

DEWEY'S EMBODIED LOGIC

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ABSTRACT: This paper offers some preliminary steps towards putting logic on an embodied basis, drawing on the work of John Dewey and George Herbert Mead. The first two sections show how Dewey's idea of stimulus and response in "The Reflex Arc Concept in Psychology" (1972/EW5), and what amounts to a logic of the body described in the second chapter of *Logic, the Theory of Inquiry* (1986/ LW12), are enactive and embodied. The third section turns to Mead's theory of symbolic communication to show how it is fundamentally embodied and enactive, and how it bridges a logic of the body and a logic of symbolic thought. The last two sections look at several logical relations discussed in Dewey's *Logic* to show how they are grounded in embodiment.

The biggest challenge in developing an embodied and enactive approach to cognition is being able to account for our abstract intellectual abilities. Some critics of embodied cognition may admit that it can help us understand more basic abilities, but they think that it cannot help us adequately understand complex symbolic communication and cognition (Shapiro 2011, Madzia and Jung 2016; Madzia 2016). Fortunately, the groundwork for an embodied and enactive approach to understanding higher level cognition has already been laid by the American pragmatist philosophers John Dewey and George Herbert Mead. Combining Mead's social theory of symbolic communication with Dewey's reconstruction of logic gives us a view of higher order cognition that is embodied, enactive, and social. Recognizing the importance of Dewey and Mead to 4e cognition is not new, nor is recognizing that pragmatism sees higher order cognition as embodied. For instance, Mark Johnson (2007), drawing on James, sees logic as grounded in embodied feeling. However, it is rare that detailed attention is directed specifically to Dewey and Mead's contribution to an embodied understanding of higher order cognition. The present paper focuses on one aspect of higher order thought, the function of propositions in the logic of forming judgments, with a view to eventually putting logic on an embodied basis. I

can only offer a small beginning of such a project. However, if logic can be put on an embodied footing, it would signal the possibility of putting other higher order cognitive abilities on an embodied basis as well. Moreover, showing how the logic of propositions is fundamentally embodied directly challenges the dominant view in analytic philosophy that sees meaning as fundamentally propositional. An embodied logic turns this notion on its head.

Before getting to the discussion of judgments and propositions, some preliminary work is required. Dewey makes clear in the second chapter of *Logic, The Theory of Inquiry* that the pattern of reflective inquiry is based on the basic patterns of life activity (LW12). In this chapter Dewey is describing the organizing activities of the body. We can call the structure of these organizing activities a logic of the body. I pick out a few key features of Dewey's logic of the body that are particularly relevant to an embodied theory of propositions. Turning to Mead, we see how his theory of meaning and communication offers a way understanding symbolic thought as embodied thought, and symbolic meaning as embodied meaning. Mead's ideas are crucial to any understanding of the continuity of conceptual meaning with more basic embodied meaning, and for clarifying how a logic of propositions is continuous with Dewey's logic of the body. The beginning of Dewey's enactive view of cognition can be found in his early article "The Reflex Arc Concept in Psychology" (EW5). The ideas he develops in that seminal paper appear throughout his writings, from his organismal view of human behavior and experience, to his later work on logic. So, we will start there.

1. An Enactive View of Stimulus and Response

In "The Reflex Arc Concept in Psychology" Dewey developed an enactive theory of mind long before the cognitive revolution in psychology, and even long before the ascendancy of the behaviorism that the cognitive revolution replaced. Dewey had effectively anticipated the problems of contemporary cognitivism that motivates the growing movement toward a 4e approach. Then, as now, a

stimulus was viewed as something independent and outside of the organism, while the response was the act of the organism that followed the occasion of the external stimulus. Mediating between these two events is an internal factor. This might be conceived physiologically as a process of the central nervous system, or it might be conceived in mentalistic terms such as a motivational state, an idea, or a mental representation. Nowadays we have such things as cognitive modules or massive parallel processing that sometimes does the job of mediation.

Dewey rejected the assumption that stimulus and response were separate existences, mediated by a third process inside the organism. Instead, he saw stimulus and response as functional factors or "divisions of labour" within a developing coordination (EW5, 97). The stimulus is the developing coordination as it falls away from an established equilibrium. The response is the same coordination moving toward a new equilibrium under new conditions. Stimulus and response are, he said, "strictly correlative and contemporaneous" (109). They occur simultaneously, with the stimulus persisting through the response. Elements that are falling away from equilibrium continue in an unstable condition during the response until a new equilibrium is achieved. Stimulus and response are mutually determining, and herein lies Dewey's enactivism. The stimulus, of course, determines the nature of the response, but the response also determines the nature of the stimulus. When conditions are uncertain and it is not clear what the response should be, then it is also uncertain what the stimulus is. As Dewey says, the problem may be equally well stated as discovering and constituting the right stimulus, or discovering and constituting the successful response (106). To put it another way, to determine the nature of the response requires determining the nature of the stimulus, and determining the nature of the stimulus is part of the response. Indeed, says Dewey, the response "is only for the sake of determining the stimulus" (102). The stimulus is fully determined only when the response is complete.

In terms of an embodied logic, any stimulus, and any occasion of a percept, is particular. It is just that thing, quality, or situation that it is at the present moment. The response to that particular is general. The response generalizes a particular stimulus as the kind of stimulus which evokes that response. Though every stimulus situation or percept is unique, one is similar to another if it evokes the same response. Before we overtly respond to an object, we take an *attitude* or readiness to act toward it. An attitude, in Mead's terms, is the beginning of a response, and it is general because it has not yet been expressed as a particular action. Mead (1934, 83) gives the example of missing a hammer and looking around for something that would serve in its stead. The attitude of hammering is the general element in the response, while the actual tool used and the blow struck are aspects of the response answering to particulars of the stimulus. The general attitude of response determines the meaning of the particulars of the stimulus. This is embodied and enactive meaning at its most basic level, as the felt anticipated outcomes of action. Those anticipations are bodily attitudes.

