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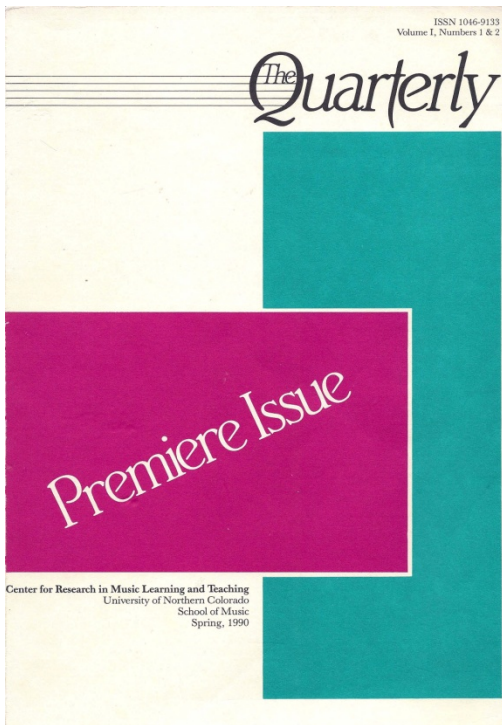
The Semantic Differential in the Study of Musical Perception: A Theoretical Overview

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It is with pleasure that we inaugurate the reprint of the entire seven volumes of The Quarterly Journal of Music Teaching and Learning. The journal began in 1990 as The Quarterly. In 1992, with volume 3, the name changed to The Quarterly Journal of Music Teaching and Learning and continued until 1997. The journal contained articles on issues that were timely when they appeared and are now important for their historical relevance. For many authors, it was their first major publication. Visions of Research in Music Education will publish facsimiles of each issue as it originally appeared. Each article will be a separate pdf file. Jason D. Vodicka has accepted my invitation to serve as guest editor for the reprint project and will compose a new editorial to introduce each volume. Chad Keilman is the production manager. I express deepest thanks to Richard Colwell for granting VRME permission to re-publish The Quarterly in online format. He has graciously prepared an introduction to the reprint series.

The Semantic Differential in the Study of Musical Perception: A Theoretical Overview

By Robert Miller
University of Connecticut

Questions concerning what music “means,” how and why those meanings arise, and how children can be educated to understand those meanings have long occupied philosophers, musicologists, and educators. Most of our educational processes in music are intimately tied to engaging children in the search for meaning of one sort or another. For the musician, the very term “meaning” carries several denotations. It might subsume the simplest translation of music notation into sounds (“this note ‘means’ this sound”), or far more complex processes in which other kinds of significance are derived from the forms and combinations of musical sounds themselves. This article addresses these latter kinds of meaning generally, with eventual emphasis on the kind of meaning system (or “semantic”) described by Osgood and his colleagues.

Meaning in music arises in many ways and can take many forms. When a person encounters a piece of music (either hearing a new piece or rehearsing an old piece with which she is, as Perlmutter and Perkins (1982) would say, “building up an experience”), a series of meaning problems is presented. If the piece is not ignored, these general problems of meaning (What is this? How do I make sense of it? How do I respond to it?) are addressed either unconsciously or through learned heuristic tactics. Both the unconscious meaning process and the heuristic meaning process have their roots in the perceiver’s total history of experience with music. Much of that experience is informal, accruing simply from living in a given musical culture, especially while young. Campbell (1988) has postulated

that early musical experience results in the learning of an implicit music rule structure which permits musical communication. These rules allow individuals to understand cadences and phrase boundaries. In practice, these rules are analogous to the implicit rules for language understanding. They may be learned in much the same way as language rules and in the same developmental period.

“A foundation of the present discussion is the constructionist premise that meaning exists only in the mind and results from the mind’s ability to impose order on the data coming from the senses.”

For many members of the Western cultures, there are other strategies for making sense out of music. Some of these are explicit, reflecting conscious, learned, heuristic tactics such as music students might use in identifying the style period of a piece played in a “drop the needle” exam. Likely there is a sort of continuum from habitualized, unconscious sense-making through the more formalized heuristic tactics resulting from study.

A visual example (Hrushovski, 1981) can be borrowed to demonstrate one of these kinds of meaning. The lobed arch on the left of Figure 1 represents, or carries the sense of, or means Islamic architecture in Spain. The arch on the right, however, represents Gothic architecture. For each of us there was a time when these forms did not carry these meanings. The forms were, in this way, meaningless. Some might have learned

the meaning of these forms from living in the culture; others might have applied more explicit strategies to derive meaning. A similar condition exists for music.

