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ON THE ORGANISM–ENVIRONMENT DISTINCTION IN PSYCHOLOGY

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ABSTRACT: Most psychology begins with a distinction between organism and environment, where the two are implicitly (and sometimes explicitly) conceptualized as flipsides of a skin-severed space. This paper examines that conceptualization. Dewey and Bentley's (1949) account of firm naming is used to show that psychologists have, in general, (1) employed the skin as a morphological criterion for distinguishing organisms from backgrounds, and (2) equated *background* with *environment*. This two-step procedure, which in this article is named *the morphological conception of organism*, is shown to inform the writings of the well-known psychologist B. F. Skinner. A review of difficulties with the morphological conception is followed with a review and preliminary integration of four attempts at an alternative conception of organism, and thus environment. Together, these four attempts converge on an analysis of living systems as transdermal (through and across skin) processes only *within* which organism and environment are distinguishable as complementary phases. The notion of a biological total process, or *bioprocess*, is employed to clarify this alternative analysis, in which an organism is an ongoing organization rather than a skin-bound body.
Key words: organism, environment, skin as boundary, morphological conception, organization, transdermal, bioprocess

It is commonly assumed that the skin of an organism's body partitions that organism from an external environment. Here I review some difficulties with this assumption. I also review and integrate several attempts at an alternative.

Three points are worth emphasizing at the outset. First, nowhere does this paper deny the importance and necessity of a distinction between organism and environment. Rather, the paper addresses the nature of this distinction, the way in which it is made, and the question of whether it can be better made. Second, although many of the ideas discussed have implications for empirical work, I can only hint at such implications here. This paper is primarily a historical and philosophical survey of a recurring concern in psychology with the distinction between organism and environment.

AUTHOR'S NOTE: A version of this article was presented in a paper entitled "The Organism of Behaviors: A Conceptual Analysis" at the convention of the Association for Behavior Analysis, San Francisco, May 2003. Though I learned of it too late to incorporate, I note that Alan Costall has recently published a highly relevant article on a similar theme in this journal (Costall, 2004). Please address all correspondence to Dan Palmer, 62 Stockdale Avenue, Clayton 3168, Australia. Email: danpalmer@transactionalview.org

The third point concerns the following objection: "Why does this issue—the distinction between organism and environment—matter? Why subject this distinction to a critical conceptual analysis at all? Isn't it self-evident what is organism and what is environment?" Consider how self-evident the distinction between space and time was before Einstein. Einstein's contributions exemplify Whitehead's (1968) observation that "fundamental progress has to do with the reinterpretation of basic ideas" (p. 216). The conventional, skin-based distinction between organism and environment is a basic idea. This paper explores the possibility that its reinterpretation can advance scientific psychology.

Distinction, Specification, and the Morphological Conception of Organism

Distinction: Foregrounds and Backgrounds

Many authors have reflected on the fundamental event by which a foreground is made different from a background and some kind of entity is thereby distinguished (e.g., Dewey & Bentley, 1949; Maturana & Varela, 1987; Oyama, 2000; Spencer-Brown, 1969; Varela, 1979; Weiss, 1978). Maturana and Varela (1987) expressed the matter concisely:

> The act of indicating any being, object, thing, or unity involves making an *act of distinction* which distinguishes what has been indicated as separate from its background. Each time we refer to anything explicitly or implicitly, we are specifying a *criterion of distinction*, which indicates what we are talking about and specifies its properties as being, unity, or object. This is a commonplace situation and not unique: we are necessarily and permanently immersed in it. . . .A *unity* (entity, object) is brought forth by an act of distinction. Conversely, each time we refer to a unity in our descriptions, we are implying the operation of distinction that defines it and makes it possible. (p. 40)

In their *Knowing and the Known*, Dewey and Bentley (1949) discussed this mutual and reciprocal relation between an *act of distinction* and a *unity*, though using the words *designation* and *existence*:[1]

> The Designation we postulate and discuss is not of the nature of *a* sound or *a* mark applied *as* a name *to* an existence. Instead of this it is the entire activity—the behavioral action and activity—of naming through which Existence appears in our knowing as Fact. (pp. 60-61)

> In a myopic and short-term view Existence and Designation appear to be separates. The appearance does no harm if it is held where it belongs within

[1] Dewey and Bentley initially used the word *event* before settling on *existence*. For consistency with their later formulation I have substituted the word *existence* for *event* in the following quotations.

> narrow ranges of inquiry. For a general account of knowings and knowns the wider envisagement in system is proposed. (p. 61)

As these quotations suggest, for Dewey and Bentley (as for Maturana and Varela), designation and existence, naming and named, or knowing and known are always twin phases in a single ever-evolving system.

Specification: Accurate Distinctions Entail Firm Names

Dewey and Bentley (1949) suggested three grades of designation, ranging from what they called *cue* through *characterization* to *specification*. *Cue* was envisaged as the evolutionarily most primitive form of designation, including warning cries, expletives, one-word sentences, interjections, and exclamations. From the clustering of cues develops *characterization*, which is "that type of naming which makes up almost all of our daily conversation" (p. 159). With characterization, "words cease to be of the type of 'this,' or 'that,' or 'look,' or 'jump quick,' and come to offer a considerable degree of connection among and across environmental situations. . ." (p. 159). As an example from contemporary psychological discourse, the term *information* (and accompanying discussion) in cognitive psychology (e.g., Sternberg, 1999) rates as low-grade characterization. Though reasonably adequate for the purposes of everyday conversation, (e.g., "I've got information overload"), the term causes trouble in psychological discourse because of its relative vagueness and ever-shifting usage. For Dewey and Bentley, characterizations remain loose names ideally to be eliminated from scientific discourse, whether by removal or improved accuracy of usage.