Three points of similarity between Dewey and Mead's view of stimulus and response, and an embodied and enactive view of mind are worth noting before proceeding further. One is that the response *enacts* the stimulus. In an enactive view, a percept is not something existing independently and prior to an active response. We perceive through our active engagement with the world. Perception not only guides action, it is itself an action and so it is part of the response as it moves toward determination. The percept clearly emerges only through the active response. As Alva Noë writes, "Perception is not something that happens to us. It is something we do" (Noë 2004, 1). Our perception is "determined by *what we do* (or what we know how to do); it is determined by what we are *ready* to do" (1). It is a form of 'skillful activity on the part of the animal as a whole" (2). Dewey and Mead would agree completely.

The second point of similarity is that organism and environment are two poles of a unified relationship. Though they can be distinguished, they can never be separated. This is more than just organism-environment coupling, a term often used in 4e cognition to describe inseparability (e.g. Varela et al. 1993; Johnson 2007) but suggests two things "coupled" together. Properly speaking, we do not have organisms *and* an environment, but organism-environment relationships *within which* we can distinguish organisms and their respective environments. The organism as well as the environment is part of the stimulus, and the environment is part of the response. The stimulus is the entire organism-environment relationship in a condition of disequilibrium, and the response is the entire relationship moving toward recovery. We can, however, place an emphasis on one side or the other. On one side, the environment sets the problem by not meeting the current needs of the organism. On the other side, the movement toward recovery is centered in and organized by the body. Though we might shift our emphasis according to our interests, it is a mistake to see the stimulus as located only outside the body and the response as an activity only of the body.

The third point of congruence between Dewey's view and today's enactive approach to cognition is that both Dewey and enactivism reject the idea of a third process mediating between stimulus and response, or between perception and action (e.g. Noë 2004; Thompson 2007; Chemero 2009). Because stimulus and response are, in Dewey's view, functioning factors rather than separate existences, and because each involves both organism and environment, no mediating process such as mental representation or information processing is necessary. Similarly, an enactive view does not require mental representations or internal cognitive processing to come between perception and action. Dewey's view is *enactive* in the mutual determination of stimulus and response; it is *embodied* because thinking is always an activity of the organic body, not a disembodied "mind"; and it is

embedded and *extended* (Madzia 2013) because cognition is always an organism-environment relationship.

2. The Logic of the Body

Stimulus and response are, says Dewey, "teleological functions." The end to which they are directed is the maintenance of an integrated organism-environment relationship. The living body is a self-maintaining integration, where every part of the body serves to support the function of all the others as an integrated whole. To maintain its integrity, the body has certain *requirements* that must be met by *availabilities* in the environment. Requirements and availabilities, like stimulus and response, are mutually determining. Requirements grow out of previous availabilities, while something is an availability because it is required by the organism. While relations inside the organism are highly organized and stable, relations outside the organism are highly contingent. Environmental conditions are brought into organized relations with each other through the organized requirements of the living body. In terms of a logic of the body, we could say that organic requirements *specify* features of the environment that are required to maintain an integration. Later we will see this same kind of relationship between universal and existential propositions.

Conditions change, and environmental availabilities cease to meet organic requirements. The result is what Dewey calls a condition of need (LW12, 34; LW1, 195). Need is a felt bodily tension and a felt indeterminacy in the situation. It acts as a stimulus for the movement toward a re-determination. This responsive movement Dewey calls search or effort, which includes determining what the need is, and determining what activities are necessary to satisfy the need. When requirements are met and a new equilibrium is established, the need is satisfied. This is the "satisfaction" or "consummatory" phase. A satisfaction helps establish in the body the

pattern of effort that led up to it, thus shaping subsequent search activities. The pattern of need, search or effort, and satisfaction is the embodied basis for the pattern of inquiry, with need as the basis of the problem, effort as inquiry, and satisfaction for the resolution of the problem and the enactment of judgment.

Like the enactive relationship of stimulus and response, need and search are cotemporaneous and mutually determining. They are functional factors in maintaining an integration. The state of need, functioning as the stimulus, persists through the effort so that behavior is not just a succession of independent events, but a series with "one act growing out of another and leading cumulatively to a further act until the consummatory fully integrated activity occurs" (LW12, 37). The persistence of need through the response allows the response to both satisfy the need and adapt to changes in the need along the way. The persistence of need all the way to the satisfaction makes the satisfaction actually satisfying rather than just a bare event. Based on past experience and bodily memory, the satisfaction is anticipated and prepared for in the search. This enables search behavior to be directed *toward* a satisfaction. The interpenetration of need, search, and satisfaction is what makes them mutually determining. It is also how the search enacts the need, in the sense that it determines the need and is an outflowing or actualization of the need.

The interpenetration of need, search, and satisfaction gives behavior and experience their temporal and teleological organization, and results in genuine embodied temporality. Covert attitudes of the body are temporally organized so that one response can prepare the way for the next. Consequences are incorporated into the body as habits and conserved as embodied memories, which provide the means to prepare for future consequences. Acting toward restoring an equilibrium opens the temporal horizon into the future, with the search activities of the body reaching out into the environment both temporally and spatially. This embodied temporality grounds the

temporal transformation of subject-matters in the continuum of inquiry.

To satisfy bodily requirements, the organism selects *things* out of its environing field. "Thing" is used here in a very broad sense as any relatively stable feature of the environment that the organism must deal with in some way. It is part of a percept, and is constituted through the organization of sensorimotor activities. Perceived qualities are unified into a specific thing through the unifying bodily activities of perception, both as overt interaction and as covert attitudes. Mead (1938, 121) refers to a thing or object as a "collapsed act." When an action begins, other phases of the act are mobilized in the body as an organization of attitudes. The object is perceived in relation to the entirety of that organization. A coin on a table at a distance, says Mead, looks round because we remember and anticipate handling it as round as it stimulates a complex of attitudes that cluster around our daily dealings with coins. These are embodied meanings of the coin. Similarly, a house viewed from the front is seen to have a back because we anticipate that we can go around back if we want. We perceive the house through the complex of attitudes and meanings that this kind of house has for us. Selection and organization of things, perceptions, and meanings pre-figures on a pre-reflective level the organization of existential materials in reflective inquiry. Things enter into inquiry as potential existential means and as potential evidence toward the resolution of a problem.

