, also see p. 39; 1971, p. 95; 1980b, pp. 85, 275; 1985/1987, p. 107,

for further examples of this usage). Attacking the opposition was overriding.

Another example of an extended practice of claiming essential meaning is Skinner's repeated claim that "dictionaries do not give meanings; at best they give words having the same meanings" (Skinner, 1957, p. 9; also cf. 1968, p. 202; 1973/1978, p. 177; 1974, p. 95; 1988/1989, p. 37). However, dictionaries do not "give words having the same meanings." At best they give partial and rough summaries of the contingencies for meaning. If Skinner is referring to synonyms, two word forms may have the same meaning if meaning is a property of a word form and the two word forms have the same essential property of meaning. However, as Quine (1987) observed,

Everything real and objective having to do with our use of expressions, and hence with their meaning, can be said without positing any relation of full synonymy of expressions, or sameness of meaning. . . . Often a dictionary explains a word by citing another word or phrase that would serve much the same purposes in most situations or in situations of specified sorts, but no clean-cut relation of synonymy is called for. (p. 131)

At best, dictionaries may identify different word forms with similar meanings in some of their uses. *Same* is far too strong. Nevertheless, Skinner more than once used the phrase "words having the same meaning," which implied essential meanings.

In addition, Skinner's regard for Tooke seems excessive. Skinner (1957) talked as if behavioristic language had been anticipated by the essential-meaning-from-etymology of Tooke and Barclay:

The method of John Horne Tooke is relevant again here. *A Sequel to the Diversions of Purley* by John Barclay (London, 1826) examines the origins of terms concerning spirit and mind in an early anticipation of twentieth-century behaviorism, tracing them back etymologically to more robust concepts in human behavior. (p. 469)

Later, Skinner (1983/1984) said, "I had cited John Horne Tooke and his disciple John Barclay, for their behavioristic analyses of mental and spiritual terms" (p. 278). If Tooke had offered an early anticipation of behavioristic analysis, it was an S-R analysis. Barclay (1826), however, was far from an accepting disciple and gave reasons for the low estimation in which etymology had been held:

As usage is allowed to be the proper criterion of language, many seem it useless labor to trace the origin and history of words, a knowledge of their present import being sufficient. . . . The etymological sense must, in every case where they differ, yield to that of usage. (pp. 2–4)

Barclay also joined in many of the criticisms that Stewart made against Tooke: "Many of Stewart's points were cited against Tooke by John Barclay in his *Sequel to the Diversions of Purley*" (Aarsleff, 1967, p. 112n).

In brief, Skinner's early approach to meaning was more or less shared with those who participated in the traditions of ideal language and positivism. Traces of this approach remained for some time in his writing.

MACH'S PRAGMATISM

In introductory remarks to the *Analysis of Sensations*—the book that furnished an extended quotation for Skinner (1938/1966, p. 432)—Mach (1959) presented a biological-pragmatic side:

The presentations and conceptions of the average man of the world are formed and dominated, not by the full and pure desire for knowledge as an end in itself, but the struggle to adapt himself favorably to *the conditions of life* [italics added]. . . . The biological task of science is to provide the fully developed human individual with as perfect a means of orientating himself as possible. . . . No point of view has absolute, permanent validity. Each has importance only for some given end. (pp. 32–37)

The *conditions of life* was one of Darwin's key terms along with *variation* and *selection*, and to say "Each has importance only for some given end" indicates a concern with consequences.

Mach and James met and corresponded. In a letter to James, Mach said of pragmatism, "Although I am by my entire training a scientist and not at all a philosopher, nevertheless *I stand very close to pragmatism* [italics

added] in my ways of thinking, without ever having used that name" (cited in Perry, 1936, Vol. 2, p. 463). Both Mach and James shared a common concern to extend Darwin's evolution of species to the evolution of ideas; and Mach (1883/1986) said, "If Darwin reasoned rightly, the general imprint of evolution and transformation must be noticeable in ideas also" (p. 218). More sweepingly, Mach (1883/1986) said, "We are prepared, thus to regard ourselves as a product and a subject of universal evolution" (p. 235); and he (1883/1960) said, "All science has its origin in the needs of life" (p. 609). Elaborating on how this process worked, Mach (1896) said, "The disclosure of new provinces of facts before unknown can only be brought about by accidental circumstances under which are remarked facts that commonly go unnoticed" (p. 168) and "That which has resulted slowly as the result of a gradual selection, appears as if it were the outcome of a deliberate act of creation" (p. 174). Giving examples from Morgan and Romanes, Mach (1905/1976) said,

From these examples it seems that we can derive the following rules: 1. Animals know how to exploit associations obtained by chance. 2. Because the facts are complex, unrelated features may become associated. . . . Only those associations are maintained that are biologically important and often repeated. (p. 52)

