

A CONSTRUCTIVIST DESCRIPTION OF A CONSTRUCTION SYSTEM

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The Constructivist Assumption

As a constructivist I assume that any and all sensory input becomes integrated into whatever I will discuss as the person's psychological system. When I meet Tom PaoloPietro, light reflections from what one takes to be his face (among other inputs) becomes input to a sensory system. From the standpoint of "knowing," that input has relevance only in so far as my existing personal construct system assimilates that sensory input. Such assimilation allows me to recognize that I am encountering a stimulus pattern that I can categorize as a person who belongs in the special subordinate category, Tom Paolopietro. When I declare, "I recognize Tom," I am verbalizing a conclusion to a constructivist process.

Though, I assume, a personal construct system must be grounded in a biological system, that biological system does not concern me. My goal is to devise ways to track out the psychological system that I assume to function as the construction system. I assume that a stimulus pattern deriving from an ecological event has set up energy transfers at my sensory endings. I assume the presence of a system that mediates my recognition of the event which I take to be associated with that stimulus pattern. That is, my construction system "assimilates" the input to make the ecological event "similar to" my construction. I am setting out to formalize a description of that system. My aim is to convince my coterie of colleagues that, using their standards of justifiability, they should give warrant to my set of propositions regarding the system that mediates the constructive process.

One need not proceed from this basic constructivist assumption. Gergen (1989) decried the enthusiasm about "cognitivism," arguing that by taking the position that "it is not the world in itself that determines human action, but the way in which the world is perceived," we stand "in great danger of getting off at the wrong revolution" (p. 464).

He elaborates, as follows:

... For, if we continue to reduce the world as it is to the world as mentally represented, there ceases to be a "real world" in which the individual operates. And by implication, there ceases to be a subject matter for the science.... Are not scientists, too, locked into their own conceptual or perceptual systems, expressing only their subjectivities rather than accurate representations of the way things are? (pp. 465-66)

Committed "epistemological constructivists" (see Chiari & Nuzzo, 1996) occasionally need statements such as this to remind us that serious thinkers - even those thinkers who would bill themselves as constructionists - have conjectured about "real worlds" (while, with proper caution, surrounding the term in quotation marks), and of the world as it IS. Such thinkers continue to worry about the objectivist/subjectivist dichotomy, despite the readily accepted claims that, "... anything that talk of objectivity can do to make our practices intelligible can be done equally well by talk of intersubjectivity. (Rorty, 1998, p. 82). And,

The truth of our narratives does not reside in their correspondence to the prior meaning of pre-narrative experience; rather, the narrative is the meaning of the pre-narrative experience. The adequacy of the narrative cannot, therefore, be measured against the meaning of pre-narrative experience but, properly speaking, only against alternative interpretation of that experience. (Kerby, 1991, p. 84)

Nevertheless, a theorist who no longer worries about objectivism and realist ontologies and the arguments that arise from such worries would experience little discomfort on reading Gergen's warnings. A committed constructivist, after all, became a committed constructivist only after having determined that

scientists, like all persons, unprofitably pursue ephemeral when they attempt to ground their formulations in foundational premises laboriously extracted from a real world. "Indeed," one would answer to Gergen, "scientists, as persons, are locked into their own construing systems! Alas, as persons, scientists must be satisfied that they function within cosubjectivities." All our social interactions involve efforts to convince a select coterie of colleagues, "us," that our propositions are justifiable, in "our" terms. And, thus, ".... if we can just keep democracy and reciprocal tolerance alive, everything else can be settled by muddling through to some reasonable sort of compromise" (Rorty, 1998, p. 82).

Cantor (1990), as a personality theorist, credits Kelly (1990/1955) for his having planted constructive alternativism and individual subjectivity into the center of the kind of personality theory that may follow from adherence to constructivist epistemologies. "By explicating these processes of translations (and of construction) a cognitive approach underscores the dynamic, transactional development of personality" (pp. 735-36). Cantor elaborated on George Kelly's basic constructivist foundation: "First, he placed the interpretive process at the very center of his account of individual differences: People differ because they anticipate events in unique ways which, in turn, channel their behavioral responses" (p. 736).

In this essay, I undertake to elaborate a description of the construct system which underlies a person's unique ways of anticipating events.

Some Ground Issues

Having accepted the basic constructivist assumption, we will need to determine response to the myriad of issues which arise immediately. I choose to focus on three issues which demand attention. First, I will address the issue of what constructions are to be built when one uses the very term construction. The effort to attain intersubjectivity regarding the term construction, of course, depends on one's assumption about "the contents" of a presumed integrating psychological system. I will attempt to resolve the second issue by proposing that constructs may be regarded as the basic units of a psychological system. Cantor (1990) pointed to a third overriding issue when she wrote, "a cognitive approach underscores the dynamic, transactional development of personality. By recognizing the power of intelligent beings to think in novel ways about themselves and others, it acknowledges a potential for creative adjustment" (p. 736). In terms which are more compatible with the language of this essay, we need a version of the integrating system that allows ready explanation of the events which we reference, using common terminology, when we speak of personal choice. In the remainder of this essay, I will explore formulations by which one might address these three issues.

An Effort to Attain Intersubjectivity Regarding the Term Construction

Why does one speak of a construction?

I would use the term construction to designate a very transitory end state of an integration of inputs. In effect, the assimilating system guides the building of a particular construction as a suitable transitional end state of the processing of a set of inputs.

An analysis of continuous psychological activity would allow us to conclude that such activity represents a continuous production of such constructions. At this point I wish to legitimize my use of the term construction as a noun. I propose that constructions can be conceptualized as products of a dynamic transaction involving inputs and a psychological system.

A construction represents a fit between the input and the existing assimilating system. Let me try to elucidate by exemplifying. Shepard (1975, 1984) reported on a series of demonstrations of persons building spatial constructions from visual inputs. Shepard's work elegantly elaborates Wertheimer's (1912) venerable demonstrations of the construction of movement. Recall that Wertheimer's phi-phenomenon requires that the

investigator position two lamps within the visual field of an observer. The lamps are then alternately extinguished and lighted, with an interval of about 350 msec. between the lightings. The observer usually then reports that she/he "sees" the lamp moving back and forth, and will even trace the trajectory across the intervening space. Kolers (1964) produced an even more startling effect by alternately projecting separated Necker cubes into a viewer's visual field. Observers also report that the cube "travels" across the space which separates them. Additionally, Kolers' viewers occasionally declared that the cube underwent midflight (See Figure 1).