Only at the next level of *specification* do the relatively accurate, efficient, or firm names underlying modern science emerge.[2] For Dewey and Bentley, specification

> is the type of naming that develops when inquiry gets down to close hard work, concentrates experimentally on its own subjectmatters [sic], and acquires the combination of firmness and flexibility in naming that consolidates the advances of the past and opens the way to the advances of the future. (1949, p. 162)

Further, where "cue states and characterization connects. . .specification goes much further. It opens and ranges. By the use of widened descriptions it breaks down old barriers, no matter how strongly the older characterizations insist on retention" (p. 163). The name *molecule* in the context of its contemporary scientific usage is an example of specification. The name *molecule* is used precisely to distinguish instances of particular existences/entities. It is neither ambiguous nor vague. Relative to a psychological term like *information*, the name *molecule* does not wobble (though a given molecule might).

[2] This analysis parallels that of Ziman (1978), in which science requires sharp categories (i.e., specifications) as opposed to unsharp categories (i.e., characterizations).

To summarize: I have introduced the mutual reciprocity of existence (or unity) and designation (or distinction) whereby some thing or entity is made different from a background through naming. I then reviewed Dewey and Bentley's (1949) three gradations of designation: cue, characterization, and specification. Dewey and Bentley view science as a passage from loose to firm names, where "progress from stylized cue or loose characterization to careful specification [is] a compelling need" (p. 306). Having established a framework for the evaluation of scientific names, I turn to the terminological specimen of interest in the present inquiry, namely *organism*.

"Organism": Skin as Implicit Criterion

I aim to clarify the status and role of the name *organism* in contemporary psychological science. Having clarified the way in which names designate existences (i.e., distinguish unities) I begin by inquiring about the criteria psychologists use to differentiate organisms from backgrounds or surrounding worlds.

Observe first that in psychological usage the word *organism* is used coherently only in relation to a second word, *environment*. Each of the two words is implied by the other and is defined only in reference to the other. Each *is* what the other *is not*. As is occasionally emphasized, the two make an inseparable pair (e.g., Gibson, 1979/1986, p. 8; Lewontin, 1982, p. 160).

A central argument in this paper is that this inseparability has the following basis: the criterion by which an organism is distinguished from a background is almost universally equated with the line of demarcation between organism and environment. Organism is inside this line and environment outside it. One begins where the other ends. Brunswick (1957) exemplified this view when, after asserting that organism and environment are "both hewn [i.e., distinguished] from . . .the same block," he spoke of their "mutual boundary or surface areas" (p. 5). Here I argue that this frame of orientation, in which *organism* and *environment* are used in the way one might speak of an *object* and its *surrounds*, dominates psychological discourse (sometimes implicitly, other times explicitly). Further, this usage depends on a conception of where the boundary between organism and environment exists.

A. F. Bentley (1941b) addressed this issue:

> "Inner" and "outer" are ever present distinctions, however camouflaged, in philosophical procedure as well as in conventional speech-forms and in the traditional terminology of psychology. What holds "inner" and "outer" apart? The answer must come not by way of transcendental build-up but by indications of pertinent fact. Bluntly the separator is skin; no other appears. (p. 3)

As Bentley suggested, and as I will shortly show, the line by which psychologists delineate organisms (and thus environments) is the skin of organism's bodies. Table 1 illustrates some common binary oppositions following from an organism–environment separation hinging on the skin as the critical line of separation. In

each opposition the organism is conceptualized as a container-like object with an inside and outside.

It is important to note that the skin is a *morphological* criterion of distinction; it takes the organism as a structure in space. There are two steps. The first step is to distinguish the organism, on the basis of the skin of its body, from a background. The second is to equate this background with environment. Taken together, these two steps are here designated *the morphological conception of organism*.

Organism	**Environment**
Person	World
Subject	Object
Inside	Outside
Mental	Physical
Ego	Non-ego
Observer	Observed
I	You
Private	Public
Knowledge	Reality
Soul/Spirit/Mind	Matter
Representation	Represented
Individual	Social
Rational	Empirical
Cognitive	Behavioral

Table 1: Common binary oppositions following from a morphological conception of the organism hinging on the skin as the critical line of separation.

Once the two-step morphological conception is applied, it constrains the resulting conceptualization of psychology's subject matter. As Laing (1960/1965) put it, "the initial way we see a thing determines all our subsequent dealings with it" (p. 20). The morphological conception compels psychology's subject matter to be conceptualized as (a) physiological, cognitive, or behavioral events located inside or at the organism, and (b) relations (whether linear, cyclical, or mutual and reciprocal) between the organism (or (a)) and events outside the organism (in its surrounding environment).

To summarize this section: I have claimed that in practice, psychologists (a) distinguish organism from background using a morphological criterion (i.e., the skin), and (b) name the background (or, equivalently, the surrounding world) of an organism "environment." The organism is subsequently conceptualized as an enclosed physical space, just as a box is considered an enclosed physical space.

An Examination of *Organism* as Used in the Writings of B. F. Skinner

In this section I evaluate the validity of the above claims by examining how the core proponent of one well-defined approach to scientific psychology has used

and conceptualized the term *organism*. The examination has the primary aim of establishing the presence (or absence) of the morphological conception. It has the secondary aim of tracing the implications of this conception, if present, for the resulting conceptualization of psychology's subject matter.

