

# THE TRANSACTIONAL DEVELOPMENTAL MODEL: PART ONE

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## Introduction

A number of systems of development devoted to reconciling “matter” with “mind” have been proposed over a period of time extending from Aristotle to certain contemporary philosophers. What these systems have in common is the positing of some sort of central dynamic of development, under the influence of which physical/material and mental/abstract categories become unified in a single non-metaphysical account. Of focal interest here is the nature of the developmental dynamic. In the present paper three such systems are discussed: those of W. V. Quine, John Dewey (with A. F. Bentley), and Aristotle. In Part Two of this paper comparisons will be made with a wide spectrum of Eastern, Esoteric and Mythic systems.<sup>1</sup>

## 1. Quine’s Developmental Viewpoint

In his 1960 book *Word and Object*, W. V. Quine outlines a series of stages in the development of the “referential function of language.” Basically Quine’s scheme is simple. A necessary biological prerequisite for the initiation of the developmental sequence is the “mechanism” of reinforced stimulusresponse. A slight shift in the character of the reinforcement – a shift brought about by parental encouragement of behavior which “matters socially” – introduces a stage of *indirection* of behavior which is characterized as “intelligent.” This marks the first division of behavior, a division between the linguistic and the nonlinguistic.<sup>2</sup>

The indirection which marks the division occurs when a verbal utterance that had been a response (e.g. the child’s reinforced utterance of “mama” when the mother enters its sensory field) becomes itself a stimulus, when uttered by another (e.g. the father), the appropriate response to which is directed toward the stimulatory conditions originally appropriate to the utterance of the sound *as* response (e.g. toward the mother, upon hearing the father utter “mama”).

We may abstract this description as follows. Given two organisms *a* and *b*, and a description of reinforced stimulus-response, a response *r*’ is linguistic just in case that there is a stimulus *s* such that

1. *a* responds *r* to *s*
2. *b* responds *r*’ to *r*
3. *r*’ has a significant relation  $\Phi$  to *s*

Here we cannot construct a general description of the relation  $\Phi$ , but in the example Quine uses it is the baby’s act of turning toward the very object which under other circumstances would elicit the response “mama” now heard instead as stimulus. There is, in other words, some sort of meaning-relation present, connected with the socially standardized adult use of “mama.” We may call such an act a case of *significant indirection*. Lower organisms can also exhibit significant indirection, as we shall discuss in the next section.

The relation of response-patterns we have just set forth is an early form of what Quine calls

“transitivity of conditioning.” Further modifications occur when the infant responds to one word with another word. In this way the “interanimation of sentences” or sentence-to-sentence connections of a fabric of “theory” (as Quine calls it) begins to develop. It seems that Quine hopes to reduce abstract conceptualization to reinforced stimulus-response. However this cannot succeed because of the necessity for referring to a meaning-relation  $\Phi$ , significant indirection, “transitivity of conditioning,” “learning,” and the milieu of social standardization, all of which slip in factors not explicable in terms of physiological mechanism. The weak point is most tellingly revealed in the expression “slight shift” to cover what is in fact the essential factor in the entire developmental process. Quine does not use any special terms such as “linguistic” and “nonlinguistic” to mark the distinction between direct stimulus-response and the “slight shift” to significant indirection within a social or communicative frame. However, he takes this as the moment of development in which linguistic phenomena first become identifiable as such.

Further differentiations between “intelligent” behaviors are now made. Transitivity of conditioning is coupled with a gradual refinement of the range of stimuli to which a given response is conditioned. The procedure is one of making clear the boundaries of application of the expression involved, in terms of behavior. The initial infantile “intelligent” responses may be considered “incipient terms.” The child’s first learning of words “...is uniformly a matter of learning how much of what goes on around him counts as (e.g.) mother, red or water.” At this stage the infant may be said to have mastered “mass terms” that “refer cumulatively” to any of a like range of stimuli. This stage Quine calls the *first phase* of a developmental series.

When one of a like range of stimuli, under social pressures, comes to be discriminated from another in virtue of differing spatiotemporal quality and minor stimulatory variations, recognition and response to these differences is encouraged by reinforcement of behavior in association with words such as that, not that, an, same, another, these, and the plural ending and expressions of identity. Instead of the mass term “apple” we now obtain the general term, subject to modifications of “divided reference” such as “apples” and “an apple.” This is the *second phase*.

We see here a further move away from any reasonable interpretation in terms of reinforced stimulus-response as a mechanistic reduction. Quine is forced to use vague expressions like “differing spatiotemporal quality” and “minor stimulatory variations,” as though the ability of the child to discriminate such a potentially infinite set of complexities can be handled easily by the physiological mechanism of stimulus-response. Furthermore Quine must appeal to the added complexity of grammatical factors such as this, that, an, same, plural endings, etc. etc. which makes the reduction to stimulus-response border on absurdity. The issue here is similar to that of attempting to achieve human levels of pattern recognition by means of computer hardware and software. The situation is rapidly becoming so complex that next Quine must introduce a teleological notion, which he calls “the objective pull,” as seen below.

Mastering the second phase is coextensive with the development of consistent verbal habits toward “enduring and recurring physical objects.” The development of these habits is accomplished under the pressure of what Quine calls “the objective pull.” What the objects “are” and what the associated verbal apparatus of response is, is determined in a pervasively social context toward social or communicative ends. The verbal devices associated with this are called the apparatus of objective reference.<sup>3</sup>

Bridging the gap from mass terms to divided reference is perhaps more important from the human point of view than bridging the gap from direct stimulus-response to intelligent (linguistic) response, since linguistic response prior to divided reference may be present in lower organisms. A

shriek from one bird in response to danger may serve as a signal for another bird to react in a manner appropriate to that danger, for example. But the apparatus of divided reference is more distinctively human. (Recent developments in the study of language in animals such as chimpanzees, apes, dolphins, and even dogs and birds, may make this distinction somewhat blurred).