A listener's derivation of meaning can be the result of study in music theory where listeners are taught to form a tonal context within which to place a musical composition. Study in music history allows listeners to develop yet another context of meaning. A listener's attitude toward music of various kinds reflects meaning, as does performance, which forms a music communication "link" between the performer and the listener. The notion that music is meaningful is so pervasive that the opposite assertion, that music is meaningless, doesn't often arise.

A foundation of the present discussion is the constructionist premise that meaning exists only in the mind and results from the mind's ability to impose order on the data coming from the senses. The argument is that the data received through the senses are actually sparse and impoverished compared to the mind's responses, which are complete and rich. The mind combines sensual data, thought, memory, and construction strategies of various kinds to "build up" meanings of an object or event.

The result of this building up is sense-making or order. Order may be portrayed as many separate but interrelated organizational schemes or structures in the mind. The mind's representation of a single object, or event, or abstraction can exist in several of these organizational schemes at once. Sensations are made into sense by the placement of these representations of objects, events, or abstractions into context within these organizational structures.

There is even evidence that, just as our theory and musicology teachers hoped, these consciously learned strategies may become so integrated into a listener's sense-making apparatus as to be indistinguishable from the "music communication" system described by Campbell. For example, when musicians with a great deal of formal training were asked to judge similarities among music examples, they seemed to attach far greater importance to historical context than did un-

trained listeners. This was apparently true even when no formal historical question was asked (Miller, 1979). Thus we see that the results of the formal, explicit study are not simply laid over or applied to the previously existing implicit rule structure; parts of the explicit become integrated with the implicit.

For purposes of this article, meaning is equated with sense-making. We can call one's total mental configuration of schemes the "cognitive" structure. Sense-making, or the derivation of meaning, involves the mind's placement of those representations within this cognitive structure. Because the cognitive structure can be modified, made more complex, expanded, or contracted, the meaning of the mental representation of an object, event, or abstraction is not necessarily stable. It changes.

Once an object, event, or abstraction has been processed from the initial sense data and placed in the cognitive structure, the assertion is that a "concept" has been formed. Recall that meaning exists only in the mind; thus, strictly speaking, it is not the object, event, or abstraction that has meaning, it is the mental representation of concept that has meaning. The concept is related to or refers to other concepts within as well as outside the mind; it is the cognitive structure that provides this bridge to the external world of objects and events.

Musical Meaning and Music Learning

Questions about the meaning of music and the ways of deriving that meaning have challenged many music educators. For instance, Langer's answers to these questions induced Leonhard and House (1972) and Reimer (1970) to articulate philosophies of music education based upon her conclusions. These educational philosophies were then translated into educational practice both through widely used classroom materials such as the Silver Burdett & Ginn's Music (Reimer, 1985) and the legions of graduate of doctoral programs now training teachers in colleges across the country. In a further example, Meyer's (1956) ideas about "embodied" versus "designative" meaning

were manifested in the educational philosophy of Broudy (1972). Meyer's ideas concerning meaning were expressed as curriculum by Colwell (1966) and by the CEMREL Aesthetic Education Program (Madeja & Onuska, 1977). Clearly, questions of musical "meaning" are important in education.

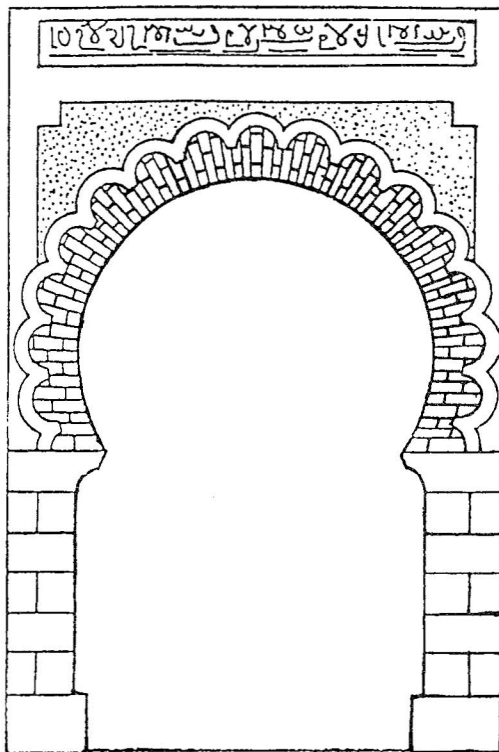
Psychologists, too, have often been concerned with questions of musical meaning. These studies can be loosely classified under two rubrics. The first can be called the "music has only musical meanings" classification. Investigators who hold this point of view maintain that the meaning of music is purely musical; musical concepts are understood only by their placement in purely musical cognitive schemes, and extra-musical meanings are trivial if they exist at all. An example is the Heller and Campbell (1982) model, which postulates that music exists only as an element in a uniquely musical communication process. A second example can be found in the cognitivist/constructionist approach of Serafine (1983) which relies