Behavior Analysis

The definitive proponent of behavior analysis was its founder, B. F. Skinner, whose seminal text (*The Behavior of Organisms: An Experimental Analysis* [1938]) prominently featured the name under scrutiny (i.e., *organism*). Behavior analysis is an approach to psychology that takes its subject matter to be behavior in its own right. The basic unit for a behavior analyst is a three-term operant contingency relating behavioral responses to antecedent (discriminative) and subsequent (consequential) environmental stimuli. As implied by the three-term contingency, the most prominent distinction in behavior analysis is not between *organism* and *environment* but between *behavior* (or response) and *environment* (or stimulus). From early in his career Skinner (1935) stressed ". . .the natural lines of fracture along which behavior and environment actually break" (p. 40) and the process of ". . .breaking behavior and environment into parts for the sake of description. . ." (p. 61).

Though Skinner stressed the distinction between behavior and environment, to the extent that he identified *behavior* with the *organism*, his separation of *behavior* and *environment* followed logically from a prior separation of *organism* and *environment* (i.e., the morphological conception). Skinner did identify behavior with the organism. He not only conceptualized behavior as *of* the "organism as a whole" (1938, p. 441), but as a "primary characteristic of living things" we almost "identify with life itself" (1953, p. 45) and "as much a part of the organism as are its anatomical features" (1953, p. 157).

Accordingly, when Skinner (1938) wrote ". . .behavior is that part of the functioning of an organism which is engaged in acting upon or having commerce with the *outside* [italics added] world" (p. 6), he defined *behavior* in terms of (a) being a part of the functioning organism, and (b) being something different from, and yet related to, the *outside world*, where *outside world* was synonymous with *surrounding world*: "We are most often interested, however, in behavior that has some effect upon the *surrounding world* [italics added]" (1953, p. 59), and *surrounding world* was synonymous with *environment*: "Many theories of human behavior, nevertheless, neglect or ignore the action of the *environment* [italics added]. The *contact*[3] [italics added] between the organism and the *surrounding world* [italics added] is wholly disregarded or at best casually described" (1953, p. 129). These quotations indicate Skinner's adoption of the two-step morphological conception of organism.

[3] Consider here the OED's leading definition of the noun *contact*: "The state or condition of touching; the mutual relation of two bodies whose external surfaces touch each other. Hence to be or come in (into) contact."

In addition, Skinner explicitly identified the skin as a boundary in psychological theorizing. He wrote, "a small part of the universe is contained within the skin of each of us" (1974, p. 24) and went on to contrast ". . .the world *around* [italics added] us. . ." (1974, p. 25) with ". . .the private world *within* [italics added] the skin. . ." (1974, p. 34). Here Skinner stressed that "we need not suppose that events which take place within an organism's skin have special properties for that reason" (1953, p. 257). He did, however, explicitly draw (and thereby validate) the line in using it to organize his conceptual framework and his analysis of subtle events such as thinking and imagining (as noted and critically discussed by Hayes, 1994). As a final example, consider the relevance of the morphological conception, and thus the skin, in Skinner's (1974) summary statement that behaviorism ". . .is almost literally a matter of turning the explanation of behavior *inside out* [italics added]" (p. 274).

To sum up, behavior analysis, as presented by its founder B. F. Skinner (and more recently by his intellectual descendents),[4] accepts the morphologically based usage of the term *organism*. Skinner assumes a morphological separation between organism and environment, where *environment* is synonymous with *surrounding world*. He localizes behavior on the organism's side of the divide, advocating investigation of (functional) relations between behavior (as response) and environment (as stimulus).

It is important to note that I chose the writing of Skinner to demonstrate something that applies more generally. The morphological conception is evident in most, if not all, approaches to scientific psychology. As examples, it is evident in cognitive psychology (e.g., Gardner, 1985; Haberlandt, 1997; Lindsay & Norman, 1977; Neisser, 1967; Newell & Simon, 1972; Sternberg, 1999), interbehavioral psychology (Kantor, 1924, 1959, 1984), ecological psychology (Gibson, 1979/1986; Reed, 1996), and perceptual control theory (Powers, 1973, 1989). These four additional psychologies respectively conceptualize psychology's subject matter as *internal representational processes mediating between stimulus input and response output*, *interactions between organisms and surrounding objects*, *animal-surrounding encounters*, and *organismic control of external environmental variables*. All such conceptualizations depend on a morphological conception of organism.

Difficulties with the Morphological Conception of Organism

I have argued that most psychology assumes a morphologically conceptualized line partitioning organism from environment. I next review early arguments that there is no such line and that the skin is both logically and biologically incapable of bounding the organism.

[4] Modern behavior analysts continue to adopt Skinner's morphological conception of organism and environment, if departing from his approach in other respects (for two explicit examples see Rachlin, 1994, pp. 32-33 and Roche & Barnes, 1997, p. 602).