Quine's description of the transition is indecisive. Nevertheless he continues to couch references to the transition in stimulus-response terminology. For example, he says that the phase of divided reference diverges from the phase of mass terms "simply on the score" that the range of stimuli associated with some mass term "comes then to be appreciated as an integrated spatiotemporal thing." The phrase "comes then to be appreciated" is certainly "develops into" and lacks any explanatory force. Quine uses the expression "emergence" in the same context. "Appreciated" is of course vague but may be understood to refer to an increase in the complexity of behavior; we "appreciate" a stimulus as "an integrated spatiotemporal thing" when we behave toward it in a certain complex way, which includes the apparatus of divided reference (promoted by the "objective pull") as a necessary condition.

As Quine's account approaches nearer to "abstract objects" he finds these so radically different from the ordinary physical objects of divided reference that he engages in some further attempt to establish a basis for *continuity* of development. He does not wish to allow for a break in the developmental chain with respect to the dynamic of development underlying that chain. Stating that the phase marked by abstract objects is not to be separated from the overall emergence of the systematic structures of objective reference, he asks "what can the mechanisms have been?"

Quine here comes up with a possible solution. He appeals to what he calls the "hybrid air" of the mass term as a possible "wedge" around which some explanation might be formulated. The mass term may be taken as a kind of primitive abstract term, naming an attribute rather than a "scattered portion" of the world. This is a highly significant switch from a reductionistic explanation, in effect moving a capacity for abstraction to an earlier stage of development and depending on vague metaphors "hybrid" and "wedge."

In any case, the child is said to slip "into the community's ontology of attributes" in "easy stages," from mass terms onward.<sup>4</sup> The title of the chapter in which Quine discusses this emphasizes the developmental context: "The Ontogenesis of Reference." At this point a further broad distinction has been made within the area of linguistic behaviors, namely that between non-objectifying responses (first phase of mass terms) and object-positing ones (beginning with divided reference). Quine says that a third phase of *compound general terms*, such as "flying horse," does not posit any new sorts of objects on the way from general terms to attributes, but that there is another intermediate phase, that of *composite general terms*, which brings "a new mode of understanding" in that "compounds are produced which do not even purport to denote things to which we could point and give individual names."

The fifth and last phase is the introduction of abstract terms. The linguistic apparatus is the formation of substantives out of general terms by the addition of particles such as the suffix "...ness" as in "roundness." The relative term "has" also functions to produce abstract terms, since it is, as Quine puts it, "abstract at one end" in phrases like "the ball has roundness." The sorts of objects posited in the fifth phase are attributes, classes, numbers, geometrical figures, functions, units of measure, ideas, possibilities. Included among attributes are those characteristic of much of science, such as "bearing spines in clusters of five."

The linguistic structures on the higher levels of abstraction carry with them a corresponding increase in the spatiotemporal boundaries within which a term may be said to "complete" its

meaning. Such a boundary Quine calls the *modulus*. “Occasion sentences” are sentences the meaning of which are exhausted by reference to stimuli within a short modulus. The child’s use of mass terms is similar to occasion sentences in this respect. Quine distinguishes occasion sentences from “standing” sentences, which may elicit assent or dissent at indeterminate times, when no particularly appropriate stimuli need be present, such as “there is ether drift.” In the case of occasion sentences assent or dissent requires prompting “all over again by current stimulation.” “Current” here means relative to the extent of the modulus. But Quine argues that the modulus cannot be extended too far without matters “getting out of hand” because of the increase in variables: the lengthening of the modulus “diminishes the scrutability of stimulus symptoms.”

In the case of occasion sentences and the child’s use of mass terms, the stretch of the modulus required to yield the meaning of the term (Quine is discussing meaning in terms of synonymy here) is short. As usage moves toward the abstract, stimulus and response become separated by an “arch” of sentences constituting “the verbal network of an articulate theory.” The modulus expands, and immediate stimulation becomes less relevant. This increase of the modulus is actually an increase in the spatiotemporal “distance” of the “reference” of significant indirection. In a singularly interesting passage, Quine explains,

“Someone mixes the contents of two test tubes, observes a green tint, and says ‘there was copper in it.’ Here the sentence is elicited by a non-verbal stimulus, but the stimulus depends for its efficacy upon an earlier network of associations of words with words, viz. one’s learning of chemical theory. Here we have a good glimpse of our workaday conceptual scheme as a going concern...The verbal network...has intervened to link the stimulus with the response...The theory as a whole, a chapter of chemistry, is a fabric of sentences variously associated with one another and to non-verbal stimuli.”

Having reached this point Quine re-asserts his tendency toward reductionistic explanation in terms of stimulus-response. However complex such a verbal network may become it must, he says, “finally be due to the conditioning of sentences as responses to other sentences as stimuli.” In other words, to the interanimation of sentences and the transitivity of conditioning (in Quine’s terms). Increase in abstraction, then, along with the axis of the developmental scheme, presupposes a corresponding increase in the complexity of intervening verbal-behavioral “networks.” Quine places this scheme within the context of the child’s progress toward adulthood: “ontogenesis.” He asserts however that his developmental speculation may have some phylogenetic significance. It may suggest “how organisms maturing and evolving in the physical environment we know might conceivably end up discoursing of abstract objects as we do.”