In the simplest of organisms, things are experienced through contact activities alone. When distance receptors and locomotion are involved, response is directed toward things distant in space and time (LW12, 35-36). Distant objects are perceived as signs or affordances for action toward a consummation. However, the actual consummation for most activities is still experienced in contact activities---through touching, tasting, eating, sitting, and the like. In other words, satisfaction of a need is a genuine bodily consummation. The flexibility of the human hand has introduced an extended manipulation phase between distance

perception and consummation (Mead 1938, 24; Madzia, this volume). Hands can pull things apart, put things together, and move things from here to there. Mead and Dewey conceive manipulation in a broader sense than just doing something with the hands. It is any activity that makes use of (manipulates) some object in the natural or cultural environment toward an end not intrinsically connected with that thing. With manipulation, a definite relationship of means to ends emerges. Things become instrumental means, or tools, to remote ends. Embodied cognition is comprised of actual or imagined manipulations of instrumental means toward a satisfactory resolution of a situation.

Though things have connections to each other, they are more or less scattered in the environment. They are not organized. Things that are selected out of an environing field are organized, in proper sense of the word, with respect to each other through the organizing activities of the body. In the logic of the lived body, they are organized through the integration of the organic requirements of the body that specify them. Thus, for a thing to be a thing is to exist always in relation to other things and to the directed activities of organic bodies. Things are elements of organic relatedness.

Embodied thinking occurs when habitual ways of acting are blocked due to changing environmental conditions and undergo a re-organization in the body (MW14, 127, 133). Blocked modes of response reach out into the environment as attitudes to distinguish affordances that will enable their release as overt activity, or to uncover obstacles to that release. Distinguishing these affordances constitutes the organization of the stimulus. Bodily attitudes undergo a re-organization as they make their selections. This constitutes the organization of the response with respect to the particulars of the environment. This response effects a re-organization of perceived relationships in the selected materials, increasing the definiteness in the stimulus, which in turn suggests new avenues of response until there is a definite overt action. The body

uses existing conditions and its repertoire of responses as *intermediate means* toward establishing a new integration. When a response is conceived before its execution, it is an idea. It is conceived as a possible way of action to be carried out on existential conditions. Reflective thinking proper occurs when responses are delayed, when avenues of possible responses are tried out in imagination, and possible ways of acting are given linguistic formulation as ideas.

Dewey refers to embodied thought as "qualitative thought" (MW5). The body lives a life of immediate quality, and the transformations that constitute its life are transformations of immediate quality. Dewey insists that no verbal symbols can do justice to the fullness and richness of the qualitative. The qualitative dimension of thinking has a controlling and directing influence on our verbal formulations (LW5). Thinking begins in the qualitative bodily tension of need that is pre-cognitive and directly had. The thinking that follows the original feeling consists of the ideational and conceptual transformation of that feeling. Immediate qualities stop the thinker "when he enters the wrong path and send him ahead when he hits the right one" (LW1, 125). Dewey says that whenever an idea loses its immediate felt quality, "it ceases to be an idea and becomes, like an algebraic symbol, a mere stimulus to execute an operation without the need of thinking (125)." When thinking loses a sense of immediate quality it ceases to be thinking in the true sense of the word.

Every situation is characterized and permeated by a pervasive and unique quality undergoing transformation. As the situation develops, this quality is differentiated into things and relations. The differentiated qualities "hang together; there is a great variety of them but they are saturated with a pervasive quality" (MW5, 322). They hang together because they are differentiations within the experience of an organized body. The pervasive quality has a controlling influence on the selected and differentiated features within it. It enters into all the minute adjustments of the organism, and all the

operations and observations of inquiry. Selecting, relating and associating are carried out in reference to the pervasive quality. It is this quality that allows any particular element of an inquiry to feel that it fits well with the transformations that are going on. The pervasive quality also sets the limits from which and to which organization moves. It carries a feeling of whence the movement comes and a whither it is going. It sets the limits on "enough."

The bodily impulsion toward re-integration that propels thought is emotional. Emotion is both propulsive and anticipatory—propulsive in that it seeks an outlet in overt activity, and anticipatory in that it comes with want and expectation. Without this propulsive emotion, reflective thought is undirected and goes nowhere. As anticipatory, emotions give qualities their significance toward an expected outcome (LW1, 48). Things have significance because of felt emotional anticipations that go with them and that are characteristics of them. Bodily emotion is the selecting and relating "force" giving a qualitative unity to otherwise distributed elements of a situation (49). The reorganization of the situation is the reorganization and articulation of the moving emotion; it is emotion differentiated into objects and relations. The organization and reintegration of meanings is the transformation of emotional quality. Even the most intellectual thinkers "press forward toward some end dimly and imprecisely prefigured, groping their way as they are lured on by the identity of an aura in which their observations and reflections swim" (LW1, 80).

3. Social Embodiment and the Gesture

The mutually determining relationship of stimulus and response that is found in the relationship of living bodies to their world also holds for communication between individuals in what Mead calls the "conversation of gestures" (Mead 1934). Mead is well known to sociologists for his social theory of mind and self. What is less appreciated is how his theory is an embodied and enactive theory of mind. Throughout the 4e literature,

the social aspect of human embodiment has not yet received the treatment it deserves (Booth 2016; see Franks 2010, Madzia 2013 for exceptions). Mead's work offers a rich resource for developing a social 4e approach to cognition.

A gesture is any movement of one organism that is responded to by another. If a movement of one organism does not arouse a response in another, that movement is not a gesture. Viewed from the point of view of the second organism, the gesture of the first organism is part of a stimulus in Dewey's understanding of that term. It is that part of a developing coordination of the second individual that is falling away from an equilibrium and that demands a recovery through a response. The response of the second organism determines the meaning of the gesture for that second organism. In Mead's theory, the meaning of the gesture is in its relationship to the outcome of the social act for the responding organism. Its meaning is in its function as a sign of an anticipated outcome. A gesture of the first organism means a later phase of the act to the second organism, so that the second individual is responding not only to the present movement, but also to what the gesture portends. We can name this kind of social meaning *gestural meaning*. Gestural meaning is a social form of embodied meaning. It is not something "mental"; it is inter-corporeal. It is embodied both in the movement of the first individual and in the response of the second individual. Gestural meaning is found in the relationship of the bodily movements of two organisms to other elements of their social act, including elements (things) of the environment.