The problem was stated clearly by A. F. Bentley in an originally unpublished draft dated 1910 (eventually included in A. F. Bentley, 1954):[5]

> However spatially isolated the individual appears at a crude glance, the more minutely he is examined, the more are his boundary lines found to melt into those of his environment, the more frequently are functions found which work through both individual and environment so that it cannot be told where the one ceases and the other begins. (p. 5)

The harder we look for a line partitioning organism from environment, notes Bentley, the more does the possibility of any such line dissolve in front of our eyes. Sumner (1922) offered a continuum of examples highlighting the arbitrariness of drawing that line at the skin:

> If I should ask you whether the nest of a bird constituted a part of the organism or a part of its environment, I presume that everyone present would resent the question as an insult to his intelligence. Nor would there probably be any hesitation if the question related to the patch-work dwelling of a caddis-worm, even though this dwelling is carried around by the larval insect, as if it were an integral part of its body. . . .The situation becomes somewhat less clear, perhaps, when we consider the calcareous tube of a marine annelid. Here is something which is definitely secreted by the epidermal cells of the organism, and which forms a sort of permanent integument. It does not, however, in this case retain any organic connection with the body of the worm. But when we pass to the shell of the mollusk we find that there is such an organic connection with the body, so that the animal cannot be dislodged without extensive injury to its living tissues. Moreover, the purely mineral ingredients of the shell are sandwiched in between layers of a substance we commonly speak of as "organic," though not in this case as living. Does such a shell belong to the organism or its environment? (pp. 231-232)[6]

As we pass from bird nest to mollusk shell (not to mention Sumner's subsequent step to tortoise's carapace, which includes living cells, blood vessels, and nerves) we find ourselves having moved from what we can probably agree is environment to what we can probably agree is organism without being able to say exactly where we crossed the line. Again, the seeming security of the morphological conception is dissolving in front of our eyes. At the least, we can sympathize with Sumner's conclusion that ". . .the organism and the environment interpenetrate one another through and through. The distinction between them. . .is only a matter of practical convenience" (p. 233).

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[5] Note that in this quote Bentley is using *individual* as a synonym for *organism.*

[6] In expounding his extended phenotype theory of genetic effects, Dawkins (1982/1999, Ch. 11-13) traversed a similar continuum in the reverse direction. He also used the caddis worm example and critiqued the "arbitrary decision to cut off all chains [of influence from gene to phenotype] at the point where they reach the outer wall of the body" (p. 232).

A few years later M. Bentley (1927) used different examples to support the same conclusion:

> . . .the separation of the organism and environment at boundary lines and surfaces is, in certain cases, arbitrary and conventional. The symbiotic relationship offers an example, and so does the parasite which is lodged within the host and is not therefore really external. Neither is the nutrient material ingested into the cavities really environmental. It would be difficult to define the exact moment when food-stuffs become part of the organism and cease to be "foreign" materials; and on the other hand, the exact passage from organism to environment of rejected glandular and digestive products and of residues expired from the lungs is equally indeterminate. . . .Once more, in our body-coverings, hand-tools and weapons. . .we have "outside" attachments which might well—save for our arbitrary delimitation at the rind—be functionally partitioned with the organism, quite as much as hair, claws, and teeth, instead of with the environment. (pp. 57-58)

Here Bentley observes that in many concrete instances a skin-based separation of organism from environment becomes arbitrary and uncertain.

As such quotations suggest, difficulties with the morphological conception of organism have been under discussion for many years (see also Angyal, 1941; Ashby, 1960; Bateson, 1972; A. F. Bentley, 1941a; 1941b; Dewey & Bentley, 1949; Goodwin, 1989; Järvilehto, 1998a; Lewontin, 1982; Lindeman, 1942; Llewelyn & Kelly, 1980; Lotka, 1925/1956; Mead, 1934/1969; Oyama, 2000, in press; Sullivan, 2001; Whitehead, 1933/1948). The consensus in such discussions is that any attempt to map the living organism onto a skin-based morphological template,[7] and thereby to execute a clean severance of organism from environment, fails.

I will assume that enough has been expressed to suggest that the morphological conception is problematic (for additional material, see especially Angyal, 1941, Ch. 4; A. F. Bentley, 1941a; Järvilehto, 1998a; Sumner, 1922). Upon detailed observation, difficulties arise in attempting to draw a skin-based line between organism and environment.

Organism as Characterization in Need of Specification

I now use Dewey and Bentley's (1949) analysis of scientific names to clarify further why the morphologically defined organism presents difficulties. As reviewed earlier, names designate existences in the sense of distinguishing entities from backgrounds. Importantly, "existence and designation. . .go forward together"[8] (Dewey & Bentley, 1949, p. 63), which is to say that named (existence)

[7] A template reminiscent of the frame in Wittgenstein: "one thinks that one is tracing the outline of the thing's nature over and over again, and one is merely tracing round the frame through which we look at it" (1953, p. 48).

[8] Or, in another wording, "namings and named develop and decline together. . ." (Dewey & Bentley, 1949, p. 89).

and naming (designation) are always mutual and reciprocal—the existence is every bit as vague (or firm) as the designation. Names vary in the accuracy with which they designate, ranging, in order of decreasing vagueness, from cue through characterization to specification. Specifications are the firm or accurate names scientific advance relies upon.

Turning to the term *organism* as used in contemporary psychology, we find it a loose name, or a characterization. The criteria for its application are, in practice, vague. This vagueness stems from the assumption that the skin of an organism's body is a sufficient criterion for accurate designation. As suggested above, and elaborated below, this assumption fails. Further, the vagueness of *organism* extends to its complement, *environment*. The vagueness of the two names (not to mention that which they name) increase or decrease in unison.

For Dewey and Bentley (1949), increasingly accurate names are a pressing scientific objective, especially in a science such as psychology, in which cues and characterizations everywhere outnumber specifications. Psychology has much to gain, therefore, from an effort to elevate *organism* from characterization to specification. This is especially so given the status of *organism* as a linguistic nucleus around which many other psychological names revolve (e.g., *environment*, *behavior*, *action*, *stimulus*, *input*, *response*, *output*, *perception*, *action*, *person*, *psychology*).

A Review and Preliminary Integration of Some Alternative Starting Points

I have developed an argument that psychology's (morphological) distinction between organism and environment is problematic. I now review and integrate four attempts to develop a non-morphological conception of organism (and thus environment). As will become apparent, a common conclusion is that the words *organism* and *environment* most coherently designate complementary phases within a single process.