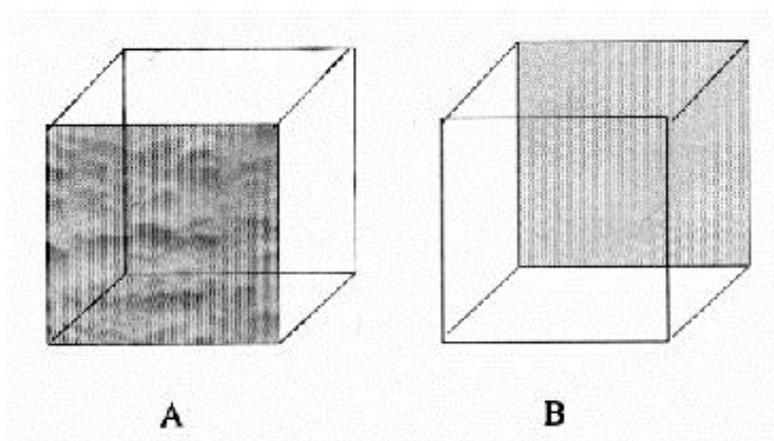


Figure 1. Kolers (1964) presented participants with a stimulus sequence in which cube A was first lighted for 50 milliseconds, then the light was extinguished. After a 250 millisecond interval, cube B was lighted. Observers reported that the cube appeared to move from position A to position B. Additionally, the observers reported that while experiencing the cube in movement, they also experienced reversals in the depth of the surfaces, such that, for example, the shaded surface in cube A appeared nearer to the observer for a period of time, and then the shaded surface of cube B would appear nearer to the observer.

Shepard added elaborations to these demonstrations of apparent movement. The added variations created input patterns that would induce a person to build a construction of a figure moving into the third dimension. By projecting figures such as those shown in Figure 2, he was able to bring viewers to report that they had construed the shape as rotating through space while simultaneously moving through the near/far dimension.

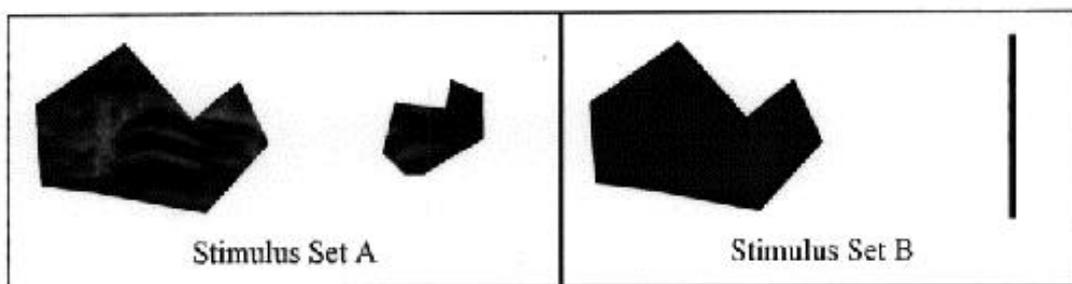


Figure 2. Shepard (1975) presented participants with a situation in which they viewed stimulus patterns such as those shown in Set A and those shown in Set B. Participants, for example, first viewed the left figure in Set A. The figure was then extinguished, and the right figure of the set was presented after a very short interval. Participants reported seeing the figure move through space: to the right, and twisting counterclockwise as it moved away from the participant. A pair of stimuli like those in Set B were similarly presented consecutively in the same spatial location on the plane in front of participants. Participants reported seeing the figure rotate around its central axis, and then stop when an edge-on view appeared.

I wish to illuminate intensely one important point which is made valid by these demonstrations. Assume that these integrations of inputs into a person's system of spatial constructs produce constructions such as the light moved across the space, or the cube changed perspective as it traversed the interval, or the figure rotated as it moved back from the frontal plane on which the first figure was presented. Notice that the viewer imports to the construction some elements which simply cannot be associated with any energy inputs designed by the investigator. The investigator presented two discrete light patterns. The viewer reports a construction which involves the assuming of energy inputs which would arrive, temporally, in the very short, real time interval between the extinguishing of the left figure and the appearance of the right figure.

These observations become important if one asks the question, "From where came those contributions to the observer's construction?"

I am willing to assume that the observers' construction systems contributed those elements in order to create a "fitting construction" -- that is, a construction which fit over the sensory inputs, while, simultaneously, maintaining the integrity of the viewers' construction systems.

More elaborately, we can claim that the viewer brought to the situation his/her construction good story. The person constructs for the flow of inputs a narrative that fits the positive pole of his/her construct random sequence of words/good story (See Mancuso, 1996).

Now consider another important question: "At which 'real time' point did the system add those elements?"

We must agree that they were added after the second set of energy patterns (derived from the right hand figure) arrived at the sensory system. What is reported if the two lights are spaced as they were in Wertheimer's study, and one light simply was extinguished? The observer does not report that the light moved part-way across the space and then disappeared into nothingness! The person's system adds the elements of the construction only after the second light appears -- thus creating the fitting construction, "Oh yes, the light moved across the space."

The point to be made, particularly by Shepard's studies, which involve novel light energy patterns, is that constructions are not retrieved whole. Constructions are made on the spot. The term construction is chosen advisedly: Persons build - persons construct - constructions to anticipate and to "track out" the flow of the input. Correlatively, I pointedly advise rejection of a view that constructions are retrieved from the psychological system as unitary assemblages. In the case of the viewers of Shepard's stimulus patterns, an observer must locate the two-discrete sources of reflected light in terms of a series of bi-polarized subordinate constructs; e. g., near/far, up/down, small/large, wide/narrow, edgewise/frontal, left/right, back/front, before/after and so on. By the use of such sets of constructs, the viewer "makes sense" (successfully anticipates) the two different objects reflecting light to his/her retina. One of the objects is located on the near end of his/her near/far construct. One of the objects is located at the back end of his/her back/front construct, and so forth. Most of these constructs, it will be noted, do not depend on the direct sensory inputs. The constructs allow the construction of relational aspects (e.g., before/after). At some point during the psychological development of the observer, he/she needed to acquire the relation-describing construct through a learning process.

In the situation created by Shepard, the observers applied a single superordinate construction through which they could successfully anticipate the continued flow of inputs. They used the construct inert/mobile. Again, nothing in the direct sensory input would provide immediate evidence of the utility of locating the stimulus patterning as mobile. That construction, I again note, was imposed only after the stimulus patterns were located on the subordinate constructs such as those listed in the previous paragraphs.

Before proceeding, I would note one other important assumption underlying the conclusions drawn from Shepard's investigations. In order to contrast the left stimulus object in Stimulus set A, in Figure 2, to the right stimulus object of the set, the observer would have "stored" a representation of the left stimulus object in some kind of "memory bank." The two objects were not presented simultaneously. One must posit a

"storage mechanism" in order to account, for example, for the observer being able to locate the right pattern at the (relatively) far end of his/her near/far construct. The human ability to store such "iconic" representations for use in cognitive processes allows humans to carry on extraordinarily intelligent activity. (At a latter point, we will note that this ability must be posited in order to discuss the ways in which humans build bi-polarized construct.)

My considerations of the conclusions to be drawn from results of Shepard's studies of the very complex construction processes involved in his observers' construing the novel stimulus patterns, heightens my caution about sliding into a view that a construction represents a kind of retrieval of a preestablished, fixed, or unitary assemblage. Under the perceived threat of being accused of having adopted a radical relativist position, some theorists who had leaned toward epistemological constructivism have adopted an epistemology that can be labeled critical realism (see Chiari & Nuzzo, 1996). From this perspective one would assume that a person can, through having had sensory contact with objects in the ecology, directly incorporate those representations into his/her knowledge system. In that inputs cannot be regarded as a "reflection" of an object (we work only with activated neurons) those representations are not "accurate" representations of the ecological "reality." Nevertheless, they are regarded as constructions that are retrieved when a person next encounters a similar stimulus input.