on building up a purely musical context/response structure in the mind of the listener.

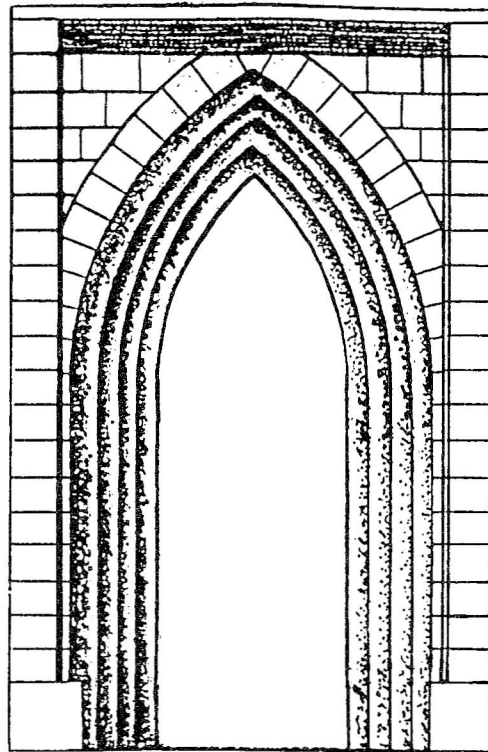
The opposite point of view accepts as valid that music can share qualities of meaning with other types of concepts; that is, that mental representations of music may also reflect or make reference to extra-musical qualities. The famous experiments by Hevner (1936), which derived the "adjective circle", are from this point of view. It is also in this spirit that semantic differential research in music has proceeded.

The Semantic Differential

The semantic differential or "SD" technique was derived by Osgood (1953; Osgood, Suci, & Tannenbaum, 1957) to examine the cross-cultural universality of meaning. This family of techniques has been described by Kerlinger (1973) as "a method of observing and measuring the psychological meaning of concepts" (p. 566). Measurement, and through it control and prediction, is a major concern of science. Because questions about musical



Moorish



Gothic

Figure 1

meaning are so important, an approach which offers to measure and quantify meaning becomes potentially attractive.

The following list of studies demonstrates that the semantic differential has been used to address a wide variety of research problems in music. Crozier (1974), Hare (1974), and Bragg and Crozier (1974) used SD scales to examine the importance of complexity as an element in musical perception. Van de Geer, Levelt, and Plomp (1962) used SD scales to examine the meanings of musical consonance and dissonance. Accurso (1967) devised a more general semantic differential instrument to examine differences in the meaning of examples of popular and serious music by naive and sophisticated listeners. The SD technique has been applied cross-culturally to musical stimuli by Keil and Keil (1966). SD technique has been used to examine the relationships between musical stimuli and visual art (Ruth & Kolehmainen, 1974). It was also used by O'Briant and Wilbanks (1978) to examine whether or not the meaning of a piece of music can be affected by establishing various moods in the listener before the music is heard. Pellizzoni (1986) used semantic differential technique to search for differences in the meanings of fragments of examples of serious music by both musicians and nonmusicians.

The attitude that a person holds about something is strongly related to the meaning of that thing to the person. That attitudes toward music can be studied through the application of SD has been shown by Buss (1971) and Darling (1982). Holbrook and Huber (1979) used semantic differential to predict affective response to saxophone jazz recordings.

While SD studies are verbal, other research tools are not. Often researchers using these purely nonverbal techniques encounter some difficulty in labeling and reporting their results. The results of some studies are intuitively interpretable by the researcher who is intimately familiar with the nonverbal stimulus materials, but not by others. Some verbal interpretation is necessary for meaningful reporting and discussion. Occasionally, SD is used to provide verbal labeling data for essentially nonverbal studies. Sometimes these

nonverbal techniques include other factor analytic procedures which yield numerical output (Nordenstreng, 1968). Other studies have used SD to label the essentially visual product of multidimensional scaling procedures which have been applied to music (Hare, 1975; Miller, 1979).