Angyal: Biosphere

Angyal's (1941) *Foundations for a Science of Personality* was an important precursor of the present work. Angyal observed that "*environment* is not identical with *surrounding world*" (p. 108),[9] and that "the consideration of the organism and environment in morphological terms leads to such logical entanglement that the concepts of organism and environment are made useless for scientific purposes" (p. 121). On top of critiquing the morphological conception of organism, Angyal (1941) developed a systematic reconceptualization of the organism, and thus the organism–environment distinction, in terms of *dynamic process* (as opposed to *static structure*):

[9] This insight was also expressed by M. Bentley (1927) in his observation that "much of the surroundings of the living organism is not really environment" (p. 57).

> We shall try and show in what follows that it is, in principle, impossible to draw any line of separation because organism and environment are not static structures separable in space, but are opposing directions in the biological total process. (p. 92)
>
> . . .the body surface is not the boundary of the organism. It has been emphasized that the organism is entirely permeated by the environment which insinuates itself into every part of it. On the other hand, the organism does not end at the body surface but penetrates into its environment. The realm of events which are influenced by the autonomy of the organism is not limited to the body but extends far beyond it. Every process which is a resultant of the interplay of the organismic autonomy and the environmental heteronomy is part of the life process, irrespective of whether it takes place within the body or outside of it. The biological process of feeding oneself does not begin with the chewing of one's food; the preparation of food, the raising of vegetables are also "biological" activities in the broader sense of the word. (pp. 97-98)

Here Angyal uses the names *organism* and *environment* to differentiate the relative role of *autonomy* and *heteronomy* within any life process. For Angyal, *autonomy* designates self-governance, as illustrated by the healing of a burn, the reflex action by which a falling cat turns to land on its feet, and the homeostatic self-regulation of body temperature. *Heteronomy*, in contrast, designates that which is governed from outside,[10] such as the burning action of a drop of acid, the gravitational influences on the cat's fall, and the air temperature. In each of these examples an autonomous organism asserts itself upon a heteronomous environment.

An important precursor to this formulation was Von Uexküll (1926), who suggested "to be alive. . .means. . .the continuous control of a framework by an autonomous rule, in contrast to a heteronomous rule that loses its efficacy as soon as the framework is disturbed" (p. 223). Disturb the framework of a dead earthworm by cutting off its head and the framework remains disturbed (without efficacy). Subject a live earthworm to the same disturbance and a new head is grown—the earthworm's framework is autonomously re-asserted.

For Angyal, the relative presence of autonomy and heteronomy varies within and across different parts of the life process. Consider some examples. The process by which blood pressure is regulated is highly self-governed. It has a large degree of autonomy and a small, yet ever-present, degree of heteronomy. The movement of a shovel when digging a hole, on the other hand, has a smaller degree of autonomy and a higher degree of heteronomy (especially given poor hand-eye coordination, weak muscles, a blunt shovel, and rocky soil). Both processes are biological for Angyal; they are both occurrences within a single life process.

[10] Angyal's somewhat misleading use of the word *outside* here is metaphorical and refers not to location in space but to being foreign (not belonging) to the biological life process under consideration (see Angyal, 1941, p. 42). A tapeworm in the stomach of a cow, for example, is heteronomous (i.e., environmental) from the perspective of the host despite being inside the skin.

Angyal observed that the general tendency of the biological total process was toward increased autonomy[11] or self-expansion. As a child learns to ride a bicycle, for example, the bicycle begins as a "foreign" object that takes great effort to keep upright. Heteronomy prevails. Eventually the bicycle appears at one with the child in the riding process. The riding process has become integrated with the biological total process in the sense that it now has a much greater degree of autonomy.

Angyal designated the biological total process the *biosphere*.[12] In his words, "the biosphere includes both the individual and the environment, not as interacting parts, not as constituents which have independent existence, but as aspects of a single reality which can be separated only by abstraction" (p. 100). Angyal's primary distinction is between biosphere and surrounding world. A secondary distinction is between autonomous (or organismic) and heteronomous (or environmental) trends within the biosphere. This approach differs *radically* from the traditional tendency, first, to distinguish the organism on the basis of its skin from a background and, second, to call that background "the environment (of the organism)."

For Angyal, what makes a biospheric sub-process autonomous (organismic) or heteronomous (environmental) is not a matter of whether it happens inside or outside the skin, but instead a matter of relative contribution:

> In a study of biological dynamics we do not ask whether a given morphological entity is a part of the organism or of the environment. Rather, we wish to determine whether a part process occurs by virtue of autonomous (organismic) or by virtue of heteronomous (environmental) determination. Thus, for example, we do not ask whether the contents of the stomach belong to the environment or the organism, but whether the processes going on in the lumen of the stomach are system-determined (autonomous, organismic determination) or are due to factors foreign to the system (heteronomous, environmental determination). (p. 94)

Consider a surgeon performing open-heart surgery. While the scalpel and the surgeon's hands are physically inside the skin of the patient's body, their dynamics are more under the control of, and thus a part of, the surgeon. Similarly, consider the squirrel who stores food as (a) fat within its body and (b) acorns stacked within its nest. While (a) and (b) are on different sides of the skin, they serve a common biological function and are thereby both *inside* a single biosphere. An important implication is that for Angyal, physiological and psychological processes are

[11] I only hint here at Angyal's (1941) contrast of this trend with the equally important trend towards *homonomy* or integration with larger superindividual wholes (e.g., family, religious order, or the natural world). In his words, "in the trend toward increased autonomy the biologically chaotic items of the environment are fitted into the organization of the individual's life, while in the homonomous tendency the individual seeks to fit himself into even larger organizations" (p. 174).