My rejection of this "weak version[s] of constructivism" (DeNora and Mehan, 1994, p. 170) derives from a proposition that I must accept. In the first place, as I noted above, many constructs reflect relational aspects of stimulus patterns. Nothing in direct visual functioning immediately represents, for example, near/far. Further, persons are metaphor makers. Inputs from putative objects, events, and signs can instigate novel constructions -- metaphors and fantasy. A theory based on propositions which speak of retrieval of experientially preestablished constructions -- e. g., there is nothing in the mind that was not ever in the senses -- do not satisfactorily explain metaphoric and fantastic constructions. Thus, I am led to regard constructions as on-the-spot creations built from the various "parts" of the constructions, rather than representations that are retrieved whole.

In summary, I have presented demonstrations by which I claim the justifiability of regarding a construction as a kind of representation internal to the person. The constructions represent the locations of stimulus patterns on bi-polarized judgment scales; scales which have been abstracted from sensory patterns that are assumed to derive from objects and events. The demonstrations that I have referenced also allow us to assume that the construction process takes place in extremely rapid bursts, as is indicated by the finding that if the interval between the presentation of successive stimulus patterns is extended the person does not use his constructs of motion to process the inputs. Further, the extreme rapidity of the processing indicates that the person does not need to build "consciously" assessed representations of the input patterns in order to build anticipatory constructions. Of course, the participants in Kolers' and Shepard's studies did attempt to signify their constructions in order to communicate with the experimenter. Thus, the reviewed studies also demonstrate that persons attempt to gain intersubjectivity by using verbal signifiers to evoke cosubjectivity.

What units are "stored?"

If we accept the proposition that the system creates a flowing series of constructions to fit as templates over the flow of inputs, how shall we construe the more or less permanent contents of the "knowing" system of that is applied for use in integrating input?

The basic units of the storage system, I propose, should be regarded as two-poled judgment scales. Crudely put, we can say that the system contains a finite set of scales, whose analogue is to be found on all varieties of devices that scientists have used in their attempts to measure the ways in which people construe events.

Behavior scientists have repeatedly granted validity to the assumption that the functioning of the human psychological system somehow involves basic units which can be represented as two-poled judgment scales.

The assumption, like other major assumptions on which psychological theory has been grounded, often forms an implicit, rather than an explicit, foundation for explications of constructive activity. In an earlier paper, I (Mancuso, 1976) have explored the many instances in which this assumption appeared, both implicitly and explicitly, in psychological research ventures and reports. The assumption that two-poled judgment scales form the elements of the construction system underlies two extensive lines of psychological research: Studies based on Osgood's (Osgood, Suci, & Tannenbaum, 1957) Semantic Differential, and studies based on Kelly's (1991/1955) Role Repertory Grid (See Mancuso & Shaw, 1988 for a introduction to applications of repertory grid analyses). The use of this central assumption in a long line of investigations that have their well-spring in the vigorous activity of cognitive science was aptly demonstrated in Adams-Webber's (1982) review of the relevant studies. He summarized some of the ramifications of adopting the Kelly's dichotomy corollary:

... [The] corollary asserts that "a person's construction system is composed of a finite number of dichotomous constructs" (Kelly, 1955, p. 59). Each construct represents a single bipolar distinction, such as happy/sad, which is seen as applicable to a limited range of events. One of its alternative poles is assumed to have a nominal, as well as a contrastive, function; that is, it provides the name of the construct (for example happiness). The opposite pole is viewed as having only a contrastive use. Recent research indicates that the nominal poles of constructs are applied to events more frequently than are their contrastive counterparts and also that there is more interjudge agreement concerning the meanings of the former. The contrast poles, on the other hand, are used more idiosyncratically and independently of one another and are applied to events in a more definite manner. (Adams-Webber, 1982, p. 112)

While studies which support these summary statements should go a long way toward prompting cosubjectivity on the issue of the bipolarity of the basic units of the construing process, a circle of cognitive scientists cautioned against accepting the bipolarity proposition.

Lingle, Altom, and Medin (1984) framed considerations that would guide the development of theoretical positions regarding bipolarity.. "The component attributes of categories can be described in terms of either dimensions or features.... choice of dimensional or featural attributes can have important implications for assumptions of category structure and processing" (p. 82). Lingle, et al, rightly contend that "dimensions contain mutually exclusive values, and zero typically indicates a particular level along a dimension, rather than the complete absence of the dimension" (p. 82).

In the more familiar terms of personal construct psychology, dimension refers to a bipolar construct, where zero indicates that the event to be located on the construct is out of the range of convenience of that construct (Mancuso & Eimer, 1982). One can take as an example the construct short/tall, which allows adherence to a view which seems to agree with Lingle, et al.'s position that quantitative "components" can best be represented by dimensions -- whereas qualitative components are best represented by features. If a person were processing an event along the short/tall construct, locating that input at the tall (or short) end of the construct would be to judge that the event "matches" a prototypically tall (or short) exemplar of that event. If the range of convenience of the construct short/tall did not extend to the object -- that is, short/tall do not count in locating the object in a category (a construction) -- a zero scaling would be applied.

A personal construct theorist who attempts to work with the construction feature, as used by Lingle, et al. as well as by other cognitive scientists, encounters a difficult processing problem. Lingle, et al.'s usage allows one to trace out the sources of the difficulty. They offer a basic proposition, " ... attributes form the elementary building blocks that mediate judgements of similarity among categories and category members" (p. 78).

The beginnings of a personal construct theorist's processing difficulties can be located in the following passage

... we use the terms category and concept interchangeably to refer to a grouping of entities (events, object, situations, or whatever) based on one or more characteristics. We use the term attribute to refer to some characteristic of an entity that could potentially serve as the basis for a grouping. Thus, in our use of the two terms all categories or group memberships can also function as attributes, although not all attributes function as categories. (pp. 79).

In this passage, the terms category and concept would seem to correspond to this constructivist's use of the term construction. A processing difficulty, however, begins to arise in dealing with the term entities in the first sentence of the passage. A strict constructivist might better avoid that term, or, if necessary, would use a term such as assumed entities. A constructivist would better see the scrutinized psychological system -- the person -- as a system which "assumes entities." The person derives a construction of an assumed entity from inputs which are assumed to derive from assumed entities.

The distinctions pressed in the foregoing paragraph become particularly fundamental when one considers Lingle, et al's elaboration of their construction attribute. That term "refer[s] to some characteristic of an entity." The conceptual trap closes! Category refers to a grouping of entities -- "out there" events which "have" characteristics, to which we will refer as attributes. We are ineluctably led into a naive realist's world! But, why should even a realist theorist rename the extant somethings which earn the verbal designator characteristics? Should he/she not simply continue to speak of characteristics rather than cloud the theses by introducing other terms -attributes, features, dimensions.??? A constructivist would have less difficulty if theorists would speak directly of attributes - intending to signify that the construer is assimilating inputs to his/her system, rather than unpacking inputs to discover the characteristics of the event from which the stimuli derive.