The technique for gathering the raw data for the semantic examples of whatever class of object, event, or abstraction is under study. The things under study are referred to as "stimuli", following the behaviorist convention for use of that term. Responses might be made to actual objects (say, recordings of five-second musical examples), or to abstractions ("the music of Beethoven," "the music of Brahms") In nonmusical studies, the stimuli have included nations, abstractions like "God" and "hunger", and more concrete stimuli like color chips. The individual subjects in an SD experiment are asked to respond to each stimulus through the use of a number of bi-polar adjective scales, for example:

LOUD : ____ : ____ : ____ : ____ : ____ : SOFT
ROUGH : ____ : ____ : ____ : ____ : ____ : SMOOTH
STRONG : ____ : ____ : ____ : ____ : ____ : WEAK

Respondents are usually asked to place a mark in the space which corresponds to the degree to which the stimulus is related to the quality in question. For example, if the respondent judged the example in question to be "very loud", he might mark the space closest to "Loud"; if the stimulus was judged to be "quite soft", he would mark the scale toward the opposite end.

The results are usually converted to numbers and then treated either as Likert-like scaling results or as input for factor analytic procedures. For a more complete explanation of the derivation and use of semantic differential scales, see Osgood, et al., (1957) and Torgerson (1958).

Because of the very clear instructions given for the construction and analysis of SD scales by Osgood, et al., and because of the many studies which can serve as models, the selection of scales and administration of the SD instrument is not too difficult. Interpretation of the results, however, is a different matter. There is a well-articulated theory—representational mediation—to assist in interpretation, but it is not always invoked by the researchers.

Perhaps the use of the semantic differential has become so routine that its techniques are becoming dissociated with the original thinking that generated semantic differential techniques. Science would not be served if the methods of data gathering and analysis become divorced from theory. Considering these omissions and the recent cognitive/constructionist approaches to music research which seem to point to further mediational structures to explain musical experience (Perlmutter & Perkins, 1982), a restatement of the theoretical bases for the semantic differential and the theory of meaning from which it is derived is in order.

Discussing Meaning

Osgood, et al., (1957) begin their discussion of meaning by casting three definitions. The first is the “pragmatical” definition of meaning; it is the relationship of signs to situations and behaviors. When a sociologist inquires about the “meaning” of a sign, this is most often the definition intended. The second definition, which is the basis for questions asked by linguists, may be termed the “syntactical” definition; it states that meaning is the relationship of signs to other signs. Psychologists and philosophers, on the other hand, have been more interested in what might be called the “semantical” definition of meaning. This definition holds that meaning is the relationship of signs to their significance.

The authors consider the philosopher to be interested most often in “stating the logically necessary and sufficient conditions for signification, which may or may not involve the behavior of the sign-using organism as component; the psychologist is typically interested in the role of the organism’s behavior in mediating the relationship between signs and significates” (p. 5).

There are several theories of how psychological meaning arises, or the process by which a stimulus which is not an object becomes a sign of that object (Osgood, 1953). First is the mentalistic view, perhaps the most “classical” view of meaning. It stems from the Western naturalist philosophers and holds that signs and their objects are physical events; there

must be some mental event that links the two together. The core of this mental event is the “idea”. The definition of meaning from this position, says Osgood, thus may be stated: “. . . something which is not the object becomes a sign of that object when it gives rise to the idea associated with that object” (p. 201).

The substitution view holds that an over-zealous application of the principles of Pavlovian conditioning leads to the theory that organisms assign meaning after being conditioned to the responses originally made to objects. Thus the object is viewed as the unconditioned stimulus, and the sign as the conditioned stimulus. Osgood’s (1953) definition of the sign process from this point of view is, “. . . whenever something which is not the object elicits in the organism the same reactions evoked by the object, it is a sign of the object” (p. 201).

Meaning as a set or disposition is a step back in the direction of the mentalistic view. It holds that signs derive meaning by “taking account of” the objects they signify. Osgood (1953) states this view as “. . . any pattern of stimulation which is not the object becomes a sign of that object if it produces in that organism a ‘disposition’ to make any of the responses previously elicited by the object” (p. 202).