In saying "Only those associations are maintained that are biologically important and often repeated," there is some anticipation of the relations in operant behavior. Extending his interpretations, Mach also spoke of the effects of tradition, culture, and histories:

In this way behavior of older members can be transmitted to younger ones by tradition, but furthermore, new modes of behavior discovered can be spread to several or all members of the species. The life of a species thus changes with time. Although this rarely happens as fast as for civilized humans, for example by invention, nevertheless the processes are similar in kind for both, and for both we can speak of a history. (p. 53)

Peirce (1931–1958, 2.86), whom Mach had read, also included "inventions"

in his account of evolution and analogous processes. Mach's pragmatism, however, did not extend to detailing its significance for verbal behavior, although it could be interpolated. In saying "unrelated features may become associated," Mach's position resembles Stewart's and Wittgenstein's on word families.

SKINNER'S LATER VIEWS ON VERBAL BEHAVIOR

In a letter to Fred Keller of February 25, Skinner (1940b)[1] said his major interest was verbal behavior:

I find myself thinking about and working with human problems more than animal. I have never been [in] love with the rat *per se* but only as a spring-board. My major field of interest is verbal behavior. I did a book-length MS on it as long ago as 1934 and have been digesting and revising off and on ever since, in addition to a lot of experimental work, most of it not yet published.

And he (1980a) said, "It [*Verbal Behavior*] will, I believe, prove to be my most important work" (p. 198). Skinner began this work as an S-R behaviorist—who primarily used S-R or reflexological formulations—in the tradition of ideal-language positivism. He finished some 23 years later as a radical three-term contingency behaviorist who would be aligned to a tradition of pragmatic selectionism. Definite signs of this change occurred in 1945 when he (1983/1984) "adapted part of the manuscript of Verbal Behavior and called it 'The Operational Analysis of Psychological Terms' " (p. 294).

This change was unlikely to have been the sole result of reading Mach inasmuch as Mach had said so little about verbal behavior and meaning in discussing his pragmatic-selectionist views. However, if we add in the views of Peirce, James, and Dewey, and traces of pragmatism in others (e.g., "What in operation is most useful, that

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in knowledge is most true," Bacon, 1620/1960, p. 124), the sum of these views could well have been sufficient support for Skinner to join the pragmatic tradition on meaning. Even if Skinner's views did not change from direct readings and discussions of these sources (he did not say he read Mach's pragmatic-selectionist views), various influences could have led Skinner to share a common cultural tradition with classical pragmatism.

In Skinner's (1945) new formula for operant behavior, "Meanings, contents, and references are to be found among the determiners, not among the properties, of response" (p. 271); and "When someone says that 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" (1957, p. 14). These determiners were to be found in the antecedents and consequences of a three-term contingency for behavior, which differed in different contexts. Meaning now included consequences (missing in an S-R formulation) as well as other independent variables. This position was close to the pragmatic position on meaning (cf. Moxley, 2001a, 2002).

In the pragmatic tradition, Peirce (1878/1992) had presented a three-term contingency for the meaning of a habit that anticipated an operant formulation:

What a thing means is simply what habits it involves. Now, the identity of a habit depends on how it might lead us to act, not merely under such circumstances as are likely to arise, but under such as might possibly occur, no matter how improbable they may be. What the habit is depends on *when* and *how* it causes us to act. As for the *when*, every *stimulus* [italics added] to *action* is derived from perception; as for the *how*, every purpose of action is to produce some sensible *result* [italics added]. 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 this account of meaning by Peirce: (a) a stimulus to act, (b) an action, and (c) a sensible result, which are set against the background of Peirce's probabilism. In Peirce's (1931–1958, 2.86) AB-because-of-C formula, the relation between the stimulus and the action is because of the results (past results).

In a recorded interview whose written account was checked and approved by Skinner himself (J. E. Morrow, personal communication, May 30, 2004), Skinner (1979) said that Peirce's pragmatism was "very close . . . to an operant analysis" (p. 48). When Skinner read Peirce—which could have originally occurred when he (1979/1984, p. 41) bought the collection of Peirce's essays in *Chance, Love and Logic* that contained "How to Make Our Ideas Clear" (1878/1992)—he could have found a viable alternative to essentialist S-R verbal behavior that would later prove useful (cf. Moxley, 2001a, 2001b, 2002).