In the article by Gergen, cited above, one finds some clues to why a theorist refers to features rather than referring to attributes (constructs).

... In particular, the theorist again confronts the problem of understanding how the individual would come to recognize the features, objects or configurations of events of the world at the outset. How would it be possible to recognize the features of a particular configuration without a preliminary concept of these features? For example, how does one come to recognize feathers, beaks, wings, and so on? all features which enter into the generation of the natural category bird? Must one not already possess a category system in which such features are rendered sensible and discriminant in order for recognition to occur? From whence this category system? Further, there is no salvation in arguing that these attributes are themselves built up from exposure to their sub-features or attributes. For such rebuttal would simply place the critical question one step remove. How would these features be recognized? In effect, to solve the problem of how people come to have concepts of birds and other "natural occurrences," Rosch must ultimately rely on the existence of uninterpreted, uncategorized inputs into the cognitive system. But, if inputs only count or are significant to the individual insofar as they are cognized (interpreted, labeled, categorized, etc.) then such entries into the mental system are nonsensical. They simply would not register as identifiable events. (p. 468)

Innate feature detectors provide one attractive answer the challenges laid down by Gergen. Some cognitive psychologists are willing to explore the possibilities of inborn "feature detectors." By this solution, one can postulate that certain input patterns are interpreted and categorized through the use of a system with which infants are biologically endowed. Harnad (1987), for example, takes seriously investigators' conclusions "that infants are born with categorical representations for speech sounds, perhaps encoded in syllabic chunks" He regards this special class of feature-detection models as being analogous to the visual feature detectors models proposed by Hubel & Weisel (1979). At the same time, he proposes that "Features that are not innate must be learned from experience, so categorical representations for learned categories consist of learned feature detectors" (p. 18).

I take the liberty of concluding that Harnad had meant to say, "Features that are not processed through innate mechanisms" rather than, "Features that are not innate..." (I cannot understand how a feature could be innate.) I then transmute Harnad's sentence into, "One must learn the mechanisms by which to process features that are not processed through innately given mechanisms." I would then ask that theorists forestall inclusion of propositions about innately given feature detection systems, I would recommend that we set out to offer justifiable propositions about the ways in which all bi-polarized constructs are "learned." My invitation, to be sure, does not follow from a presupposition that events sit "out there" containing constructs (or features) that the person must somehow "pick out" and then incorporate into his/her construct system.

My study of the passage, written by Gergen, that is cited in the early part of this essay leads me to conclude that he expects us to agree that we must deal with a real world of features, objects, or

configurations which are extant in the world's events. I suspect that when he uses the term inputs he intends to transmit a construction built on the presupposition that the world of features, objects, and configurations enters the psychological system as features, objects, and configurations. It appears that Rosch and Harnad fall into the trap of accepting that belief, and then respond to a challenge like Gergen's, by yielding a strong epistemological constructivism. "Well, there are some innate feature detectors! Humans do automatically use basic level categories!"

The perception/cognition dichotomy in problems of understanding categorization processes. For several thousand years (at least), thinkers have considered it useful to regard psychological functioning as if one could make a useful distinction between perceptual processes and cognitive processes. Goldstone and Barsalou (1996) wrote a survey which reflects a reliance on this distinction, and then offered to "illustrate ways in which conceptual processing is grounded in perception, both for perceptual similarity and abstract rules" (p. 1) and to "discuss the advantages, power, and influences of perceptually teased representations" (p. 1).

Unfortunately, Goldstone and Barsalou did not satisfactorily verbalize the construction which is to be accessed when they use the term perception. I am led to conclude that they had intended to designate a process which takes place within the psychological system at that moment when sensory energies transform into neural energies to become inputs into the psychological system. From their use of the term amodal processes, which I deduce they mean to use as a term which may substitute for conceptual processes, they would regard perceptual processes as modal; that is, as those psychological processes which occur contemporaneously, in real time, when one of the sensory modes functions. They also allow me to infer that whatever takes place in the psychological system as one of the sensory modes operates will recur at later times when the person engages in a categorization process (a cognitive process).

What do Goldstone and Barsalou assume to be the process that takes place at the time during which of the sensory modes functions? Again, I could only attempt to use hints given in their text to make deductions regarding this question. They said, "Perceptual ... representations, because they preserve aspects of the external object in relative raw form, can represent certain aspects of the represented object without explicit machinery to do so" (p. 6). They then proceeded to indicate that "seemingly abstract properties can be computed by analogue devices" (p. 6). They then attempted to illustrate by examples which involve complex manipulations of spatial representations - height, width, length, etc., and combinations of these representations. At another point they said:

Because the overall similarity process has its roots in perception, the features it utilizes are biased toward features that perception makes available. Thus, features like shape, color, size, texture, and position are important, because perceptual systems make them readily available to the overall comparison process. Other features are less likely to be incorporated into overall similarity, because they are not as available. The consequence is that natural constraints are placed on the overall similarity, thereby mitigating the problem that it is unconstrained." (p. 9)

Here then, they reveal the use of the assumption that "perception makes features available." I again raise the questions, "Are the features of an event simply recorded by the perceptual process? Are there no categorization processes involved in ascribing a particular length (tall?), width (narrow?). or shape (pentagonal?) to an event?"

Adhering as strictly as I can to my constructivist assumption, I would claim that a person must first acquire the constructs by which to construe events in terms of short/tall, narrow/wide, or curvilinear/rectilinear.

What I see to be a conceptual trap can be evaded by taking seriously the term inputs. Uninterpreted inputs do enter the system. A theorist would go astray if he/she were to think of inputs as simulacra of features, objects, configurations, primitives, or constructs. It is advisable to insist that inputs be regarded as firings of neural endings.. A psychological system must build constructs on the base of those inputs -- energy transformations at the sensory endings which fire off networks of neurons. We would agree with Goldstone and Barsalou as they attempt to diminish the distinctions between perception and conception; but unlike

them, we would eliminate the distinction by claiming that all input must be "cognized" in terms of personally invented constructs. Gergen phrases a question more compatible with my system of propositions when he asks, "Must one not already possess a category system within which such features are rendered sensible and discriminant in order for recognition to occur?" Before responding affirmatively to his question, I would ask that Gergen allow me to alter the question to, "Must one not already possess a construct system in which such inputs are rendered sensible and discriminant in order for (re)cognition (construction) to occur?" I would then answer, "Yes, indeed, there can be no construction if the integrating system contains no bipolarized constructs." I would ask that bipolarized constructs be regarded as the essence of the system. We then must proceed to frame a theory of the acquisition of constructs. I would offer several hypotheses. To begin, I would want to spell out a useful theory of motive (Mancuso & Hunter, 1983; Mancuso & Adams-Webber, 1982).. And, I also would insist that we recognize that there are inputs to a rather complete nervous system for at least four months before the infant emerges into a world full of a "pandemonium of inputs. " Unhappily, I have found no elaborate explanation of how constructs are built. There is much discussion of how constructions are built and reconstructed using dimensions (See, for example, Ashby & Gott, 1988; Ashby, Boynton, & Lee, 1994; Johnson & Mervis, 1998), but I have not found discussions of how a person would acquire the two-poled constructs that are used as a person used in a categorization process; that is, the process by which a person determines that an event-related construction can be represented as one pole of a superordinate construct (a category).