Quine’s effort to pin the developmental dynamic down to the physiology of reinforced stimulus response is driven, it would appear, by his desire to establish a continuity of development from a biological level to the level of thought, conception, and abstraction. He persists in this conviction despite the fact that along the way he has to introduce all kinds of vague metaphorical expressions like *wedge*, *hybrid*, *emergence*, *interanimation*, *transitivity of conditioning*, *arch of theory*, and so on. An alternative might be to allow that the process of reinforced stimulus-response is already more than a purely mechanistic physiological capacity. In the scheme put forward by Dewey and Bentley we encounter a step in that direction.

## 2. The Scheme of Dewey-Bentley

John Dewey and Arthur F. Bentley, in their 1949 collaborative work *Knowing and the Known*, proposed an avowedly evolutionary scheme very similar in certain respects to Quine's. Both Dewey-Bentley (DB) and Quine assert that our cognitive activities are a part of the natural world as discovered or discoverable by the sciences. Both propose a sort of observational circularity, which denies the necessity for beginning with absolutes. Both assert a continuity between the knower and the Nature that is known. Such a point of view may be termed "Transactional" after the use of the expression in DB.<sup>5</sup>

DB subsume all the stages of their developmental scheme under the title "sign-process" (later shortened to "sign"). The first stage in their developmental series is *signal*. This stage, consisting of adaptive response outside of a communicative frame, corresponds in Quine's series to the area of reinforced stimulus response without communication (nonlinguistic). However rather than appeal to a purely physiological mechanism, they place the developmental dynamic in relation to the biological concept of adaptation. This constitutes a move from a narrowly physiological perspective to a wider biological (and perforce less mechanistic) one.

Next DB offer *cue*, defined as adaptive behavior within a communicative frame, that is, with the focus "shifted from organism-environment to organism-organism," but with the object "still plain within reach." The shift of attention to a communicative frame (organism-organism) is like Quine's idea of the shift in stimulus-response toward significant indirection. DB give an example of the transference of animal shrieks and cries from a noncommunicative to a communicative framework. What is required, they say, in order to effect the transition from predatory bird cries warning the prey to the prey's own responsive cries warning other members of its group not immediately present, is just a "slight shift in the stresses of the situation." This shift, which DB picture as occurring spontaneously at the animal level, is what in Quine's ontogenetic account is supplied by the parents under the influence of the "objective pull."

Of course, the immediate issue in terms of identifying the dynamic of development is that of the means by which such a "shift in stress" might occur. It is just such a "shift" that Quine's behavioristic account runs up against and which he attempts to slide through by introducing terms such as "wedge" and "hybrid." Nevertheless, the field of adaptive behavior appealed to by DB is less tied to mechanistic interpretation and more closely related to a general concept that may be thought of as "learning." Whatever might be the dimensions of "learning" is something to be determined, but it opens the field beyond that of physiological mechanism.

The degree of indirection becomes greater through "clustering" or "overlapping" of cues, a process corresponding to Quine's transitivity of conditioning, leading in Quine's terms toward interanimation of sentences. This stage is called by DB *characterization*, the "region of common nouns." We may note that here DB have begun to use metaphorical expressions to account for these "shifts of stress." There is little difference between Quine's "wedge" terminology and DB's "clustering" and "overlapping." The lower limits of characterization correspond to Quine's phase of compound general terms and divided reference. The upper limits spill over into composite general terms. *Specification*, the next stage, is defined as the region of scientific naming. DB restrict "naming" so that it does not apply beyond specification, in recognition of the increasing abstraction.

Following their understanding of the place of mathematical objects in the scheme, DB identify a final stage beyond specification, which they call *symbol*: "A later linguistic development of sign, forfeiting specific designatory application to gain heightened efficiency in other ways."

These other “ways” include the areas of definition and mathematics, placing them in correspondence with the latter part of Quine’s fifth phase. Figure 1 below compares the two systems.