A conversation of gestures involves the mutual adjustment of at least two organisms to the movements of each other. A gesture in this case is not a whole act or movement of the gesturing individual; it is the *beginning* of a movement, an attitude, of the first organism that evokes the response in the other. As one organism begins a movement, the second organism adjusts itself as it anticipates the full movement. The beginning of the second organism's response then evokes an adjustment

on the part of the first organism, which then stimulates a further adjustment by the second organism, and so on. Each organism responds to the attitudes of the other. The metaphor of a conversation is not strictly accurate, for there is no taking of turns as in an actual conversation. It is more like a dance that develops as a single dynamical system of communication and embodied meaning (King 2004). It is reciprocal enactment. It is impossible to separate stimulus and response in this dance of gestural meaning. Rather, they are functional factors in a developing relationship of mutual adjustment, with any movement having aspects of both stimulus and response.

This conversation or dance of gestures does not require self-consciousness (Mead 1934, 78-81). In non-human animals, both individuals are focused completely on the movements of the other, not their own movements. They are not conscious of the meaning that their own gestures have for the other. This is the case for gestural communication throughout the animal kingdom, and it is the case for much our own gestures as well, often much to our embarrassment and dismay when we discover what we have unintentionally communicated gesturally to others.

We humans (unlike other animals, as far as we know) have the ability to indicate the meaning of our gestures to ourselves. We are self-conscious. We become self-conscious by learning to respond to our own gestures as others respond to them. By taking the position of others toward our own gestures, we gain an understanding of the meaning they have for others, and consequently for ourselves. As Mead puts it, not only is there meaning, but there is now also consciousness of meaning (Mead 1910/1964). With the ability to take the position of the other, we can also indicate meanings to other humans as we would indicate them to ourselves. In this way, gestures come to have intentionally shared meanings. That is, they become symbols with *symbolic meaning*. A symbol, whether a vocalization, a bodily movement, or a physical mark or object, carries the

same generalized meaning for a social group as it does for the individual using the symbol.

Symbolic or linguistic meaning is not a separate kind of meaning appearing on the evolutionary scene. It is still gestural meaning, but now those gestural meanings are shared among members of a group. Since gestural meaning is embodied meaning, symbolic meaning is also a form of embodied meaning. Symbolic meanings are still bodily attitudes. With James, Mead says that there is even a "but" attitude, an "if" attitude, and a "though" attitude (James 1912, 95; Mead 1934, 86; Johnson 2007, 94-98). These form the basis of the logical relations of conjunction, disjunction, affirmation, negation, and hypothesis.

Language is the primary carrier of symbolic meanings. Its reference, according to Mead, becomes general and objective because its meanings are shared. The linguistic sound or mark acquires meaning in a community of shared use and shared consequences. With language, the conversation of gestures becomes an actual conversation where every meaning is a slight beginning of a response represented and evoked by a linguistic symbol. Though linguistic symbols have reference to things in the world, the primary function of language is not to "represent" the world, but to direct attention and evoke action. For pragmatists, language is a tool for evoking meaning, and as a tool it is part of the intermediate or effort phase of movement toward a consummation.

By taking the position of the other toward our own meanings we are able to internalize into our bodies the conversation of gestures. Thinking, in Mead's embodied theory of mind, is nothing other than an internal conversation of gestures trying out in imagination various actions and influencing oneself as we would be influenced by others. "When you are reasoning, you are indicating to yourself the characters that call out certain responses—that is all you are doing" (Mead 1934, 93). Internalizing the conversation of gestures is internalizing the mutual determination of stimulus and response.

When you are acting in a rational fashion, "you are indicating to yourself what the stimuli are that will call out a complex response, and by the order of the stimuli you are determining what the whole of the response will be" (94). Bodily attitudes become ideas in relationship to other ideas. One idea functions as the stimulus and another idea functions as the response in an internal conversation of gestures. This response then can serve as a stimulus to further ideas. One's response to one's own attitudes determines the meaning of those attitudes and determines how they function in the role of the stimulus. The dynamics of the overt conversation of gestures and the mutual determination of stimulation and response is played out in thought and imagination. This is an embodied view of reasoning.

Reflective thought has the same structure as the pre-reflective organization of attitudes. It moves from an indeterminate stage of need, through the intermediate stage of search or effort, to a determined satisfaction or consummation, with the condition of need and the anticipation of satisfaction persisting through the effort phase of thought. The difference is that reflective thought involves symbol-meanings, not just immediate meanings. Blocked habits reaching out into the environment become alternative courses of action that stand out as ideas and possibilities. The complexity of the central nervous system enables the covert initiation of various possible responses before the completion of an act. This "makes possible the exercise of intelligent or reflective choice" (Mead 1934, 98). Through indicating responses to ourselves and to others, we can break up our potential responses and recombine them in new ways that offer new possibilities. We analyze and synthesize. Things selected out from the environment become named objects, and settled objects become sources of ideas that can be used in further thinking.

In abstract thought, the individual takes the attitude of the "generalized other" rather than one other individual. The generalized other is a community, and the attitude of the generalized other is the generalized attitude or response of the community. Mead

emphasizes that it is only by taking the position of the generalized other that a person can think at all (Mead 1934, 155-156). The meaning of an abstract idea or symbol is the meaning given by the generalized other. Abstract meanings are stated in terms of the generalized attitudes of the entire social group (155-156n). The more abstract the thinking, the more removed from particular responses it is. Though abstract, these concepts are still rooted in the bodies of the social group because they are shared attitudes, and attitudes are always attitudes of the body. Because concepts are based on the attitudes of an entire group, they may seem to float unmoored to any particular body, therefore to any bodies at all. But they are always embodied in the attitudes of the group, and they are embodied in the responses of particular individuals as they express or respond to the generalized other.

Mead calls symbols *universals*. A universal is a symbolized attitude of the generalized other in response to the particulars of a developing situation. A universal generalizes the different perspectives of multiple individuals within a social group. The wider the group, the more universal the symbol. Because a universal's reference is objective and general, it is not attached to any particular thing. Dewey reminds us that smoke is a natural sign of fire due to an existential connection between the smoke and fire (LW12, 57). As a natural sign, smoke is evidence of fire. On the other hand, the word "smoke" is a symbol or universal, though it represents actual smoke in general, is not evidence of anything. As a universal, it is removed from actual existence. Removed from existence, universals make ordered, and re-ordered, discourse possible (58). Symbols can be related in ways not tied to the actual connections between things. This allows new meanings to be created and possible outcomes to be rehearsed in imagination before engaging in action. Imaginative rehearsal, reasoning, and language can be developed without limit and can themselves come under the examination of reasoning. One result is logical theory.