The Process of Representational Mediation

Osgood rejects all of these in favor of another approach to understanding how signs arise. He calls this process “representational mediation”. While related to Morris’s (1946) set or disposition theory, it differs in that it provides an explanation for how the disposition or mindset comes about in the first place.

As described by Osgood (1953), representational mediation involves four premises, here given and amplified by his explanation of how a rat is conditioned to recognize a buzzer as a sign of an impending electrical shock, or how the buzzer comes to mean electrical shock to the rat:

1. Stimulus objects (S) elicit a complex pattern of reactions from the organism, these reactions varying in their dependence upon the presence of the stimulus

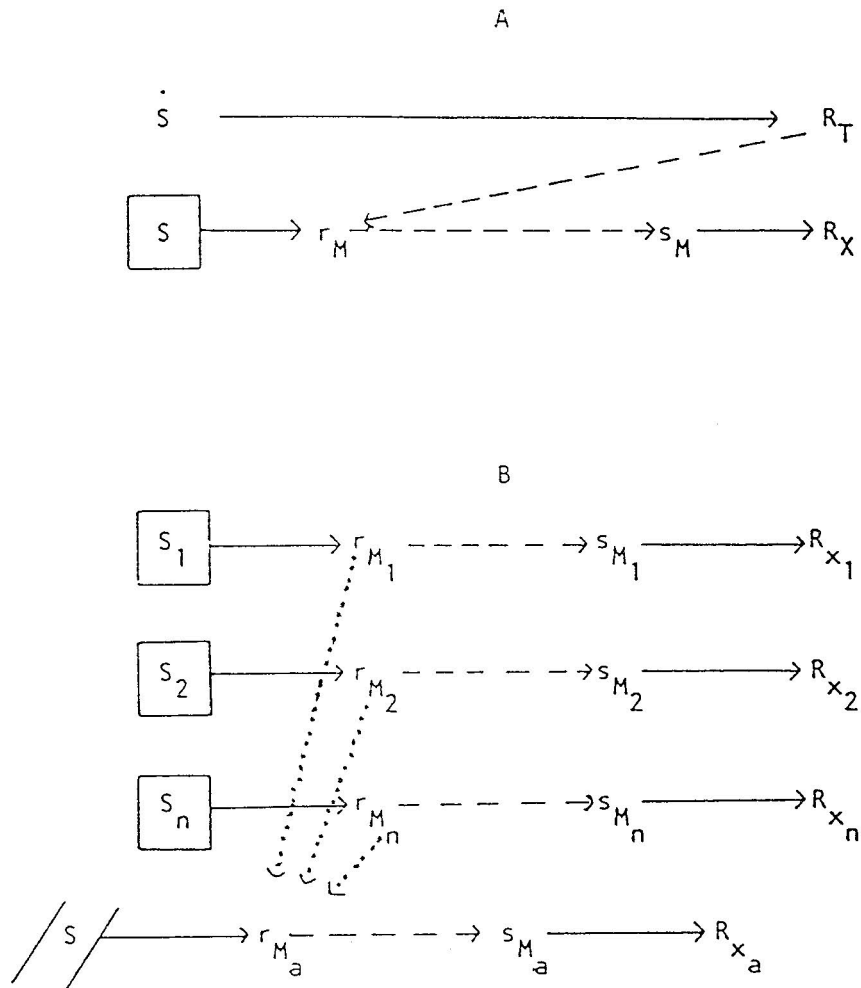


Figure 2

Symbolic Representation of the Development of a Sign Process:
 A. Development of a sign. B. Development of an assign.

object for their occurrence. Electric shock galvanizes the rat into vigorous jumping, squeaking, and running, as well as autonomic "anxiety" reactions. Food elicits salivating, chewing, lip-smacking, and so forth. Components like salivating and anxiety are relatively independent of the food or shock stimulation and can occur when such objects are not present.

2. When stimuli other than the stimulus object, but previously associated with it, are later presented without its support, they tend to elicit some reduced portion of the total behavior elicited by the stimulus-object. This reduction process follows certain laws: (a) mediating reactions which interfere with goal-achievement tend to extinguish; (b) the more energy expenditure involved in making a particular reaction, the less likely it is to survive the reduction process; (c) there is evidence that certain reactions (e.g., autonomic) condition more readily than others and hence are more likely to become a part of the mediation process. This last may merely reflect factor b above.