We might start by working carefully with the hints available in reports of studies which relate to Kelly's (1993/1955) suggestion about contrast (p. 43-45) to propose that constructs develop from the system's ability to contrast two similar patterns of inputs to a third dissimilar pattern. We might find it useful to move out from findings recently reported by Marcus, Vijayan, Rao, and Vishton (1999) who showed that seven-month old infants acquire internal representations that they use as they cognize and re-cognize the patterns within the auditory inputs provided by ordinary speech.

Marcus, et. al. showed that infants can distinguish a pattern of phonemes, such as li na li (ABA grammar) from a different pattern, such as an ABB pattern (ga ti ti). That is, the infants habituated to the ABA pattern showed more behaviors indicating attention when they were presented with an ABB pattern. In effect, the infants were able to extract a "rule" from the first set of presented stimuli, ABA, and were put into a state of preparation for effort when the use of that rule failed to allow assimilation of the second set of presented stimuli, ABB . Creation of the rule requires a process well beyond a simple stimulus-response associative process, in that the rule summarizes a relationship between different phoneme combinations. To explore the origins of two-poled constructs, an investigator would want to extend the work of Marcus, et al. to understand how the infants had previously built the constructs which allows them to distinguish the vowels and consonants from which the syllables had been constructed. Marcus, et. al., note that the assumptive structure that underlies their work includes often unspoken propositions acknowledging that "To recognize that an item is reduplicated, a system must have the ability to store the first element and compare the second element to the first" (p. 79). One can note that Marcus, et. al. used three worded "sentences" in their study. Assuming that the infants in this study do have the ability to store and to contrast representations of the stimulus elements, one could conjecture that the infants used already existing constructs to construe the patterns. Every "word" (li, ga, etc.) that Marcus, et al. presented to the infants involved a consonant-vowel sequence. Thus, to have any confidence in any conclusion derived from this study, one would need to assume that the infants had mastered the construct consonant/vowel, and that all vowels could be categorized on the construct closed/open. Additionally, one would need to assume that the infants could range consonant sounds on constructs that might be labeled (by adults) labial/glottal and so forth. If one did not assume that the infants could locate phonemes on these judgment dimensions, one could not assume that they could categorize two phoneme patterns such as li and ba as being different. If they could not locate the two patterns (B and B) on the same end of a superordinating construct, they could not develop a extract an ABB rule that might be verbalized by the statement, "two similar phoneme combinations after one phoneme combination that differs from the two." To expect that the infants could develop that rule, one also

would need to assume that the infants had developed time-related constructs; namely, before/after and separate/consecutive.

These considerations of the Marcus, et. al., study allow me to conjecture that if an infant aged seven months can extract a "rule" about vowel-consonant combination, he/she also enjoys the availability of a neural system that allows the creation of two-poled constructs. At birth, infants can "hold" input patterns in some kind of neural store, allowing for comparison of that pattern to ensuing patterns. Indeed, I would claim that the results of the study are best interpreted by working from an assumption that the infants under study already had developed some very complex two-poled constructs, particularly constructs by which they could categorize phonemes. As noted above, some investigators have proposed that phoneme recognition functions are "built into" the psychological system of humans. What then of the time-related constructs (before/after) that must be used to learn a ABB pattern or a ABA pattern? Shall we simply add those "feature detectors" to the list of inborn judgment scales?

With these observations in mind, let us return to the issue of whether attributes should be regarded as bipolar dimensions or as unipolar features. One can hold in mind Lingle, et al.'s perplexing shifting between the terms characteristic and attribute. We can ask the following questions Shall we regard an attribute as an extant "characteristic" of an extant "entity" that is then detected by a person? Should we regard attributes as "constructs" -- as contents of the construing system, which are imposed on inputs from an "assumed entity?" More fundamentally, we are trying to answer the question: "Are we trying to define how a person processes a 'real world,' or are we trying to invent ways to construe the system by which a person construct inputs?" In short, we have returned to Gergen's discomfort: Do we wish to dismiss the question of whether or not to attend to the demands of a correspondence epistemology; the demands for a search for "real entities?" Do we abandon the goals of psychology when we do so?

By turning to a strict constructivist perspective, as I did in my treatment of Gergen's concerns, I desist from an effort to determine whether or not "attributes" correspond to the "the characteristics" of "an entity," and focus, instead, on how a person makes attributions about "characteristics" as he/she cognizes events. From this position, one assumes that all bases for a grouping -- locating inputs within a construction -- derive from the basic units of the person's construct system. Before a person can judge the category location of an object or an event (including the self as an event) he/she must "invent" a series of two-poled constructs - white/pink, far/near, fast/slow, stupid/smart, biased/just, depressed/cheerful.

After these many diversions, I can resume consideration of the matter of whether one assumes that those basic units should be regarded as bipolar or as unipolar. One might first ask, "What is gained by assuming that any construct is unipolar?" The arguments for an assumption of bipolarity, based on demonstrative evidence, attests to the its utility. To assess the utility of the assumption of the unipolarity of constructs, consider again Lingle, et al.'s view of featural attributes as referring "to qualitative components, like 'can fly' or 'wears glasses'" (p. 82). What theoretical gain accrues to the investigator who takes the position that a judgment process by which a person places an assumed input-associated event into the category wears glasses necessarily involves an "all or nothing qualitative component?" I suspect that one slides into this position by his/her having stepped on to the infamous dictum, "Either A or non-A" -- a dictum which is totally unnecessary to a strict constructivist. A person's attributing of "A-ness" to an input says little about what would result from categorizing that input by the use of the category "non-A. " More importantly, A constructivist does not concern himself/herself with whether or not the construer has placed the "event" into the "right category." Instead, his/her concerns center around the processes leading to the construer's use of categories to frame input patterns. When a constructivist observes person J offering the judgment "That thing 'can fly'," he/she assumes that that statement is person J's shorthand declaration that "The assumed event which has produced this or that input pattern may satisfactorily fit into the can fly end of one of my constructs --perhaps the can walk/can fly construct, or the heavier than air/can fly construct. I need to use this construct to build a construction that will allow successful anticipation." The construer does not attempt to follow "the logic of reasons" as laid out by analytic philosophers who attempt to find truth by deducing "hue categories." When the location of the object at the A end of the construct allows successful anticipation,

the contrast pole of the construct has little relevance to the person's psychological functions.

When receiving input from one particular event, the construer might find it convenient to use the construct immobile/can fly. If he locates the object (a duck that was recently in the sights of his shotgun) on the immobile end of the construct, and sends his dog into the water to retrieve the "immobile" duck, he will have successfully anticipated the flow of input if the dog returns with a duck in its mouth. Whether or not the event's location on that construct was inappropriate becomes psychologically relevant only when the duck flies off as the dog approaches. The person's psychological processes are not directed toward establishing the "truth" of the category. When the hunter made the category location, his only concern, psychologically, was whether or not he had anticipated successfully.