In Dewey's terminology, symbols or universals have *reference* to existential things, and they have *relations* with other symbols. The relations that symbols or universals have to each other are formally expressed as non-existential or *universal propositions*, which include definitions. Definitions express the relations of symbol meanings to each other. Existential things have *connections* with each other, and these connections allow one thing to serve as evidence of another thing. The connections that things have to each other are formally expressed as *existential propositions*. Universal and existential propositions have mutually determining roles within the pattern of inquiry toward the construction of judgment.

4. Enactive and Embodied Judgment

Inquiry begins with an indeterminate situation. Indeterminacy is first experienced on a pre-reflective, purely embodied level. No matter how abstract the subject-matter, it is experienced on the level of feeling. The feeling of indeterminacy stimulates a response toward a re-determination. This response becomes inquiry, says Dewey, when conditions are consciously examined for their potentialities, and action is taken to realize some potentialities rather than others (LW12, 111).

The first step toward a resolution is to determine the nature of the problem. Observation looks for things that are settled in order to enactively determine preliminary facts and bring the nature of the problem into better focus. This begins the determination of the stimulus of inquiry. The initial lack of organization of factual materials is why the situation is problematic. Organizing the facts of a situation requires the organization of meanings as possible operations (attitudes) that pick them out. Initial facts suggest and stimulate further operations of observation to determine further facts, which in turn suggest further observation, and so on. In this way, facts control and determine observation at the

same time that operations of observation control the determination of facts. This is the enactive relationship of stimulus and response played out as the enactive relationship of factual materials on one hand, and operations of observation and test on the other. Possible modes of response are conceived as ideas, which we saw are linguistically represented attitudes of the body. Ideas guide the direction of further operations and further determination of facts.

Determining the factual materials locates and describes the problem. Ideas and conceptual materials represent possible movements toward a solution. Factual materials and conceptual materials develop correlatively as "functional divisions in the work of inquiry" (LW12, 116). Both are operational, thus enactive and embodied. Ideas are operational by directing further operations of observation and test. They enact the factual materials that are their subject-matter. Facts are operational by being selected in such a way that they can function as evidence and suggest ways of acting toward a solution. Those that do not fulfill these roles are set aside.

Examining the relationship between facts and possible courses of action constitutes reasoning. As we saw, reasoning in Mead's embodied view is an internalized conversation of gestures trying out in imagination possible modes of response. Reasoning can anticipate potential changes before action is taken, and thus direct action in a controlled manner. However, reasoning by itself does not resolve the existential situation. The actual resolution of the problem must involve action in the world. At some point inquiry ends and definite action begins.

The end of inquiry is judgment. End is intended here in two senses: as the ending or termination of an inquiry, and as the objective of inquiry. Judgments are pivots between inquiry and action. They are the result of an inquiry and the beginning of action. Because judgments initiate action, they are individual and have real existential import. Dewey uses a legal judgment to

illustrate the function of any judgment. A legal judgment is the end of an inquiry and it prescribes certain actions. A judgment of guilty or not guilty means that either some recompense or punishment is required, or that a person goes free. The action then resolves, or does not resolve, the actual existential situation. Value judgments, if they are judgments in the logical sense and not just unconsidered opinions, are the ends of a process of evaluation and indicate the preparation or willingness to take certain actions (LW12, 123-5).

Judgments are stated in a subject-predicate form. The subject of judgment is a determined object, a specific *this*. An object is subject-matter that has been settled through inquiry. Once settled objects are available as means for subsequent inquiries. In the development of an inquiry, the determinate subject of a judgment emerges from the factual materials that set the problem and that provide evidence toward a solution. As a definite object, it invites predication; and any settled object can serve as the subject of predication. The predicate of judgment anticipates a possible solution to the problem set by the subject, and specifies actions to be taken toward the solution.

The subject and predicate of judgment are mutually determined through the process of inquiry. This mutual determination is an extension of the embodied and enactive relationship of stimulus and response. Again echoing his Reflex Arc article, Dewey in *Logic* refers to the relationship between subject and predicate as a "division of labor" in the distribution of active factors toward a desired consequence (LW12, 136). Existential materials that set the problem and constitute the subject are an extension of the stimulus. The conceptual formulations that offer a possible solution and that constitute the predicate are an extension of the response. Just as the response determines the nature of the stimulus, the conceptual materials involved in predication determine the nature of the subject. For instance, the judgment "this is sugar" conjoins an existential "this" to the conceptual predicate "is sugar" (131). This predicate is an *anticipation* of the resolved

situation. To determine that something is sugar means that it will sweeten something, or if tasted we will experience sweetness. As an anticipation, it is a bodily attitude, a mode of response. The predicate "is sugar," as a mode of response, determines the nature of the subject. The word "sugar" is a universal. It represents attitudes of the generalized other toward a certain substance. That is, it represents the organization of a nexus of social responses toward a specific kind of thing.

Judgments are always in some degree provisional. They develop through phases of partial judgments, which Dewey calls "appraisals" or "estimates" (LW12, 136). These partial judgments, when used in further inquiries, are expressed as propositions. Propositions are provisional means toward final judgments. They are evaluated according to their effectiveness in moving inquiry to a judgment. The formal subject-predicate structure of a proposition is the same as that of a judgment. On their face, propositions and judgments look the same. The difference is their place and function within inquiry. A proposition is an intermediate means toward a judgment, while a judgment is the end of an inquiry and the beginning of action. Judgments are expressed as propositions in further inquiries in what Dewey calls the continuum of judgment. The continuum of judgment is the ongoing mutual determination of facts and concepts within the continuum of inquiry and experience.