3. The fraction of the total object-elicited behavior which finally constitutes the stable mediation process elicited by a sign . . . will tend toward a minimum set by the discriminatory capacity of the organism. This is because the sole function of such mediating reactions in behavior is to provide a distinctive pattern of self-stimulation.

4. The self-stimulation produced by the sign-elicited mediation processes becomes conditioned in varying strengths to the initial responses in hierarchies of instrumental skill sequences. This mediated self-stimulation is assumed to provide a "way of perceiving" signs and their meaning, as well as mediating instrumental skill sequences—behaviors to signs which take account of the objects represented (p. 203).

Osgood's theory of how meaning arises may be stated formally as

a pattern of stimulation which is not the object is a sign of that object if it evokes in the organism a mediating reaction this (a) being some fraction of the total behavior elicited by the object, and (b) producing distinctive self-stimulation that mediates responses which would not occur without the previous association of the objects and nonobject patterns of stimulation (p. 203).

Osgood's theory has been clarified and illustrated by Tzeng (1972). In his illustration (Figure 2), paradigm A presents the development of a sign. The stimulus object (S) elicits a complex pattern of behavior (RT) in the organism. Portions of this behavior become conditioned to the sign (\boxed{S}); when the sign sequence is repeated several times, the mediation process is reduced to one requiring minimal effort. This mediation reaction (r_m) still includes a portion of those reactions originally elicited by S. The mediating reaction produces a distinctive pattern of self-stimulation in the organism which, in turn, may elicit a variety of overt behaviors (R_x).

The stimulus-producing process ($r_m \rightarrow s_m$) is representational in that it includes a portion of the behavior (R_T) elicited by the significate itself. It is mediational in that the self-stimulation (s_m) may become associated with a variety of instrumental acts (R_x).

Osgood's view of the stimulus-response can thus be seen as a two-stage process. The first stage, decoding (or $s \rightarrow r_m$) is the association of signs with representational mediators. The second stage, encoding (or $s_m \rightarrow R_s$) is the association of mediated self-stimulation with overt behaviors.

The majority of signs used in ordinary communications are more properly thought of as "assigns." That is, they are in a sense "assigned" a meaning through their association with other signs rather than through their relationships with objects signified.

The development of an assign is illustrated in paradigm B of Figure 2. Here portions of the representational behavior

($r_{M1}, \dots, r_{M2}, \dots, r_{Mn}$)

from a set of signs

($\boxed{S_1}, \boxed{S_2}, \dots, \boxed{S_n}$),

transfer to a new assign to form a (/S/) new representational mediator

(r_{Ma}),

which becomes the meaning of the assign. The very core of communicative sign usage lies in the formation and use of assigns. The act of reading, for

instance, involves the use of assigns (marks on a page) derived from other signs (spoken language).

Because the behaviors of different persons toward the same object vary, it should be clear that the meanings which they ascribe to the same sign for that object will also vary. The composition of the mediational process which is the meaning of the sign is entirely dependent on the total behavior (R_T) of the individual toward the object. This is probably no less the case for the meaning of music. That, too, should be viewed as the result of a compounded mediation process. The meaning of music is still dependent on the learned responses of the listener within a given musical culture. Meaning, however, even for a single assign ($/S/$) is not the result of a single response. Meaning is more complex than that.

The Componential Nature of Meaning

A critical assumption of Osgood's theory is that the representational mediation processes are componential in nature. That is, a relatively small number of r_m 's (r with a lower-case m , denoting a semantic component) may serve to differentiate a large number of r_M 's (r with an upper-case M , denoting a total mediation process). This explanation is due to the ability of the r_m 's to serve in various combinations. Each of the r_M 's is related to its source behavior in some unique manner, but unique as a whole and not unique in the same sense that the r_m components which comprise it are unique. This is what Osgood has referred to as the "emic" principle of behavior and is illustrated in Figure 2.