In sum, all the inputs I can marshal lead me to conclude that one better regards constructs as two-poled judgment dimensions. The press to consider the possibility of unipolarized, all-or-nothing constructs derives, I claim, from focus on a concept of "out there" somethings in a "real world." If one pushes hard to escape that focus, the need to assume unipolarity vanishes, and the utility of regarding judgment scales as bipolar is enhanced.

Bipolar constructs are invented to construct all variety of inputs. Owing, to the habits of languages with which I am familiar, I believe, most people, when asked to give a name to a construct drawn from their system, will designate a construct having adjective qualities quiet/boisterous, hostile/amicable, feline/canine, and so forth. I would like to assert that two-poled constructs need not maintain this adjectival quality. Constructs, I would propose, take other forms; for example, forms which express relations (e. g effect/cause, before/after, target/agent), or adverbial forms (minimally/very, rarely/often).

Categories as one end of a bi-polar construct. I now make explicit a point to which I have alluded: We would postulate the development and presence of a form of construct which we would label superordinate constructs -- still bipolarized. Superordinate constructs are retrieved as a "shorthand" for a series of subordinate constructs which serve to locate (in construct space) a particular pattern of inputs. (Ashby and Gott [1994] carefully assess models for discussing the process of locating an input pattern in multidimensional [multiconstruct] space.) Lingle, et. al. (1984) allude to this type of construct when they say, "Thus, in our use of the two terms all categories or group memberships can also function as attributes, although not all attributes function as categories" (p. 79). Shaw and Gaines (1999) have worked out and have made available statistical operations which allow a quantification of an object's location in multidimensional (multi-construct) space. By these quantifications, one may attempt to put a verbal label on the construct that superordinates the congeries of subordinate constructs. For example, by quantitative methods one can show that in a particular person's construct system the construct hostile/friendly superordinates a set of constructs such as cold/warm, demeaning/supportive, frowns/smiles, etc. Friendly serves as a category which implies that the event from which the stimulus pattern derives can also be placed in the categories designated by the positive poles (warm, supportive, smiles) of the constructs subordinated by the hostile/friendly construct.

What shall be excluded as a content of the integrating system? Whenever I study an essay which alludes to construing the contents of the construction system as schemata, or scripts, or prototypes, and so forth, I experience the effects of the preparation for action that follows from inability to use my construction system to build a suitable construction. Cantor, for example, says, "Building on the work of Kelly, Rotter, Rogers, and many others, self-schema, prototypes, scripts and episodes have been proposed as basic units of personality." Farther down the page, she says, "For example, the schema is an organized set of knowledge in long term memory summarizing the gist of an individual's feelings, thoughts, and experience in a specific life domain" (p. 737).

I cannot follow the line of thought which places schemata -- constructions -- into the "long term memory" system. Constructions, I would declare, are created on the spot to frame the flow of inputs. A variety of theoretical traps await the thinker who would assume otherwise.

I do not regard a construing person as though he/she were engaged in the retrieval of multiconstruct categories -- the person engages in the construction of objects and events within categories available in

his/her personal construct system (though a construction could be regarded as having a composition of single construct, and, in such an instance, a person retrieving a single construct category would be engaged in retrieving a category). The construction of events within categories depends on the retrieval of bipolar constructs along which that system ranges inputs. (Despite Gergen's advice to the contrary, we would recommend study of the works of cognitive psychologists as we attempt to explain the process of using construct [dimensions] as a means of locating events in categories. See, for example, Ashby & Goff, 1988; Ashby, Boynton, & Lee, 1994, Johnson & Mervis, 1998; Massaro & Ellison, 1996) To persist in the notion that categories, schemata, etc., are retrieved would depend on accepting the assumption that such elements stand as basic units in the system. We repeat the previously stated proposition: Some representation of bipolar constructs are the "saved" and retrieved elements of the memory system, and the person builds a construction of events and objects by use of those constructs.

The process of creating constructions from systems of bi-polar constructs. To create justifiable propositions about the workings of the memory systems involved in construction processes, we first note that inventors of explicated systems involved in remembering regularly present such systems in hierarchical arrangements. Taxonomic systems customarily order the categories in ways that express sub- and superordinate relationships between categories. Does a constructivist merely follow convention by proposing that the construct system, out of which constructors build categories, should be regarded as a hierarchical arrangement of constructs? Does the acceptance of this view of construct systems depend unnecessarily on the assumption that there is some kind of correspondence between the structure of the construction system and a person's explicit report of what he/she overtly presents as the working categorizing system with which he/she encounters inputs?

Again, those of us who have scrupulously studied G. Kelly's version of constructivism have been schooled in the issues related to accepting the proposition that "Each person characteristically evolves, for his convenience in anticipating events [placing constructions on inputs], a construction system embracing ordinal relations between constructs" (Kelly, 1991/1955, p. 39). Crockett (1982) masterfully adduced the evidence which prompts one to endorse this "Organization Corollary."

Following the propositions developed earlier, I would not try to lay out a hierarchically arranged system which contains unipolar categories (See Cantor and Mischel [1979] for a representation of such a unipolar category system.). Let it also be clear that I would, generally, use the term category interchangeably with the term construction, preferring to use the term construction, in that it better conveys the idea of a representation as an amalgamation of retrieved bipolar constructs. When I use the term construction I intend to reference the person's placing of an event on one or another pole of a construct; usually a superordinate construct.

I would agree to diagramming a system which contains two-poled constructs as an acceptable representation of a hierarchically arranged construction system. My diagram, however, would need to represent a third dimension. In Figure 3 I reflect my view that constructs are organized vertically and horizontally. I also attempt to show that each end of bipolar construct can be aligned with the positive or negative ends (which might better be represented as a third dimension) of the ubiquitous superordinate good/bad construct. (Osgood, Suci, & Tannenbaum, 1957). (We must be aware, of course, that Figure 3 represents but one small part of a person's personal construct system.)