The development of a judgment is a temporal event within the continuum of embodied experience. We saw that experience is temporally organized through the interpenetration of need, search, and satisfaction so that previous experience is carried into the present and toward a future integration. Similarly, every judgment is rooted in previous judgments and appraisals, and looks toward the actual resolution of the problem in the future. The development of judgment involves the transformation of existential and conceptual materials, where the results of prior inquiries become available for future inquiries. Dewey criticizes traditional logic for being removed from the temporal continuum of

experience and inquiry. It is, as it were, a disembodied logic. Dewey wants to situate logical forms within the continuum of inquiry, which means within the embodied activities of inquirers. Without the lived body, there is no whole to give an inquiry meaning. Without an account of the lived body in an actual world there is no temporal development, but only haphazard wandering, mechanical routine, or the application of external means without regard to actual consequences.

The temporal and spatial dimensions of inquiry are expressed in *narration and description* (LW12, 186 and 220-243). Thinking about existential situations involves organizing ideas in a temporal sequence, giving thought a narrative structure. At the same time, whatever exists temporally does so in relation to other existences. Co-existing conditions are expressed linguistically as description. Every narration has a background that can be the subject of description, and every description of events that occur as part of an ongoing transformation can be the subject of narration (220). The embodied basis of narration is the temporality that is fundamental to the living organism. The embodied basis of description is found in the relation that selected things have to each other through the organized requirements of the body.

When we take the position of the generalized other to our felt temporality it becomes objective time, and events are located within a definite narrative structure. In daily life as in art, this structure can take on a dramatic quality, including anticipation and fear as well as joy, relief, and regret. While those emotional qualities are disregarded in most scientific inquiries, narrative structure remains fundamental to the organization of existential and factual subject-matters. There is always some sense of dramatic anticipation and resolution in any inquiry.

Fundamental to the development of any judgment is the activity of *comparison and contrast*. Comparison is a re-qualification of existential materials so that qualities serve as signs for a potential resolution. It is thus primarily directed toward determining the subject of

judgment. Some qualities or objects stand out as more important or relevant than others for the purposes at hand. This happens on both a reflective and pre-reflective level. Pre-reflectively, things *feel* similar or not similar in relation to the development of the unique pervasive quality of the situation. "Similarity is the *product of assimilating* different things with respect to their functional value in inference and reasoning" (LW12, 186-187). Unique immediate qualities are assimilated to the pervasive quality, and they are assimilated to one another when the same mode of response yields similar consequences. When this embodied feeling of similarity is socialized and symbolized it becomes comparison and contrast. Within the temporal continuum of judgment, comparison is prospective as it involves anticipated consequences, and it is retrospective as it involves recollections of past conditions and consequences.

Comparison and contrast grow out of the embodied process of selection and rejection. We saw that the existence of a thing *as* thing depends on the selection process that determines it. Similarly, in the activity of comparison the qualities that are compared depend on the operations and purposes of the comparison. Objects are constituted and determined in comparative relationships to other objects. This is an enactive view, in that objects do not exist ready-made to enter comparative relationships but rather are constituted in those relationships through embodied operations of inquiry. The organic process of selection and rejection, and relating thing to thing, becomes comparison when humans can indicate to themselves through social symbols the potential responses and the anticipated consequences of things in their relationships with each other. Responses are compared in imagination as possibilities. Comparison and contrast are formalized in propositions of conjunction and disjunctions, based on feelings of *and*, *but*, and *not*.

The logical operations of *analysis and synthesis* are based in comparison and contrast. Through comparing things with each other, analysis locates facts and

identifies obstructions and resources for inquiry. It works toward determining factual materials and defining the subject of judgment, and is part of the determination of the stimulus within the developing judgment. Correlatively, synthesis is a re-arrangement of analyzed elements toward a unified situation. It is prospective in character. It works toward predication in judgment and is part of the determination of the response. Synthesis also works toward the determination of settled objects, which become available to serve as the subjects of judgments and propositions. The embodied basis of analysis and synthesis is found in the relationship between whole and part, and differentiation and integration. It is also found in the flexibility of the human hand and its ability to rearrange elements of the world into new relationships, and to extend the temporal range of inquiry (Madzia, this volume). Facts are analyzed, determined, and re-qualified through manipulation, either directly with the hands, indirectly through material tools, or conceptually through conceptual tools.

Analysis is not the discovery of pre-existing and independent elements of a situation. It is the determining of factual matters as signs toward a resolution. The sign function is found in the connections that things have with each other, and in the import these connections have for the requirements of the inquiring organism and the resolution of the problem. Analysis discovers the way in which elements of a situation can serve as means to meet those requirements. As means toward a judgment, established facts, information, and data are "things *by which* we know rather than things known" (MW5, 346). The real object of knowledge is the conclusion or judgment. Facts are evidential means toward the conclusion. Synthesis is the integration of factual and conceptual materials into an object of knowledge, and into a judgment.

Also based in comparison and contrast are *affirmation and negation* (LW12, 182-199). Affirmations and negations are propositions of inclusion and exclusion according to relevance of existences and concepts to the problem at hand. Affirmative propositions represent the

agreement of different subject-matters in their capacities to function as evidence. They point in the same direction toward a resolution. The word "only" in an affirmation indicates that other possibilities have been eliminated through observation and experiment (189). Negative propositions represent subject-matters to be eliminated because of their irrelevancy to their evidential function toward a solution. Selecting some things always involves simultaneously rejecting others, thus the relationship of affirmation and negation is a conjugate relationship. Affirmation and negation are based in the selections and rejections of the lived body. Organic selection and rejection becomes affirmation-negation when they are named and objectified, and when actions are deferred until their functional capacity is determined in inquiry and the actions are expressed as propositions. Affirmations gain logical status when they are subjected to the social act of *confirmation*—to affirm *with* others in a cooperative social act (188).

Comparison and contrast also underlie statements of *quantity*. All comparison involves measurement; informally there is more or less of this or that quality. This does not require representation in term of numbers, but it does require that objects and events be analyzed into parts or constituent qualitative elements. Quantity and measurement are based on qualitative experiences, such as too much, too many, enough, and not enough, relative to the determination of a solution. In commercial, scientific, or technological inquiries definite numerical scales are used to achieve a greater degree of objectivity, which can appeal to a wider generalized other. However, this objectivity is always based in a qualitative relationship, which is grounded in the comparative activities of the body.