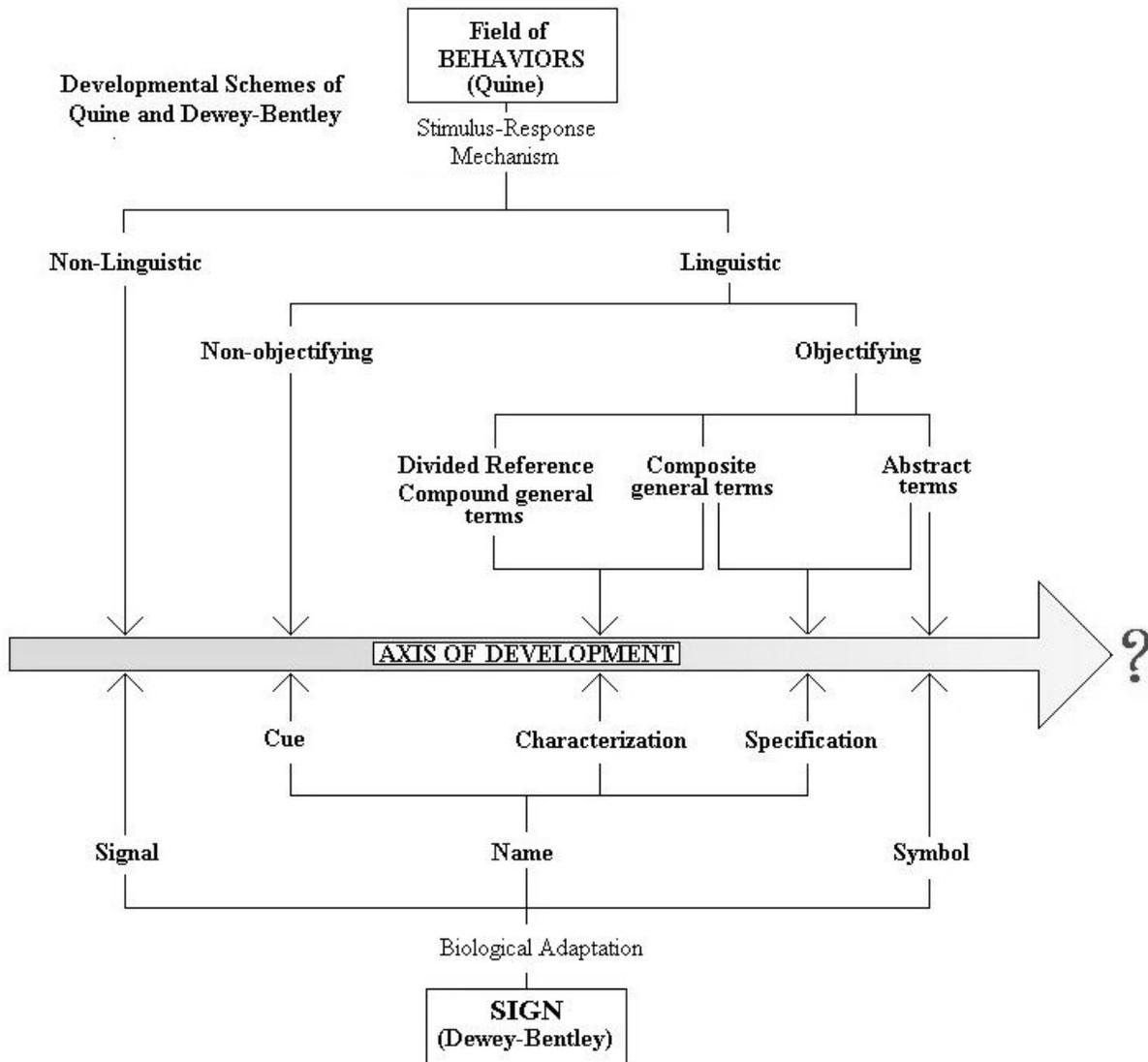


Figure 1. Developmental Schemes of Dewey and Quine

NOTE: In this figure, I adopt a general protocol. The structures above and below the axis of development is not hierarchical, but strictly organizational. The axis of course represents the time-direction of development. There is a rough analogy between the contents of the systems but they are not considered synonymous. The question mark at the point of the axis indicates that development moves in a general, but unspecified, direction. Whether there is a termination to that directional movement or it is indefinitely open is not specified in either theory. In these two systems there is no stage of development prior to the biological,

### 3. Aristotle's System

Aristotle also provides a developmental scheme. He describes an hierarchy of "souls" which are related to one another by a special sort of continuity. The levels in this hierarchy may be initially presented as three, each one identified with a faculty, an act, and an object of the act.<sup>6</sup>

FACULTY	ACT	OBJECT
Cognitive	Thinking	The Intelligible
Perceptive (Sensation)	Perceiving (Sensing)	The Perceptible (The Sensible)
Nutritive	Feeding	The Edible (Food)

Two other faculties, the appetitive and the locomotive, are especially associated with sensation (perceiving). Taken together these five faculties "constitute a series, each successive term of which potentially contains its predecessor." The serial arrangement is: *nutritive* (includes reproductive), *appetitive*, *sensitive*, *locomotive*, and *thinking* (or "mind"). Roughly, each stage is a necessary condition for those following.<sup>7</sup> In addition, the higher stage of "mind" is especially dependent upon sense-perception. And induction, the efficient cause of which is the Rational Intuition, develops out of sense-perception in a series of stages. These stages are: *sense-perception*, *memory*, *experience*, *art*, *science*.

Sense-perception, in its capacity of discrimination, is already a form of induction. Once this initial discriminatory capacity is attained, a grasp of universals is achieved by stages, each of which develops out of the one prior to it. The process is cumulative, moving from "rudimentary" to "true" universals. Aristotle provides a striking image of this process. Illustrating the connection among the stages, he says, "It is like a rout in battle stopped by first one man *making a stand* and then another, until the original formation has been restored. The soul is so constituted as to be capable of this process."<sup>8</sup>

Aristotle carries through this metaphor, speaking of the first universal as *making a stand* in sense perception, where "the earliest universal is present in the soul." In subsequent stages "a fresh stand is made among these rudimentary universals until the indivisible concepts, the true universals, are established." He calls this a process of increasing generalization. By proposing a developmental series extending from biological behavior to the acquisition of universals, Aristotle's construction stands in opposition to Plato's dualism which divides the world of eternal forms from the material world.

Aristotle's comment that "the soul is so constituted as to be capable of this process" is especially interesting. Quine, in his account of the process of acquiring the ability to master general terms, states that the minimum condition under which a child may be expected to make primitive generalizations at the level of mass terms is that it must "have the tendency to weight qualitative

differences unequally.” The child, he continues, has to “sense more resemblance between some stimulations than between others.” He calls such a capacity the possession of a “pre-linguistic quality space.” The presence of such a “quality space” and its character are investigated empirically by a study of discrimination thresholds.