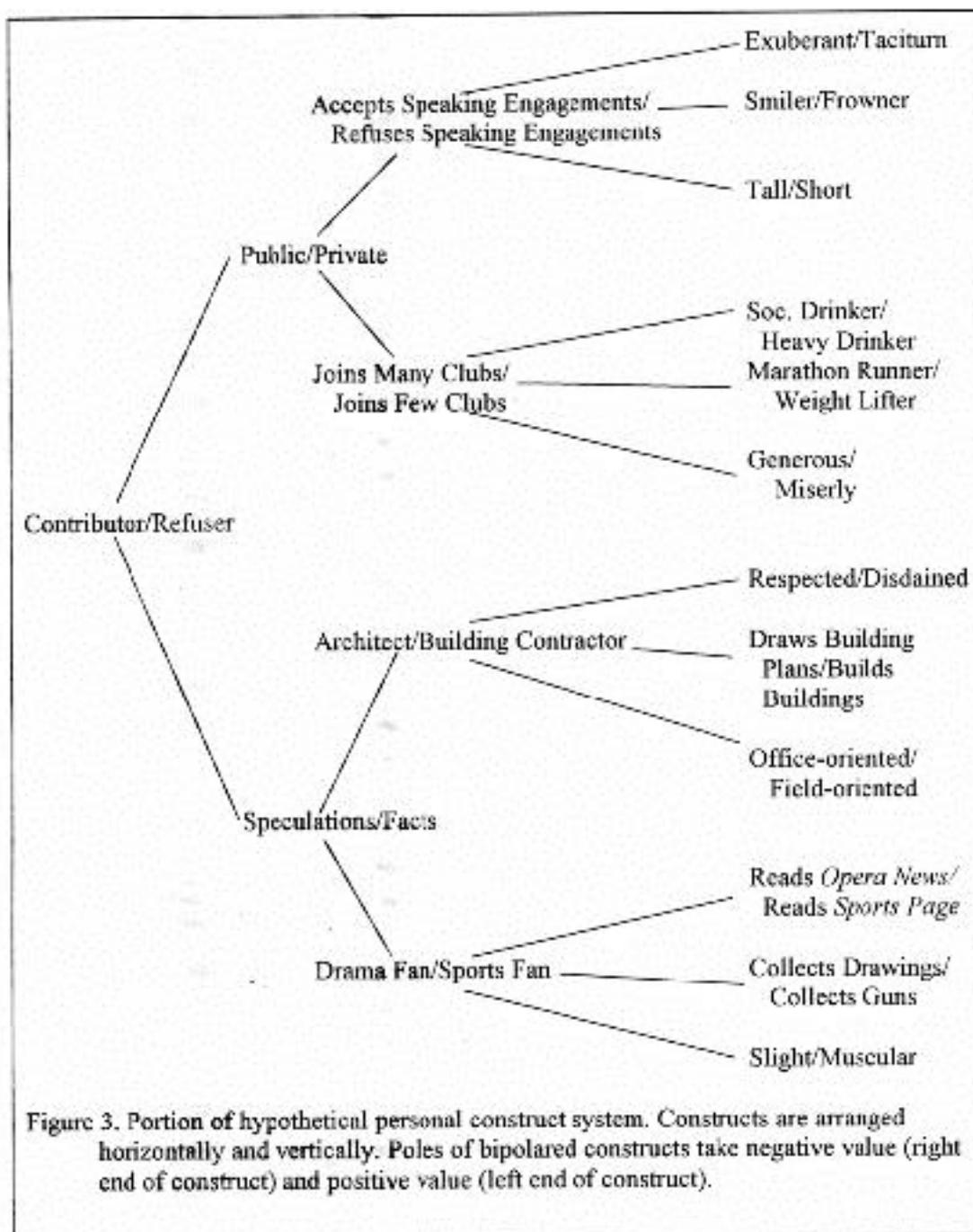
We turn again to Lingle, et al.'s (1984) article to highlight some of the problems one encounters in trying to think about hierarchical arrangements of constructs within the construct system which is used to process inputs.

Lingle, et al. raise the problem of category overlap. They present a scheme for a hierarchically arranged system, drawing from Cantor and Mischel (1979) that bears some resemblance to Figure 3. (Cantor and Mischel did not use bi-polar constructs in their hierarchical system.)

Lingle, et. al. would raise questions about whether a system such as that in Figure 3 could adequately represent a system for categorizing persons. Using a hierarchical system, they suggest, would become complicated by the amount of overlap of categories. For example, many gun collectors could be categorized

as building contractors, while others could be categorized as architect or sports fan.

It seems that Lingle, et. al., are concerned about category overlap because of their concern about assuring that the object being categorized is being placed in the "correct" category. I suspect that their concern is based on other unstated assumptions, primary among which one would find the assumption that a person evolves a category system only if the system allows "correct" classification. From their discussion, I would infer that they assume that "true" categories exist "out there," awaiting "discovery" by an astute person. I would conclude that Lingle, et al., would find little significance in Kelly's insistence that a person characteristically evolves a hierarchical system "for his convenience in anticipating events." Accepting Kelly's corollary, one would say, "The system here described was developed for the person's convenience in anticipating events. So be it." Using my constructions, I would claim that researchers can avail themselves of the various technologies (Mancuso & Shaw, 1988) by which to create a warrantable representation of the personal construct system of a single person. Despite one's skepticism that such a system would have been developed by a particular person, an investigator might find a person who had developed and then uses a personal construct system in which a reader of the sports pages could be categorized as a drama fan and as a facts person. (Following this chain of constructions, one might propose to test the individuality of such a personal construct system by exploring whether or not the term reader of sports page would act to "prime" [Neely, 1991] recognition of the term drama fan.) Persons build construct systems that allow successful anticipation. Matters of "correctness" are only tangentially relevant to the building of such systems.



Using a Construct System to Build Novel Constructions

I now clearly specify and advocate the explicit acceptance of three propositions involved in the design of the integrating systems that I have attempted to formulate:

Alignment of construct polarities. First, notice that the system diagramed in Figure 3 shows an alignment of the polarities of the constructs. I have depicted a system showing the positive poles -- the left hand poles -- aligned with every other positive pole. Conversely, one regards the negative poles [right hand] as having similar alignment. Thus, exuberant, smiler, tall, social drinker, marathon runner, generous, respected, etc. align with each other. (See Osgood & Richards [1973, 1979] for justification of assuming an alignment of

positive and negative poles of all constructs in a personal construct system.)

A construct describes a range of values. I propose that we think of the constructs illustrated as being scaled across a range of values. Thus, a person might locate another person as somewhat generous, or as mildly miserly. The user of the diagramed system might locate some person-associated inputs at the extreme ends of the construct. A person who is located at the extreme negative end of the generous/miserly construct would be taken as the prototypically miserly person (See Mancuso & Eimer, 1982, for an elaboration of the concept of prototype which would be compatible with the current discussion.) It would follow that the probability of an construing an event as an exemplar of a superordinate category would be raised by having located that event at the extreme ends of the constructs that the Superordinates construct subsumes.

The utility of the construction foundation construct. I have claimed that events located at the ends of the constructs could stand as exemplary constructions, or prototypes of a category.. One could also say that each of the constructs in the diagram shown in Figure 3 - even those designated at the lowest level of the hierarchy - represents a construct which superordinates a wide variety of subordinate constructs. Noting this encourages one to consider how he/she might define a "foundation" or "primitive" construct. That is, how would one conceptualize a construct which integrates only one particular kind of sensory input: only that input whose integration requires the use of no other construct? For example, one could think of the tall/short construct in Figure 3 as a foundation construct, in that persons may very rapidly locate events on that construct. Even the tall/short construct, however, might stand as a superordinate construct that is applied only after other constructs have been used to construe the event; e. g. figure/ground, unit/set, etc. In that I have already recommended that we strictly adhere to the constructivist principle, I can see no need for a discussion of issues that arise when theorists attempt to clarify constructions such as "basic categories" or "foundation dimensions," and so forth. Further, when considering this kind of construct, one is tempted to use the outmoded distinction between perception and cognition. I regard the effort to maintain this distinction as a remnant of realist epistemologies, and I would recommend that we dispense with efforts to maintain that distinction.