Since comparison and contrast are qualitative transformations of the situation in relation to a situation's unique pervasive quality, so are the logical relationships that are based in them. Thus, analysis and synthesis, affirmation and negation, and relations of quantity are all grounded in and controlled by the development of the pervasive quality moving toward a

felt resolution. This movement is, in turn, nothing other than the embodied and enactive maintenance of an integrated organism-environment relationship on the level of symbolic thought.

5. Embodied and Enactive Propositions

The subject and predicate of judgment are determined through the two corresponding kinds of propositions previously mentioned, existential and non-existential. Existential propositions are concerned with ordering factual materials toward the determination of the *subject* of judgment. Non-existential (purely conceptual) propositions are concerned with the organization of possible bodily operations, and are aimed at determining the *predicate* of judgment. Non-existential propositions are proposals to enact operations that make existential materials more determinate. The two kinds of propositions are mutually determining, again as functional divisions of labour. Existential propositions fulfil the function of the stimulus becoming more determinate, while non-existential propositions correspond to the response that determines the stimulus. This is an enactive view of propositions.

5.1. Existential propositions

Existential propositions are narrative and descriptive, and are concerned with the determination of conditions that lead to a solution to the problem at hand. They help organize existential materials as *potentialities* or powers to affect conditions through the involvements of things with each other. Dewey divides existential propositions into particular, singular, and generic forms.

Particular propositions describe (but do not yet categorize) a singular *this* that is present here and now (LW12, 289-290). As descriptive, they express direct sense perceptions. They occupy the first stage in the determination of the problem and the facts of the case. Particular propositions describe something in its present

condition, but also signify potential qualities of what it could be or what it could affect. The predicate of a particular proposition (such as in "this is sweet" or "this will sweeten") represents potentialities that could be actualized if certain operations are performed. For instance, "This is sweet" indicates that something has been tasted or that it would taste sweet if the act of tasting is carried out. The role of the particular proposition is to identify a quality in its function as a sign of other qualities if the operations are enacted. A description, for Dewey, is always tied to an operation, a way of acting; and ways of acting always involve the anticipation of consequences. The pre-reflective embodied basis of particular propositions is found in the organism responding to certain qualities in its environment with a bodily anticipation that other qualities will follow its response.

Singular propositions determine and identify a singular *this* to be of a certain kind ("this is refined sugar") (LW12, 290-293). They relate a particular object or event to a general idea. This represents a further step in determining the facts of a situation. A singular as a mere *this* presents a problem as to what kind of thing it is. The resolution is the determination of it being a thing of a certain kind. Members of a kind share what Dewey calls *characteristic traits* that are reliably connected with each other. So, when some characteristic traits indicate that something of a certain kind, such as sugar, these traits become signs of other traits of that kind that are not immediately present but would be discovered upon investigation. This gives a present trait or quality a representative capacity. "This is sugar" represents other qualities, such as easily dissolvable in hot coffee.

Singular propositions depend on knowledge of involvements that enacted things have with each other (like sugar and coffee), which are the result of prior inquiries. Certain immediate qualities are so conjoined with potential qualities that those latter can be *inferred* from the former. From "This is refined sugar" several inferences can be made, such as it is white, granular,

dissolves easily in hot coffee, has a certain specific gravity, and poses certain health risks if consumed in large amounts over long periods of time. In this way, a singular object is a set of qualities treated as *potentialities* for specified consequences. If an object is determined to be of the kind "apple" because of its shape, which is one of its characteristic traits, then there will be certain consequences expected from biting into it. If the consequences are not what were expected, a question is raised about the kind of thing it is and what other traits it has. Propositions relating particulars to kinds are necessary for inference from one case to another. Any particular case must be determined to be a case of a certain kind, so that we can conclude that what worked in other cases of that kind will work in the present case.

The bodily basis of identifying singulars as members of kinds is found in the response of the organism in determining certain things to be foods, poisons, dangers, pathways, etc. and in the anticipation of regularly ensuing consequences. The embodied basis of inference is anticipation. Expectation of something absent based on something present becomes inference when it is symbolized in terms of existential propositions. Human culture affords control over this process through symbols and propositions that are socially embodied in the generalized other. In the initial phases of an inquiry, elements of a situation are represented by an unorganized collection of singular and particular propositions. Organizing these propositions is done by enactive operations of comparison and contrast, analysis and synthesis, and affirmation and negation—all activities of the lived body.

Generic propositions are propositions concerning the relationships of kinds to each other (LW12, 293-298). They are general existential propositions. A system of related kinds greatly expands the range of inferences that can be made when a singular thing is determined to be of a kind. Operations of inclusion-exclusion determine some kinds to be members of a more inclusive kind. For instance, the kind dog is within the kind mammal. It is

also within the kind domestic animal and overlaps with the kind pet. Ideally, relationships of inclusion and exclusion can be ordered until the most inclusive kind is reached. The more inclusive the kind, the wider the application to a variety of circumstances. Kinds are related systematically by a system of affirmations and negations.

But what determines a kind? Dewey dismisses the idea that kinds are based on the recurrence of pre-existing common attributes of things in the world (which would be a non-enative view of kinds). A mere succession of particular instances cannot determine a kind. Every existence is like any other in some respects and unique in others, with no *a priori* grounds for comparison. Recognizing a recurrence or a commonality already presupposes a kind that enables an event to be understood as recurring, or a set of objects as having a common quality—just as for something to be a stimulus there must be an existing mode of response. Commonalities among members of a kind are not found by extracting common features, but by enacting operations that have specified consequences. "Common" refers to a mode of response, not qualities. Any group of traits can serve to distinguish a kind, such as (suggests Dewey) cross-eyed bald shoemakers. But such a kind has no use in inference and no evidential value for predicting other traits (LW12, 267). A kind emerges and is determined through practical use.

As we saw earlier, an anticipated consequence or attitude is already, on a pre-reflective level, a general to a particular stimulus. But on this level it is not yet a kind. Kinds emerge when a reliably coherent set of consequences are socially objectified through language, and a definite relationship between existential qualities of objects is established. A readiness to act may be a potential logical generality. When a potential logical generality is actualized in the form of existential propositions accepted by a community of inquirers, it becomes a kind.