This idea of an initial capacity for bare discrimination which is itself a necessary condition for the possibility of reinforced stimulus-response and thence more complex generalizations is also present in Dewey. The specialized part-whole relation between an organ and the organism to which it belongs is evidenced by a *selective bias* “in interactions with environing things,” which is exercised so that the organ can “maintain itself while also maintaining the whole of which it is a member.” Because of this functional connection with the “good” of the whole, responses are “not merely selective, but are discriminatory in behalf of some results rather than others.” (The reference to *results* here constitutes significant indirection). And Dewey urges that the capacity for such discrimination lays the groundwork for the presence of “susceptibility,” “feeling,” or “sensitivity,” even though on very primitive levels (borderline behaviors) this capacity may not be fully actualized.<sup>9</sup>

What these last considerations indicate is that in all three systems, there is some capability present and operating dynamically to initiate and continue the process of development beyond any simple mechanistic behavior. Aristotle’s idea that sense-perception is *already* a form of induction suggests a working of the dynamic “backward,” one might say, from a capacity held by the highest to an already existing potential within the lowest.<sup>10</sup>

These lowest levels of what is sometimes called “psychism” correspond to that level which Aristotle labels the nutritive soul. While Aristotle does place the beginning of “mind” (apparently in the sense of inner imagery) at the level of sensation, marking a major dividing point along the series, he never loses sight of the importance of the serial connection throughout. We find him, therefore, placing a special emphasis upon the place of “nutrition” at the origin of the serial scheme.

His concept of “nutrition” is far from simple. This “function of absorbing food” is possessed by “everything alive...from its birth to its death,” and “every such thing is endowed with soul.” As a necessary condition for the entire series, the nutritional function is a defining characteristic of soul in general. Such an important characteristic is more than the power of nourishment and growth alone. In considering food *qua* food, and not as something independent of the nutritional process, it is understood to have the potential, through interaction with the nutritive faculty, for maintaining a limit or ratio of form in the organism.

Only so far as what has soul in it is a ‘this-somewhat’ or substance, (does) food act as food; in that case it *maintains the being* of what is fed, and that continues to be what it is so long as the process of nutrition continues.<sup>11</sup>

This transformation of food into form is a change of “unlike” to “like.” It takes place through release of energy. Aristotle’s wording, that “all food must be capable of being digested, and what produces digestion is warmth” suggests the idea of energy transformed, stored, and given off as heat. In accord with this -8- generalized conception of food as that which is capable of maintaining a limit or ratio in what is fed, Aristotle understands that reproduction is inseparable from the nutritive faculty. In other words, while we might think of the nutritive and reproductive organs as performing different functions, for Aristotle they have a single functional relation to the whole.

A relatively simple way of looking at this, which does not do justice to Aristotle, is to

imagine that “maintenance of form” in this case simply notes the fact that the progeny are like the parents. Nevertheless it is difficult to see reproduction as a part of nutrition as long as we limit our attention to the individual organism as that the form of which is to be maintained. But if we expand our view to take in the form of life as a unit, reproduction is easily seen as a major factor in the regulatory process which maintains the latter.

Ecologically speaking the reproduction of populations is an essential factor in maintaining an environment, or ecological balance. Energy flow in the ecosystem and the resultant biogeochemical cycles resemble Aristotle’s generalized concept of “feeding.” A conception of energy transformations which eventuates toward maintenance of form in the ecosystem is consistent with Aristotle’s tendency to generalize the concept of food and nutrition to include reproduction.

We may moreover understand adaptive behavior, which DB take as the defining characteristic of all levels of sign, as an extension of the nutritive faculty in this sense. The ebb and flow of physical energies in the universe stretches, alters, and sometimes completely revises the range of possible modes of significant action within a given habitat. Because of this, maintenance of form cannot always mean no more than return to the exact same state. It has been noted earlier that a severely mechanistic view of the dynamic of development is hardly adequate to deal with the creative modification required by the uncertainties of nature.

Dewey, criticizing Rignano’s view that every organism strives to remain in a stationary state, argues that the conservative tendency of life is not absolute but is rather directed toward re-institution of the *form* of the relationship, and not the identical conditions. Maintenance of form, in other words, need not mean absolute rigidity of bodily structures or behavior patterns. Thus while behavior is conservative, it may change because of this, not in spite of it. Dewey considers the ability to adapt in this way to be “the source of organic evolution.”<sup>12</sup> It would not really be inappropriate to consider adaptation and evolution itself as an extension of the generalized sense of “nutritive” just discussed (although of course we cannot attribute notions of Darwinian evolution to Aristotle). Nevertheless, what is implied in this general context is that *on occasion, innovation is conservative.*<sup>13</sup>

Such a view opens the way for seeing “nutrition” (in the highly generalized sense we have been discussing) as a dominant principle which enters into each stage of the developmental series in an intimate way. But the logical character of this relationship is difficult to formulate. The metaphor of “taking a stand” for example is readily understood as common to all three levels of soul. Grasp of universals is made possible only because in sense-perception the organism “takes a stand” by making discriminations, and as Aristotle says, “that which discriminates is one and single.” But even the distinction between food and not-food at the level of nutrition is a matter of “taking a stand” and the form which the nutritive soul provides is the background against which this distinction is made, for the “good” of the whole. At every level soul provides that which is “one and single” and is the condition for anything “taking a stand.” The idea of maintenance of form is a general expression of the idea of unity.