Departing from his previous S-R reflexology, Skinner (1945) presented a new formulation for operant behavior using verbal behavior as an example:

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. 272)

Skinner's added characterization that "the contingency need not be invariable" contrasts with his (1938/1966) characterization of the "mechanical necessities of reinforcement" (p. 178). Until 1945, Skinner had presented operant behavior primarily as paired reflexes with the assumption of necessity between stimulus and response. This was changed and the operant was now in close alignment with Peirce's formula: The relation between the stimulus (A) and the response (B) is because of reinforcement (C). Skinner (1945) further clarified this AB-because-of-C relation in saying "the contingencies of reinforcement . . . account for the

functional relation between a term, as a verbal response, and a given stimulus" (p. 277). Among later changes, he indicated an expanded consideration of contexts when he (1984/1988, p. 471; 1986/1987, p. 201) moved away from a confining *discrimination* for the first term toward more encompassing terms such as *setting* (e.g., 1973, pp. 257–258; 1983/1997, p. 156; 1984/1988, pp. 215, 265; 1987/1989a, p. 62). The expanded context for the three-term contingency embraced not only cross-sectional considerations at one time but also longitudinal heredity and personal histories over time—far different from his austere S-R formulations and the interpretations of meaning they supported.

Along with his new formula, Skinner (1945) distanced himself from "adherents of the 'correspondence school' of meaning" (p. 274). In rejecting a one-to-one correspondence between word and meaning, Skinner was rejecting positions in which a single, essential meaning was assumed for the very form of the word. Skinner also said, "It is simply not true that an organism reacts to a sign 'as it would to the object which the sign supplants' " (p. 271), and he discounted the link between the physicalism of logical positivism and behaviorism. Skinner (Blanshard & Skinner, 1966–1967) said of his 1945 paper, "The physicalism of the logical positivist has never been good behaviorism, as I pointed out twenty years ago (Skinner, 1945)" (p. 325), and Skinner (1945, p. 380) attacked the logical positivist reliance on rules or logic, referring to Feigl and Carnap for illustration. Skinner rejected the idea of a rule for the meaning of a word: "[The psychologist] cannot, unfortunately, join the logician in defining a definition, for example, as a 'rule for the use of a term' (Feigl)" (p. 277). Skinner wanted to address "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. 271). Further identi-

fying those whose views he rejected, he (1979/1984) said, "It was not true, as Watson, Russell and others had said, that one responded to words as if they were the things the words stood for" (p. 335).

In identifying and rejecting those who held views he had formerly referred to with approval, Skinner specifically opposed the ideal language tradition as well as efforts to impose a logical structure on language and meaning. Skinner (1957) rejected even the possibility of an ideal language that would have one-to-one correspondence between words and empirical events: "Such a language is manifestly impossible" (p. 124). In addition, deprecating "purely formal analyses of grammar and syntax," Skinner said, "No *form* of verbal behavior is significant apart from its controlling variables" (p. 331), and he (1974) repudiated Russell's meaning-is-a-property-of-a-word view: "*Meaning is not properly regarded as a property of a response* [italics added] or a situation but rather of the contingencies responsible for both the topography of behavior and the control exerted by stimuli" (p. 90).

The later Skinner also regarded mathematical formulas with markedly less favor and abandoned the prospect of predicting human behavior with mathematical equations. He ceased to use mathematical formulas in his work, was critical of many uses of mathematical statistics, and said of his earlier equations,

I had abandoned my rather amateurish attempts to analyze my data mathematically. The orderly changes in strength in my experiments depended upon too many different conditions to be plausibly described by simple equations. It was easy to fit curves to data if you used enough of those things that can be given different values and hence are called constants. A German physicist once said that with three constants one can draw an elephant and with a fourth make him lift his trunk. (1979/1984, pp. 234–235)

In Skinner's later work, the three-term contingency may be called a formula, but it is not an exact mathematical formula.

In addition, Skinner eased up on his

previous rigidity toward using certain words. Describing the problem, Skinner (1983/1984) said,

I had trouble with my own speech, catching myself as I started to say "mind" or "think" . . . It took me a long time to realize that in using the vernacular I was no more a traitor to my science than the astronomer who comments on a beautiful sunset knowing full well that the sun does not "set." (p. 80)

The later Skinner (1982) accepted many terms he would previously have had problems with:

I cannot decide whether Dinnage wants me to confine myself to technical terms or to apologize whenever I speak ordinary English. The fact is that, although a radical behaviourist, I feel [sic] quite free [sic] to talk about my ideas, wishes, and beliefs. Upon other occasions I talk about the same things in other ways. (p. 32)

And Skinner (1989) indicated that multiple languages are acceptable for the way English is used:

Almost every field of science has two languages, one for the things observed casually in daily life and one presumably for the same things observed with the instruments and methods of science. The field of human behavior has had a third referring to things within the observer felt or introspectively observed. . . . Both the first and the third have many practical uses, the third because when people tell us how they feel, they report the effect of what had happened to them, from which we often infer something of what happened. (p. 33)

The issue is not so much good and bad words but the practical uses to which words are put.