Dewey identifies two other types of existential propositions (LW12, 298-300). *Contingent disjunctive*

propositions are existential propositions of inclusion and exclusion necessary for identifying and ordering kinds, and locating singulars within a kind. *Contingent conditional propositions* are linguistically hypothetical, thus seem like they might be non-existential. However, they refer to singulars. "If you leave that out in the sun, it will melt." This proposition identifies a singular as one of a certain kind, the kind of easily melted things. Thus, it is a variant of a singular proposition. The antecedent and consequent in the *if-then* form in this case have literal temporal meaning. The connection between them is contingent with some degree of probability.

5.2. Universal Propositions

Propositions that determine the predicate of judgment are about operations and methods used to determine factual materials that are the subject of judgment (LW12, 300-305). Because they formulate methods that *could* be used, they are about possibilities and are thus non-existential. General non-existential propositions Dewey calls *universal propositions*. Universal propositions are definitional (as opposed to descriptive or narrative). They are concerned with the relation of concepts to each other, regardless of whether they correspond to actual existences. In Dewey's enactive view, they are formulations of possible ways of acting so as to discriminate and organize existential materials in their function as evidence. They propose a *method* of solution, not an actual solution. That can only be achieved by action.

It is a mistake to think of conceptual subject-matter to constitute a realm of abstract possibility taken as complete in itself. Possibilities can never be divorced from actualities because they refer to possible operations, which gain meaning only by actually carrying them out. Executing the operation tests the relevancy of the proposition as a means for resolution of the problem. Careful observation of the consequences in comparison to what is hypothetically anticipated tests the validity and relevancy of the propositional formulation of the operation.

Even though universal propositions are non-temporal, they still have a basis in embodiment. That basis is in modes of action, or habits. Habits, when inhibited and expressed in symbols and propositions, become possible ways of acting and *suggested* ways of solving a problem. Possibilities are inhibited responses that can be indicated to oneself as they would be indicated by others. Represented by symbols, they are abstract and conceptual, but like all symbols their meaning is based in the bodily attitudes of the generalized other. They become more than just suggestions when they are developed in relation to other symbol-meanings formulated as a system of interrelated universal propositions.

While generic propositions are concerned with the relations of kinds to each other, universal propositions are concerned with the relations between abstract *categories*. The systematic organization of categories of meanings make possible ordered discourse. A category, says Dewey, "is the logical equivalent of what practically is an attitude. It constitutes a point of view, a schedule, a program, a heading or caption, an orientation, a possible *mode of predication*; as, in Aristotle, to categorize is to predicate" (LW12, 272). While an ordered system of kinds enables inference, an ordered system of categories enables logical *implication*, which is the intellectual movement from one category to another through ordered thought and discourse. The cultural basis of categories is found in practical groupings of things that are useful, enjoyable, or dangerous, as well as activities allowed or prohibited, lauded or shamed. These foreshadow the logical operations of inclusion and exclusion.

A universal proposition can be expressed in hypothetical (conditional) form (LW12, 305-307). These are *universal hypothetical propositions*. For example, by definition, if something is a triangle, then it is a plane figure with three sides. Unlike conditional existential propositions, which express a temporal and contingent relationship, universal hypotheticals express a non-

temporal and logically necessary relationship. As a possible operation, this proposition directs inquiry to determine if the figure in question is a plane figure with three sides. If so, it fulfills the definition a triangle. *Disjunctive universal propositions* determine what is included in a definition of a category. For instance, we could ask what constitutes the definition of wealth or intelligence. This is not a matter of examining existential kinds, but determining how such definitions will change which particulars fall into which kinds. As a definition, it is maintained as long as it remains useful and relevant in directing operations on existential materials. In universal propositions, to include or exclude is to determine what is to be an integral part of an operative rule or way of acting.

5.3. The Mutual Determination of Universal and Generic Propositions

Generic and universal propositions have the same enactive relationship to each other as do material and procedural means in the institution of judgment, and thus the same enactive relationship of mutual determination as stimulus and response, as well as environmental availabilities and organic requirements. Generic propositions organize material means, while universal propositions organize procedural means for the determination of materials. Generic propositions organize evidence based on existential connections, while universal propositions specify the conditions to be satisfied by existential materials. Generic propositions formulate the nature of the stimulus, while universal propositions formulate modes of response. Success in determining materials as evidence determines the suitability of universal propositions to the inquiry at hand. Systematic inference based on an ordered system of kinds depends on an ordered system of universals specifying the operations used to determine kinds. Moving easily from kind to kind in inference requires the ability to move easily from category to category by implication. Movement from one existential proposition

to another through inference depends on non-existential universal propositions as instrumental intermediaries.

No grounded generic propositions can be formed unless they are products of operations formulated by universal propositions (LW12, 274). Facts cannot be re-organized without the re-organization of ideas as possible operations that pick them out. However, no amount of reasoning can itself determine matters of fact. That requires their application to materials. Similarly, existential data cannot prove a universal. They can *suggest* it. Proof or validation requires the transformation of existential conditions into a unified situation though operations presented in the hypothetical universal proposition. This is accomplished through the actual execution of the operations that the propositions formulate. When successful, the executed operation renders existential materials more indicative or significant.

6. Conclusion

The proximal aim of this paper been to show how logical relations and formal structures of inquiry are grounded in the activities of the lived body, and in the enactive transformation of an indeterminate situation of felt ambiguity or conflict into a felt resolution. The keys to understanding how the formal structures of inquiry are embodied is in understanding how they grow out of the enactive mutual determination of stimulus and response, and out of the basic structure of organic activity, and in Mead's idea of thinking as the internalization of the conversation of gestures. Through taking the role of the other, embodied gestural meaning becomes symbolic meaning, which is still a form of embodied meaning. Pre-reflected "things" become settled objects, existential potentiality becomes logical possibility, anticipations become ideas and suggestions, and the readiness to act can be formulated as propositions.

The ultimate aim of this paper is to support the idea that an embodied and enactive approach to human cognition can account for and shed light on the nature of

human cognition in its most abstract and complex forms. If an embodied and enactive approach can account for logical forms—and I am offering little more than a suggestion as to how this can be done—it should be able to account for other abstract forms of human cognition. If such an account is successful, it will have the potential to bring together the logic of our most technical inquiries with an embodied "logic of experience."

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