The “earliest universal,” then, although it is placed in sensation, has had the way prepared for it in nutrition, where maintenance of form provides the background relative to which discrimination takes on significance. Dewey asserts that “there are organic activities on the biological level which select and order existential conditions in a de facto way. If a lower organism were equipped with powers of symbolization the result would be its ability to refer some things to certain gross generalizations or kinds – to sort them out, for example, as foods, inedibles, and as poisons.” In a related passage Dewey expands on this point: “Organic acts are a kind of fore-action of mind...Intelligent action, in utilizing the mechanisms they supply, reproduces their patterns.”<sup>14</sup>

Similarly Quine finds possession of a “pre-linguistic quality space” necessary along with the mechanism of reinforced stimulus-response, for learning mass terms; and mass terms are in turn the “wedge” which accounts for the development of the fifth phase of abstraction.

For Aristotle there is also a sense in which the soul “assimilates” materials and transforms them at all levels. In the case of the nutritive soul, what is unlike is taken in and transformed into like.<sup>15</sup> In the case of the higher functions of sensation and thought, something analogous happens, although the active and passive roles are reversed. “What has the power of sensation is potentially like what the perceive object is actually...at the beginning of the process the two interacting factors are dissimilar, and at the end the one acted upon (the faculty of sense) is assimilated to the other.” And then: “Mind must be related to what is thinkable as sense is related to what is sensible.”<sup>16</sup>

The fact that the nutritive faculty is primarily understood as active in the transformation-assimilation process, and the other faculties as passive, is not important as far as the overall result is concerned. Aristotle holds that being moved or affected can be considered as a kind of activity. The active and the passive are the same “in the sense that the road from Thebes to Athens and the road from Athens to Thebes are the same,” that is, there is “a single actuality of both alike.”<sup>17</sup> Following this Aristotle makes the quite remarkable statement:

The soul is in a way all existing things; for existing things are either sensible or thinkable, and knowledge is in a way what is knowable, and sensation is in a way what is sensible...Within the soul the faculties of knowledge and sensation are potentially these objects, the one what is knowable, the other what is sensible....The mind is the form of forms and sense the form of sensible things.<sup>18</sup>

If we recall that for Quine the “scheme of enduring and recurrent physical objects” which the child learns is a function of (a) a set of dispositions to act in certain ways relative to a selected group of stimuli, and (b) a pre-existing cultural-communicative matrix into which the child is born, we may construct an interesting way of extending Aristotle’s comment. Reproduction, as a device for maintenance of form in the ecosystem, is not purely a matter of reproduction of bodily forms but also involves continuance of behavior patterns, the matrix of habits which characterize a population as a form of life. Adaptation, too, is not merely a matter of bodily change but also a matter of change of habits. And as noted previously, adaptative innovation may be conservative of form.

This indicates that heredity and mutation each have behavioral aspects. They involve transmission of behavior, or form-in-time, as well as bodily organization, or form-in-space. But in the human system behavior is also transmitted from generation to generation by means of culture; and this is impossible without language. Biologist C. H. Waddington put the point this way: “In societies the socio-genetic mechanism of transmission of information from one generation to the next operates at a cultural level. It is a cultural socio-genetic mechanism.”<sup>19</sup>

If we take language in a broad sense as this cultural matrix itself rather than just the sounds or marks that function communicatively within it, we may view language as an extension of the reproductive-adaptive function. This approximates saying that “mind” is an extension of the nutritive function. To say “extension” here does not imply a reduction of higher functions to the lowest. At the very least it refers to some analogous and intimate relationship between the functions whereby all are expressions of some common dynamic. Similarly, while Quine’s insistence on the importance of reinforced stimulus-response as a “mechanism” would seem to be a reductionist move, it is belied by his introduction of “the objective pull” and mysterious additional factors couched in metaphor,

as pointed out earlier.

The “form” of an enduring and recurrent physical object is then to be understood as a matter of culturally determined habits of action relative to culturally selected stimulus ranges. Taking the “soul” as the capacity for behavior at a given level we can say that the human soul is potentially capable of taking on that form through the learning of culturally reinforced dispositions. It does not “become” the object, but it does take on the form of the object when the object is seen in this way. In such a view a comment like Aristotle’s “it is not the stone which is present in the soul but its form” is reasonably intelligible.

The cluster of stimuli which, as we say, we “call” a stone, is external to the body; but the matrix of habits that makes it a stone *qua* stone, rather than something else or nothing at all, is internal to our psychic life – even if we must call it our communal psychic life. But if all “objects,” including even the most abstract ones, are in the long run based on some common dynamic factor extending across all stages of development, then all objects, those of knowledge as well as those of sense, are present in the “soul” in this way and in no other way. Saying this however is just another way of asserting the continuity of humankind and nature which is a dictum of the transactional view.<sup>20</sup>

The environment, or realm of effective and discriminable entities within which the organism lives, is surely a function of its behavior as well as of its concrete form. It is also a function of the unifying principles which govern that behavior and which provide the background relative to which action becomes significant. To say that “mind” is an extension of “nutrition” becomes, in a behavioral and transactional view, the statement that language, and therefore all acts of naming and all named things, is not only a function of behavior but is unified with other behavior through whatever principles lie behind the evolutionary process. Dewey makes the point explicitly: “At every point and stage...a living organism and its life processes involve a world or nature temporally and spatially ‘external’ to itself but ‘internal’ to its functions.”<sup>21</sup>

Culture does not stand still; it moves and changes. New objects, sensible and abstract, appear from time to time in association with new ways of doing things and new things to do. From a phylogenetic point of view there must have been a time when no objects existed at all in the behavioral sense we have been discussing. There is therefore a creative as well as a passive aspect to mind. The environment of objects is not only impressed upon mind and sense, but is also created by mind and periodically sensed anew in a continual interplay.