[12] Angyal, in apparent independence, coined and used the word *biosphere* in a manner differing from Vernadsky's (1926/1998) now-popular sense of the living surface layer separating the planet Earth from the cosmic medium.

viewed as abstractions from the biosphere and thus encompassed by the word *biological*.

Figure 1 illustrates Angyal's conceptualization of organism–environment as a graded range of ratios between autonomy and heteronomy. Both extremes represent theoretical limits, not actual values. The one extreme of total heteronomy would be "pure environment," when in actuality there can be no environment without organism. The other extreme of pure autonomy would be something free from physical constraint (i.e., a fiction—Angyal's example being a transcendent soul).

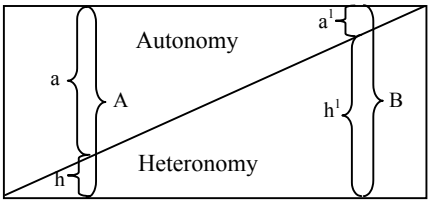

Figure 1: Range of possible ratios between autonomous and heteronomous tendencies within any living process. On the left, the ratio A (a/h) indicates a process with more autonomy than heteronomy, such as the regulation of blood pressure. On the right, the ratio B (a^1/ h^1) indicates a process with less autonomy than heteronomy, such as digging a hole. Adapted from Angyal (1941, p. 95).

Angyal (1965) acknowledged that his formulation might seem counterintuitive. Most people, he noted, experience themselves as "distinct units, with firm boundaries" (p. 8). He then explained as follows:

> Although the boundaries are, in fact, far from being firm and set, the formulation. . .should be qualified by the statement that not all variations of the *a*:*h* ratio are gradual and continuous. There are sharp gradients between the ratios typical of different groups of functions. The high degree of control we have over the movements of our body tends to create a sharp separation between this unit and the objects and events over which our control is less immediate and certain. (p. 8)

In other words, the dexterity with which one's own body can be moved relative to other objects is consistent with Angyal's formulation. Our bodies are central to our lives in the literal sense of being more autonomously governed than other aspects. They are not central in virtue of being bodily alone. This is demonstrated by a paralyzed leg, which may feel less a part of one than one's walking stick or wheelchair. Somatic processes are central to the biosphere not because they are largely inside the skin (which they are) but because they constitute a realm of relatively high and persisting autonomy within the greater life process.

In summary, Angyal developed a non-morphological conceptualization of organism and environment. He started by abstracting the biosphere from the surrounding world. Within the biosphere, autonomous (organismic or self-

governed) and heteronomous (environmental or foreignly-governed) tendencies were then abstracted. Viewed in this way, with a shift in the usual stress from bodily *structure* to life *process*, organism, as part of the organic–environmental life process, extends beyond the skin.

Dewey and Bentley: Life-Activity

In their *Knowing and the Known,* Dewey and Bentley (1949) were centrally concerned with moving from what they called an *inter-actional* to a *transactional* formulation of organism and environment. For them, ". . .inter-action assumes the organism and its environmental objects to be present as substantially separate existences or forms of existence, prior to their entry into joint investigation. . ." (p.123), whereas

> *Transaction* assumes no pre-knowledge of either organism or environment alone as adequate, not even as respects the basic nature of the current conventional distinctions between them, but requires their *primary acceptance in common system* [italics added], with full freedom reserved for their developing examination. (p. 123)[13]

In this context—and similarly to Angyal—Dewey and Bentley critiqued the tendency to separate organisms from environments at the skin of the organism's body:

> Organisms do not live without air and water, nor without food ingestion and radiation. They live, that is, as much in processes across and "through" skins as in processes "within" skins. One might as well study an organism in complete detachment from its environment as try to study an electric clock on the wall in disregard of the wire leading to it. (p. 128)[14]

Interestingly, in statements such as this, while Dewey and Bentley critique the notion that the skin bounds the organic life process, they leave the notion of a morphological boundary intact. Unlike Angyal, they imply that it is still possible to study organisms in detachment from environments, and they merely note that this strategy is unlikely to bear fruit. Later in the book, however, the morphological conception is directly rebutted:

> "Environment" is not something around and about human activities in an external sense; it is their *medium* or *milieu*, in the sense in which a *medium* is

[13] See http://www.transactionalview.org/ for more information about Dewey and Bentley's transactional view.

[14] Also consider a comment by Dewey (1934/1987): "No creature lives merely under its skin; its subcutaneous organs are means of connection with what lies beyond its bodily frame, and to which, in order to live, it must adjust itself, by accommodation and defense but also by conquest" (p. 19, see also p. 64).

> *inter*mediate in the execution or carrying *out* of human activities, as well as being the channel *through* which they move and the vehicle *by* which they go on. (p. 272)

In this statement Dewey[15] rejects the tendency to equate *environment* with *background* or *external world* (read, *surrounding world*) instead equating it with the *medium* by means of which life-activities proceed. Dewey had earlier stated that "environment. . .is not equivalent merely to surrounding physical conditions" (1911/1978, p. 438) and "an organism does not live *in* an environment; it lives by means of an environment" (1938, p. 25, see also Dewey, 1928, p. 12). Just as fire, as a process, transpires not *in* but *through* or *via* a medium of wood, oxygen, and shelter, human life-activity as (a more complex, enduring, and differentiated) process transpires *through* or *via* a broad medium of contributors including oxygen, food, houses, automobiles, and social institutions. From this perspective it is more accurate to put the medium *inside* the process than the process *inside* the medium. For Dewey it makes as much sense to say "the fire is inside the wood" as it does to say "the organism is inside the environment."