Working from the framework of propositions I have attempted to specify and support, I can proceed to a outline an explanation of how this system might operate. Then I will make some suggestions about methods of elaborating and gaining affirmation concerning the utility of the model of a personal construct system that I have attempted to sketch.

The Workings of the System

I would hope that those who have worked closely with Kelly's Personal Construct Psychology would agree that none of the propositions which have been made in this essay are incompatible with the theory which Kelly laid out.

I make this point not to invoke the spirit of Kelly as a rhetorical ploy aimed at gaining authoritative validation of my position, but to again remind readers that Kelly worked out an extremely flexible position whose corollaries readily superordinate the wide variety of constructions which have emerged from the recent active explorations of cognitive processes.

I make these points in order to make clear, for better or for worse, that I would not have worked out these propositions if I had not been able to use Personal Construct Theory to set the guidelines of my thinking.

With Figures 3 as a rough representation of part of a particular personal construct system, let us set up the following scenario. Person P, the owner of the system diagramed in Figure 3, volunteers to act as a chairperson for a fund drive to build a new arts center in her city. She now faces the task of categorizing the persons named on a long list of potential contributors. She must range those persons along the construct contributor/refuser. Though her experiences have prompted her to build the constructs out of which to

develop a superordinate construct contributor/refuser, she never has needed to build and then use that construct to construe "in the flesh persons." Nevertheless, as she starts to build a list of potential contributors living in her metropolitan area, she can quite quickly create this novel construct so that she may successfully anticipate the flow of inputs that will follow from her enactment of her self role as fund raiser. (Note that just as we assume that Person P can construct an anticipatory construction which she implicitly assumes will guide the conduct of those whom she intends to solicit, we also assume that she uses her construct system to build an anticipatory self construction [self role] that will guide her conduct as fund raiser.)

Note that I have led into a scenario that, I trust, appears perfectly plausible. That is, it is not a scenario that could occur only in the imagination of a writer of unusual television scripts.

I have done this to illuminate two issues that a constructivist theorist must confront as she/her attempts to explain the psychological functions of a person: (1) One must account for the effectiveness with which a construer deals with novelty. (2) One must explain what we take to be choice in human behavior, particularly in those situations in which the construing person functions in relative novelty. Person P is quite capable of choosing the location of all varieties of persons on the construct contributor/refuser, despite never previously having performed that task. How would one explain this within the model crudely illustrated in Figure 3?

The system would work something like this (1) Person P confronts a problem. She must decide who to target as key supporters for the project. She has not developed a superordinate construct that promises to be useful for successful anticipation of valid categorization of potential contributors. [Specification of this step is inserted only assure an understanding that we must deal with motivational issues: Why would Person P undertake a categorization process?] (2) In the face of inability to anticipate successfully, Person P enters a state of heightened preparation for action, thus facilitating the psychological activity that will prompt the development of a construct that will allow adequate anticipatory construction of candidates to be solicited for contributions. (3) Inputs putatively associated with the candidates are ranged at points on constructs which are available to the system. (4) Having located a particular input pattern on one construct, the construing system functions to infer the location of the named person on other, hierarchically related constructs [constructs either superordinated by or subordinated to the instigated construct] within her system. (5) Any change in the relationships in the system; that is, changes through the hierarchy, or changes in constructs, or changes in valences occur only if the existing system cannot allow successful anticipation. (6) Preparation for effort and construction building continues until Person P amalgamates a construction of a target potential contributor which matches, in a fuzzy fashion, one or the other end of the construct contributor/refuser.

Concretely, a member of the board of directors of the fund drive suggests to Person P that Victor Messina -- a highly successful, local building contractor - might be approached to make a sizeable contribution to the building fund. Person P has already worked out her construct contributor/contributor. Person P now engages in a category recognition task (see Ashby & Gott, 1988). Knowing that Messina is a building contractor, Person P immediately categorizes him at the facts person end of her speculations/facts construct. In her system, that location is aligned with the sports fan end of her drama fan/sports fan construct, and that pole aligns Messina with the refuser end (negatively valenced) of her contributor/refuser construct. But, as her system operates, she must also locate Messina on other constructs subordinated by that top-level superordinate construct.

Person P attends to other inputs. She recalls that Messina is a marathon runner, and every photo she has ever seen of him has shown him smiling exuberantly. She also knows that he is regularly present at important functions of several of the city's business and social clubs. She locates him at the public end of her public/private construct. The public (positive) category aligns with the contributor (positive) category. As she thinks of Messina's public activities, she recalls that she had seen him at a fund-raising dinner for the summer opera festival held in a nearby resort city. Her location of Messina on her drama fan/sports fan construct now moves him into a more fuzzy area, away from her prototype of sports fan. Having located

Messina on a series of the hierarchically arranged subordinate constructs, Person P now categorizes him, fuzzily, as a contributor. She does not see him as the prototypical contributor, but she is confident that when she approaches him, she will have a fair hearing. Person P may now enact the role prescribed by her self-category as successful fund raiser, expecting that there is a high probability that her enactment will earn validation.

Empirical demonstrations to enhance the utility of this system. A committed thinker can lay out a neat system to cover any realm of inputs he/she wishes to construe. In the realm of our scientific efforts, the value of a system will be judged on the extent to which it can accrue cosubjectivity through a process of intersubjective social action. I happen to be one of those behavior scientists who believe that such cosubjectivity will be attained through intersubjective processes involving quantifications. For my convenience as a behavior scientist, I have developed constructs on intersubjectivity involving numerical manipulations.

Thus, I believe, the system outlined above would gain greater justifiability if it could be intersubjectively construed in numerical terms.

I have referred to many reports of existing works that, through my scrutiny, can be marshaled to support some of the major propositions I have put forward. Much is yet to be done in order to make direct tests of the system. Nevertheless, as I see it, the studies of category use have developed to a point at which the results of those studies can be very useful in formulations about categorizing processes used in social interaction. Massaro and Ellison 1996, for example, have convincingly applied a fuzzy set model of categorization to explain ways in which persons make judgments of facial presentations involved in anger enactments.

Investigators can invent methods to represent the construction systems of individuals. I hold the belief that very useful representations will be developed by pursuing the quantitative multidimensional approaches which have emerged from the plethora of work on role repertory grids (Mancuso & Shaw, 1988, Shaw & Gaines, 1999).

Ideally, I claim, an investigator should be able to "map out" a system along lines of that which I created to talk about Person P's system. Following such a mapping, for example, we should be able to predict which constructs she will assemble to formulate a particular construction, such as contributor. We also should be able to predict how Person P would process inputs as she attempts to use the construct she is applying: What inferences will she draw? What is the probability value she would attach to having located a particular input at a particular point on a construct? What happens when she does not have information allowing her to locate an input on a sufficient number of subordinate constructs as she proceeds to determine how the source of the inputs shall be construed? What happens when her construction is invalidated by a particular flow of inputs, and so on?.

We're all invited to the party!!!

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