We have in such an account, then, a correlate to those aspects of the Aristotelian scheme which initially drew our attention. First, we see that mind has an active as well as a passive role in the scheme of what is known and sensed; second, we understand that “existing things” (as the cultural matrix provides) are a function of linguistic levels of behavior and therefore in a way, as Aristotle puts it, the soul is all existing things; third, in the way in which adaptive response and transitivity of conditioning are taken by DB and Quine to characterize all stages of the developmental series, so too the assimilation-transformation function may be understood to be present at all levels of the Aristotelian soul and to operate toward “maintenance of form” at each level. This is also implicit in Aristotle’s remark that the action of the nutritive faculty exemplifies that which in fact *all* things do: namely act for the sake of the “goal toward which all things strive.” That is to say that the aim of all functioning is ultimately the same even though manifested in less to more complex ways.

This particular aspect of the serial connection has been discussed at some length in order to emphasize that the relationship among the stages in all three systems is quite intimate and not simple.

It is difficult to see just where one stage leaves off and the next begins, in precisely the same way that it is difficult to separate nutrition, reproduction, adaptation, and thence complex behaviors which may ultimately serve an adaptive function. Furthermore no prior stage is “left behind” but is carried right along with the developing series. There is a shared general organizational logic in all three systems, to be discussed at length in part two. For the moment I include one further diagram representing the organizational relation between the Dewey-Bentley system and that of Aristotle (Figure 2).

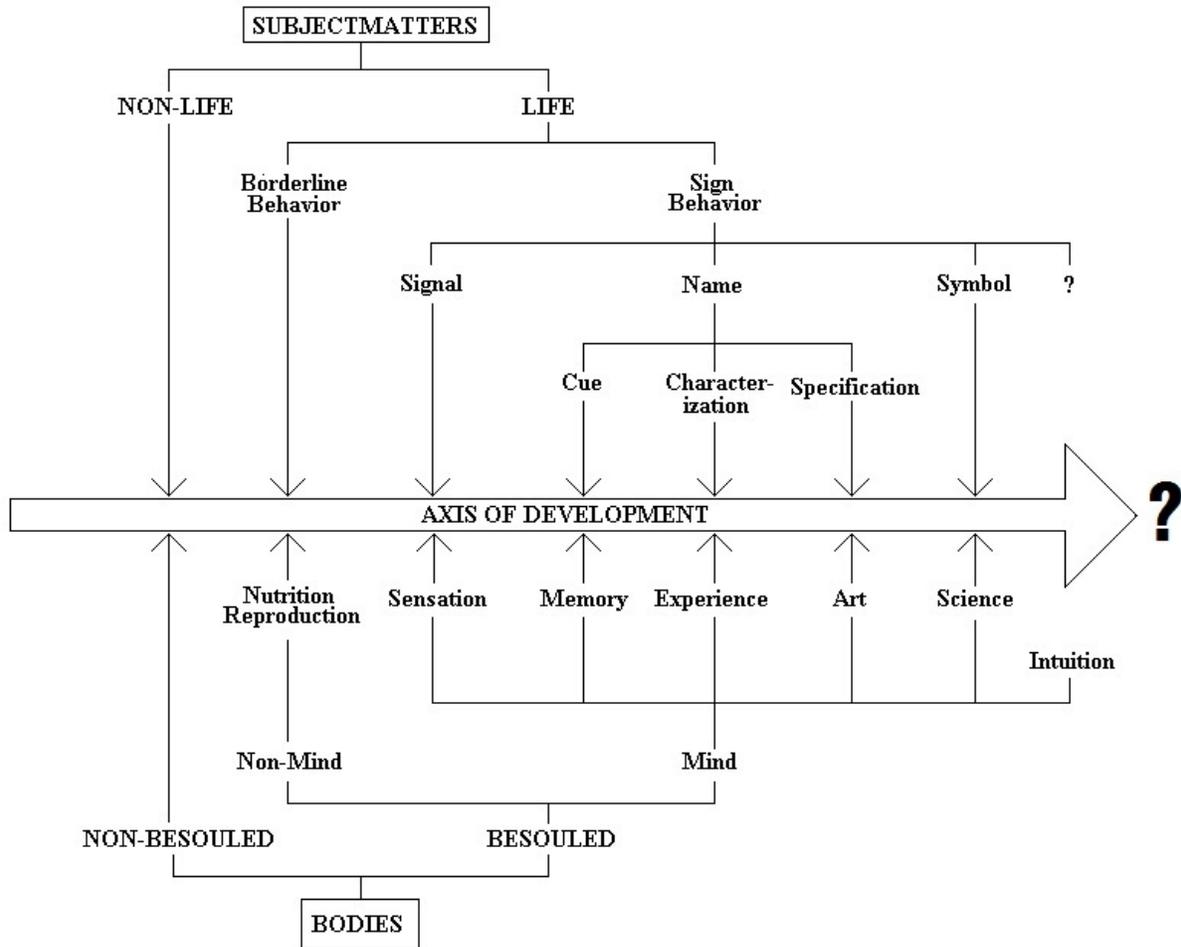


Figure 2. Systems of Aristotle and Dewey-Bentley

In this figure, to parallel the content of the two systems I have added the stage of non-life to the DB system, matching the Aristotelian stage of “non-besouled.” Keep in mind that this sort of diagram is a comparison of organization, not of content. That said, the question arises as to what extent such organizational arrangements are purely linear along a time sequence, or whether there is a more complex relationship between the “stages” of development. This question will be explored extensively in part two. For now it is possible to consider each later stage perhaps as simply a more complex manifestation of the earlier ones, while at the same time the organism carries the functional characteristics of the earlier stages along with it. This does not at all imply a “reduction” of later