The appropriateness of a word is determined more by its context than its form. Joos (1967) distinguished five kinds of languages or usages in English according to their different styles: frozen, formal, consultative, casual, or intimate. Not bothering to count different vocabularies, Empson (1930/1966) said, "English is becoming an aggregate of vocabularies only loosely in connection with one another, which yet have many words in common" (p. 237). We need not stop at three or five languages or some large number of different vocabularies. Every purpose (conscious or unconscious), every set of contingencies for the use of a word,

may have a different selection of words adapted to that purpose. Writers will continually edit and revise their work—rejecting, replacing, or altering a word, an expression, a section—to achieve the best language for their purpose. Sometimes that purpose is clarity for reproduction, sometimes not. Simply accepting or rejecting words because of their forms will not meet all these purposes.

The later Skinner's dissatisfaction with the possibility of an ideal language is readily understandable. The way the definitions in the *Oxford English Dictionary* (Simpson & Weiner, 1989) were determined provides no support for essential, unchanging meanings, and those who examine language closely come to a similar conclusion (cf. Berg, 1993; Crapanzano, 2000; Landau, 2001; Robinson, 1950; Rorty, 1992; Schiappa, 1993; Willinsky, 1994; Winchester, 2003). The definitions are the result of collecting quotation slips that show the written word as it has actually occurred in its written context. Different meanings are then derived from different clusters of similar meanings on these slips. The definitions are rough summaries of the contingencies inferred from the words in the contexts of the quotation slips. These contingencies, and the meaning of a word, can change in dramatic and surprising ways (see Nunberg, 2001, 2004). The use of a word in extended text, however brief, occurs before its definition is inferred. The slips need to be continually collected to account for the senses of new words and new senses of existing words. The very fact that a word form (or a meaning for that word form) exists in some currency of usage testifies that it serves a useful function in some way. What sense does it make to say that an animal species— or a word form or the meaning for a word form—should not exist when the continued existence of that species or word form or meaning for that word form is an argument for some consequence of value. The same may be said for habitual behavior. Skinner (1983/

1984) said his laboratory maxim was, "The rat was always right" (p. 378). Similarly, the behavior of the speaker is always right in being the product of its contingencies, although there may be problematic consequences sooner or later that revisions may prevent.

Even in science, a technical vocabulary behaves more like the vernacular vocabulary behaves in regard to change than an essentialist might assume (cf. Catania, 1973; Sutton, 1994). Skinner changed the formulation and meaning of *operant* more than once; Catania (p. 113) found three different meanings of the term in experimental use. What advantage would it have been if the meaning of Skinner's *operant* had remained forever fixed and unchanging after its first reflexological formulation? Fortunately, a guarantee of fixity is impossible in any language used in response to a changing environment.

In brief, the later Skinner's new account of meaning was an effective description of the way verbal behavior functioned and required a consideration of setting, behavior, and consequences that "is never complete or exact" (Skinner, 1974, p. 125). Although the analysis of meaning can never be absolutely complete, any interpretation—conscious or not, relatively complete or relatively incomplete—may be sufficient for practical action.

CONCLUSION

Striking similarities exist between the tradition of ideal-language positivism, in which Mach and the logical positivists participated, and Skinner's early S-R views of verbal behavior and meaning. In contrast, Skinner's later views on verbal behavior and meaning center around a probabilistic three-term contingency in a pragmatic-selectionist tradition in which Mach also participated, if not as extensively. When Skinner abandoned an S-R account of behavior, including verbal behavior, there were similarities between Mach and a pragmatic-selectionist account

that Skinner's exposure to the views of Darwin, Peirce, James, Dewey, and others could reinforce. In this change, Skinner shifted to a more descriptive approach to meaning on the way verbal behavior actually functioned.

Confusing for readers, some of Skinner's early views on meaning continued in his writing well beyond 1945— when he introduced the new operant formulation (e.g., the AB-because-of-C operant) that he expanded on in later years. Skinner wasn't the only one to have conflicts or inconsistencies with positivism and pragmatism. Both Russell and Wittgenstein showed some conflict for a time or at different times. Although speaking favorably of pragmatism at one time, Russell eventually castigated pragmatism as well as evolutionary selectionism (Moxley, 2003) whereas, in contrast to his early positivism, the later Wittgenstein has been seen as a pragmatist (e.g., Lakatos, 1978, p. 230n).

The fact that Skinner's new views on language in 1945 did not immediately and permanently eliminate all essentialist comments by Skinner shows how various and persistent the contingencies for verbal behavior can be. Statements in accordance with a new view may be learned, but statements in accordance with the older view may not be automatically unlearned. Many of the contingencies for saying something one way may remain while contingencies for saying something in another, even opposing way, may develop. Skinner's new views on verbal behavior had, for a time at least, outstripped his complete integration of them within all aspects of his verbal behavior.

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