Dewey's interpretation of environment as *medium* is compatible with Angyal's interpretation of environment as *heteronomy*. Consider picking, eating, and digesting an apple. Throughout this process, the apple is part of the medium by means of which the relevant organism goes on. It is environment in Dewey's sense. Simultaneously, the apple is participating in processes increasingly less heteronomous and increasingly more autonomous. The apple is becoming less environmental (and more organismic) in Angyal's sense. It is thus practicable to bring Angyal and Dewey's respective interpretations of *environment* into a common system.

In *Logic: The Theory of Inquiry*, Dewey (1938) emphasized that organism and environment were twin phases of a single life process. Further, Dewey made a distinction between that life process and the surrounding world:

> There are things in the world that are indifferent to the life-activities of the organism. But they are not parts of *its* environment, save potentially. The processes of living are enacted by the environment as truly as by the organism; for they *are* an integration. (p. 25)

> There is, of course, a natural world that exists independently of the organism, but this world is *environment* only as it enters directly into life functions. (p. 33)

Compare this latter quote with Angyal's (1941) "the surrounding world can only be called environment. . .when it participates in biological happenings" (p. 108) and "the objects of the external world can be called environment only in so far as they participate in the biological total process, that is, in so far as they are within the boundary of the biosphere" (p. 149). Both thinkers were expressing a common

[15] Though all chapters in *Knowing and the Known* were mutually approved, several were individually signed.

insight.[16] A related similarity to Angyal is Dewey and Bentley's (1949, p. 65) insistence that the term *biological* should encompass both physiological *and* behavioral subject matters (which nonetheless remain distinct as techniques of inquiry not to be confounded).

To sum up, Dewey rejected prevailing tendencies to distinguish organism from surrounding world at the skin, to equate *surrounding world* with *environment*, and to focus on *interactions between* organism and environment as two separate things. Like Angyal, Dewey first distinguished a full process of life-activity from a background. He then distinguished organism and environment (read *medium*) as phases provisionally abstracted from *within* ongoing life-activity. In his words,

> . . .life-activity is not anything going on *between* one thing, the organism, and another thing, the environment, but. . .*as* life-activity, it is simple event over and across that distinction (not to say separation). Anything that can be entitled to either of these names has first to be located and identified as it is incorporated, engrossed, in life-activity. (Dewey & Bentley, 1949, p. 323, see also Dewey, 1911/1978, p. 467)

Ashby: Single System

W. Ross Ashby was a pioneer of the cybernetic approach to psychology. In *Design for a Brain* (1960) he was concerned with the problem of how organisms learn and adapt. One stage of Ashby's (tentatively offered) solution was what he called an ultrastable state-determined system of interrelated variables and parameters. The soundness of his approach was supported with the construction of a working model (see Ch. 8, "The Homeostat") simulating aspects of homeostasis observed in organisms (see Beer, 1995, for a recent application of Ashby's approach). Here I limit my treatment to Ashby's conception of organism and environment.

In developing an account of organisms affording successful simulations, Ashby found it necessary to take organism and environment as together forming a single system. Thus, he argued ". . .the free-living organism and its environment, taken together, may be represented with sufficient accuracy by a set of variables that forms a state-determined system" (p. 36), noting ". . .from now on 'the system' means not the nervous system but the whole complex of the organism and its environment" (p. 41). Further, Ashby was aware of what I have named the morphological conception of organism and the possibility of a dynamical or functional alternative: ". . .the anatomical criterion for dividing the system into 'animal' and 'environment' is not the only possible: a functional criterion is also possible" (p. 106). In more detail, Ashby explained as follows:

> As the organism and its environment are to be treated as a single system, the dividing line between "organism" and "environment" becomes partly

[16] An insight shared by G. H. Mead (1934/1969, e.g., pp. 130, 245-246).

> conceptual, and to that extent arbitrary. Anatomically and physically [i.e., morphologically], of course, there is usually a unique and obvious distinction between the two parts of the system; but if we view the system functionally, ignoring purely anatomical facts as irrelevant, the division of the system into "organism" and "environment" becomes vague. Thus, if a mechanic with an artificial arm is trying to repair an engine, then the arm may be regarded either as part of the organism that is struggling with the engine, or as part of the machinery with which the man is struggling. (p. 40)[17]

Ashby comports with both Angyal and Dewey in distinguishing organism and environment only within a unitary dynamical system. For all three theorists this system extended across the skin of the organism's body. The three scholars offered different criteria for distinguishing organism from environment (as aspects of one system). Angyal distinguished organism from environment by distinguishing autonomy from heteronomy. Dewey distinguished organism from environment by distinguishing life-activity from the medium by means of which life-activity goes on. Ashby argued that the distinction could be made differently for different purposes, and that "these divisions, though arbitrary, are justifiable because we shall always treat the system as a whole, dividing it into parts in this unusual [i.e., non-morphological] way merely for verbal convenience in description" (p. 41).

To sum up, in developing a systematic cybernetic account of the organism (including its brain, behavior, learning, and adaptation) Ashby argued against the morphological conception with its "anatomical criterion" for distinguishing organism and environment. He made the distinction functionally, dividing a unitary system into parts organismic and environmental according to the practical requirements of any given inquiry.

Dewey came from philosophy and psychology, Angyal from psychology and psychiatry, and Ashby from cybernetics and neurology. Each ended with a compatible analysis. In their common rejection of the morphological conception, they emphasized organism and environment as (secondary) distinctions made within (primary) unitary dynamical systems.