The r_m 's (both those with upper and lower case m 's) may be viewed as hypothetical constructs rather than intervening variables. r_m 's and their automatic consequences s_m 's are given functional definitions in terms of S-R theory and thus allow the incorporation within the semantic mediation process of more general theories of learning. This is handy, indeed, because it admits all the more traditional single-stage theories of learning such as habit strength and generalization. Osgood (1971) has reconciled representa-

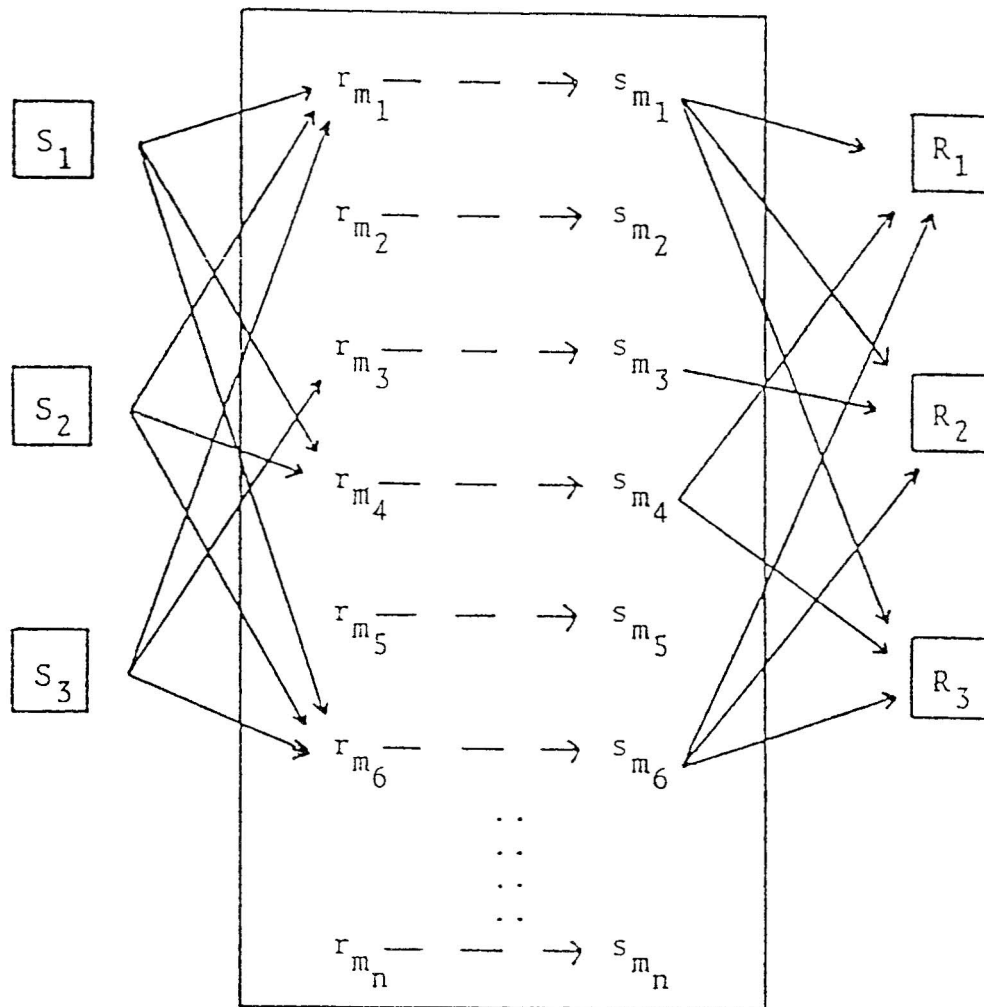
tional mediation and single-stage principles, stating that "... both the big, total M 's and the little component m 's have response-like functions as dependent events (in semantic encoding or sentence understanding) and stimulus-like functions as antecedent events (in encoding or sentence creating)" (p. 13).

As to the source of the r_m 's and their differentiation from the total overt behavior exhibited to the things signified (RT), Osgood (1971) points to the historical nature of the r_m 's in the development of the individual using them. He emphasizes that "... r_m 's are representations of those aspects of the R_T 's which have made a difference in the appropriateness of behaving with respect to those things signified by signs and have therefore been differentially reinforced" (p. 13).

Three distinctive features of Osgood's "emic" theory are revealed in Figure 3. First, r_M is an abstract entity or theoretical construct. It is observable in itself, except through the observation of its consequences in behavior. Secondly, r_M explains the functional equivalence of different behavioral events. In the diagram, for example, signs one and two are shown to have the same combination of r_m 's and thus the same meaning. Finally, r_M is shown to be a simultaneous "bundle" of distinctive components (r_m 's); these component bundles serve to differentiate meaning. In the diagram, signs one and three are the same except for the presence of component four vs. three, respectively (Osgood, 1971).