stages to earlier ones. Each of the authors attempt to express the separable but inseparable character of the relationship between the serial stages by means of metaphors. Dewey is fond of saying that a later stage is “foreshadowed” by the earlier ones and that each stage “reproduces the pattern” of the earlier ones. Aristotle gives us the image not only of “taking a stand” but of a “fresh stand” being taken at each stage. And Quine, whose metaphor of the “wedge” has already been mentioned, gives another vivid image of a similar sort: “The child scrambles up an intellectual chimney, supporting itself against each side by pressure against the others.”<sup>22</sup>

Another metaphor which occurs in a similar context (discussed at greater length in Part Two) is to say that each stage “penetrates” the next throughout the entire series. This of course is just as obscure from the viewpoint of any sort of technical clarity as to the relationship involved (it is not, for example, “class inclusion.”). The necessity for metaphor at such a crucial point is in fact characteristic of every example of a transactional developmental series identifiable as such. This much more, however, may be said: while each stage forms a part of a developmental chain, all the stages must be capable of existing and functioning simultaneously in the same organism in such a way that they are all organic functions of the whole. There is an integrated relation between the contemporary structure of complementary functions and the dynamic of serial development. The principle of serial development and the principle of organization of functions at the culmination of development are understood as two aspects of the same thing.

What remains to be analyzed is the requirement for “penetration” of stages across the temporal series, and the resulting complementarity of functions. In addition the nature of the dynamic factor or what DB and Quine refer to as the “mechanism” of development must be clarified. The result of the discussion at this point is that rather than a reduction of later stages to some mechanistic process found at the origin of the development, some dynamic process common to all the stages, not reducible in a mechanistic fashion, and frequently referenced by metaphor, is at work. This further analysis is in Part Two of this paper.

Stan V. McDaniel  
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## ENDNOTES

<sup>1</sup>. Cf. my paper “Models of Development in Esoteric and Western Thought” for a summary of the overall results of the research outlined in the present and other papers at [www.stanmcdaniel.org/pubs/development/development.html](http://www.stanmcdaniel.org/pubs/development/development.html)

<sup>2</sup>. Quine, W. V. , *Word and Object*, Wiley & Sons, N.Y. 1960, p. 108.

<sup>3</sup>. Quine is attempting to resolve the question of the relation of incoming stimuli, or a manifold of impressions, to a knowledge of physical objects, which was the effort of Kant in his *Critique of Pure Reason*. Where Kant appeals to a faculty of mind called synthesis, Quine is vaguely attempting to replace this with the mechanism of reinforced stimulus-response, except that by this stage he has really left such a purely physiological explanation far behind.

<sup>4</sup>. *Ibid.*, p. 122. Quine is, without apparently noticing it, working backwards here. Instead of development toward abstraction, he finds it necessary to posit abstraction as already existing in the “primitive abstract term.” If he can make such a move he may as well have located abstraction all the way back to the initial stage of “indirection,” in which case the mechanistic reduction fails entirely.

5. Dewey, John and Bentley, A. F., *Knowing and the Known*, Beacon, Boston, 1949, passim.
6. Aristotle, *De Anima*, 415a, 16-23. Edition Random House, N. Y., 1941.
7. *Ibid.*, 414a 30.
8. Aristotle, *Posterior Analytics*, 100a 15 - 100b 3 (my italics).
9. Dewey, John, *Experience and Nature*, Second Edition, Dover Publications N. Y. 1958, p. 256.
10. The developmental system proposed by Pierre Teilhard (De Chardin) also proposes that “interiority” or psychism is a trait extending backward along the line of evolutionary change all the way to biological and thence even to physical phenomena. In such a system there is no reduction of higher stages to the “mechanism” of some lower stage but rather a realization of a dynamic potential already existing in the earlier stages. Quine also finds it necessary to work “backward” in this manner (see endnote 4).
11. Aristotle, *De Anima*, 416b 13 (my italics).
12. Dewey, John, *Logic: The Theory of Inquiry*, Henry Holt, 1938, p. 28.
13. This dictum is known as “Rohmer’s Rule.” In another context Dewey argues that “habit” can be a basis for change of behavior rather than a restriction. Cf. *Human Nature and Conduct*, Modern Library Ed. 1922.
14. Dewey, *Logic: The Theory of Inquiry*, pp. 264-65, p. 282. Here we have Dewey also “working backward” by attributing generalization as already existing in an earlier stage (see endnotes 4 and 10).
15. Throughout this discussion it is important to realize that by “soul” (anima = breath) Aristotle does not refer to a disembodied spirit but rather “the first grade of actuality of a natural organized body”
16. Aristotle, *op. cit.*, 429a 17, 429b 30.
17. *Ibid.*, 425b 26, 430a 15.
18. *Ibid.*, 431b 20.
19. Waddington, C. H., *The Ethical Animal*, Univ. of Chicago Press, 1960, p. 147.
20. There is a potential relation here between “transactional” and Kant’s notion of “transcendental” (as contrasted with “transcendent”). I have discussed this in a separate paper, “Transcendent and Transactional: Some Views on the Subject-Object Distinction in the Critique of Pure Reason.”
21. Dewey, *Experience and Nature*, p. 278.
22. Quine, *op. cit.*, p. 93.