The function of these hypothetical constructs in the mediation process is determined by three characteristics of human cognitive processes (Tzeng, 1972). First, there is a bi-polar organization to human cognitive processes, a "pulling" between opposite poles or forces. From this, scales of the semantic differential are devised as continua between polar opposites. Second, there is an attribution of positive polarity to one of the poles of each dimension of the qualification of experience. Thus it is noted that "strong" tends to be associated with "active" and "good", rather than with "sedentary" and "bad". All are somehow psychologically positive, a finding which is generalizable across cultures and language groups (Osgood,

SEMANTIC COMPONENTS



$$r_{M_1} = [r_{m1}, r_{m4}, r_{m6}]$$

$$r_{M_3} = [r_{m1}, r_{m3}, r_{m6}]$$

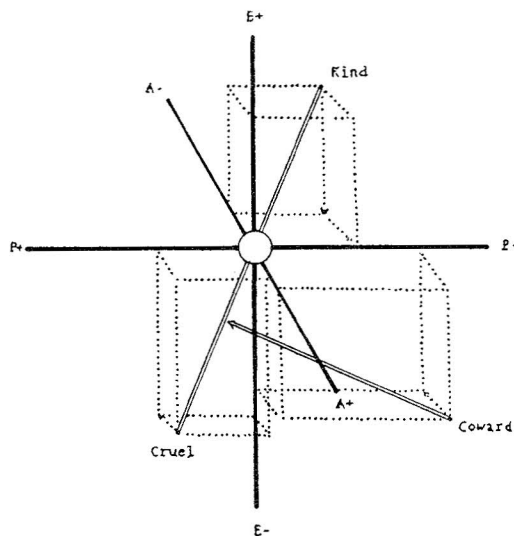
Figure 3

An "emic" principle for behavior theory.

May, & Miron, 1975). Third, there is a tendency toward parallel polarity of the r_m components of meaning; thus, the positive of these small dimensions line up to define the bundle of r_m 's necessary for meaning.

This model suggests that theoretically there exists a "semantic space" of n dimensions in which meaning might be located. The dimensions of the space are defined by groups of bi-polar, parallel r_m 's. An example of such a space is found in Figure 4, which demonstrates a three-dimensional semantic space of Evaluation, Potency, and Activity, Osgood's famous E-P-A structure for affective meaning. These dimensions are taken as functional representations of the r_m bundles. The spatial model suggests, in turn, that factor analytic procedures are appropriate techniques for "discovering" these dimensions. That is, great amounts of information in the form of variance in semantic components uncovered by individual semantic scales are distilled and explained by a much smaller number of factors (r_m 's) which taken together define the location of a point in the spatial model and define r_M or meaning. Osgood's explanation of the example shown as Figure 3 will serve to clarify the situation (Osgood, 1971):

... application of the factor-analytic measurement model provides a framework of underlying dimensions which is common to both concept meanings and scale meanings and in terms of which both can be described in relation to each other. These underlying dimensions thus have the functional properties of semantic features. Anticipating our results for those who are unfamiliar with this research, SD technique yields three dominant affective factors or features: Evaluation (Good/Bad), Potency (Strong/Weak), and Activity (Active/Passive). We refer to scales having loadings on these underlying factors; the scale kind-cruel, for example, has loadings of .70 on E, $-.35$ on P (that is cruel is more potent than kind), and $-.15$ on A. From these loadings we can assign kind and cruel their reciprocal locations in the space. We can characterize kind as being Very Good, Quite Weak, and Slightly Passive, affectively and cruel as being Very Bad, Quite Strong, and Slightly Active. We refer to concepts having scores on these same underlying factors. If the concept COWARD, for example, had scores of $-.15$ on E, $-.70$ on P, and $+.20$ on A, its affective paraphrase would be "a coward is quite bad, very weak, and slightly inactive". Making the projections from the COWARD point to the underlying kind-cruel line in the three-factor space, we predict that COWARD will be rated as "slightly cruel" on the underlying kind-cruel scale. Predictions of all concept/



kind-cruel: E+ .70 P- .35 A- .15 loadings / Coward: E- .50 P- .70 A+ .20 scores

Figure 4

Application of the factor-analytic measurement model.

scale mean judgments of Research in Music Education, Vol. 16 [2021], Art. 11. The structure of this fashion—which is not at all remarkable, since the factor loadings and scores were derived directly from these original judgments (p. 14). □

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