Järvilehto: Organism–Environment System

Järvilehto offers an additional non-morphological approach in his *Theory of the Organism–Environment System* (e.g., 1998a, 1998b, 1999, 2000). In his own words, "the theory of the organism–environment system starts with the proposition that in any functional sense organism and environment are inseparable and form only one unitary system" (1998a, p. 321). From this starting point Järvilehto (e.g., 1999, 2000) develops an evolutionarily coherent analysis of psychological phenomena including behavior, perception, memory, learning, emotion, cooperation, language, and consciousness. For present purposes (as in the above

[17] Dawkins (1982/1999) similarly observed, "in a very real sense [the spider's] web is a temporary functional extension of her body, a huge extension of the effective catchment area of her predatory organs" (p. 198).

section on Ashby) I consider only Järvilehto's underlying conception of organism and environment.[18]

In clarifying the starting point of his theory, Järvilehto (2000) discusses the living cell, which he contrasts with a wrist-watch:

> . . .the cell as a system is not limited to its membrane, the border between the cell and environment, but it extends as a functional unit into the environment. The membrane of the living system is not a line of separation, but rather connects the inner parts of the cell with selected parts of the environment. (p. 38)

> . . .the real "environment" of the cell (in the same sense as that for the watch) lies outside its "functional environment" (the parts of the environment belonging to the cell) and the border between the "inner" and "outer" is located somewhere outside the cell membrane. As for any living system, this border is constantly changing. Thus, the exact definition of the elements of the living system is difficult if not impossible. (p. 39)

> . . .the cell and its functional environment form together the unit of life, a basic organism–environment system. (p. 40)

Here is a distinction parallel to Angyal and Dewey's distinction between living system (which Järvilehto describes here as the cell plus its "functional environment") and surrounding world (Järvilehto's "real 'environment'"). For all three scholars the line of distinction changes continuously and covers a broader realm than that enclosed by the membrane or skin. However, by using the term *environment* in two different senses (inside and outside the system) Järvilehto differs from Angyal and Dewey. As an example, while Järvilehto (2000, p. 42) suggests that ". . .the organism–environment system could extract from the *environment* [italics added] *things* which it could use in its action, or avoid if they were harmful," the writings of Angyal and Dewey suggest the paraphrase ". . .the organism–environment system could extract from the *surrounding world* things which it could use in its action, or avoid if they were harmful." The same substitution applies to Järvilehto's (1999) suggestion that "perception is the process of joining of new parts of the environment to the organism–environment system. . ." (p. 90).

The discrepancy is not merely terminological. In using the word *environment* in two distinct senses, Järvilehto implies (as is clear in the above quotations about the cell) a picture of three concentric circles: organism inside functional environment inside real environment or surrounding world. This picture contrasts with that of Angyal and Dewey. For Angyal, environment, as heteronomy, permeates the entire life process (biosphere). For Dewey, environment, as medium, is the stuff through and by which the life process proceeds. In neither case is environment something external (if connected to) the organism or necessarily

[18] A key aspect of Järvilehto's theory I neglect here, for example, is *the result of behavior*.

external to its body. Organism and environment are differentiable only as complementary phases within the unified life process. Järvilehto (2000) takes a different line in his discussions of how nerve cells connect sensory and motor cells to create a "functional circle through the environment" (p. 42) or of how "human action is the process of the intertwining of the body and environment. . ." (p. 53). Such examples lean toward the morphologically influenced equivalence of *organism–environment* and *body–surrounds* (and the line between the two halves of each equation) that the theory of the organism–environment system is, overall, an attempt to overcome.[19]

In summary, Järvilehto's theory of the organism–environment system is an important recent (and ongoing) attempt to overcome the morphological conception of organism. Järvilehto uses the word *environment* in two distinct senses (as a phase of the life process and as the world surrounding that life process). This double usage supports a conception of the organism in which the *environment* sector of the *organism–environment system* is considered to be external to the membrane or skin (and yet internal to the system). Such a conception contrasts with the more thoroughly dynamical analyses of Angyal and Dewey, in which any morphological line between organismic and environmental phases of living systems is, by definition, impossible.

This completes my review of four attempts at non-morphological conceptions of organism. I now proceed to extend their preliminary integration and develop an analysis of the term *organism* in psychological usage.

Some Thoughts Toward More Accurate Designation

The Organism as Bioprocess

As we have seen, Dewey and Bentley view science as involving a progression toward ever-firmer names from relatively vague, loose, or everyday *characterizations* to fully fledged scientific *specifications*. Specifications (such as *molecule* as used in chemistry) distinguish entities from background with relative precision.

What, then, of the name *organism*? As discussed above, the name *organism* is far from constituting specification within psychological science. Its usage is at the level of low-grade and confused characterization. The basis for the confusion is the tendency to conflate the physical body participating in a living process with organism and the physical surrounds of that physical body with environment.[20] On inspection, however, the latter pair refer coherently (i.e., in light of known fact)

[19] As is evident in statements such as "the organism–environment system is not a system consisting of the organism and the environment which could be treated as subsystems of the whole system. . ." (Järvilehto, 2000, p. 37).

[20] Hence M. Bentley's (1930) caution: "We must not here substitute for our 'organism' the anatomist's abstraction of a bodily structure. . . .It is, instead, the total system. . .with which we begin and to which we shall often have to return" (pp. 97-98).

only to dynamic complements within a unitary and transdermal[21] living system. One cannot obtain a living process by taking an organism and an environment and putting them together; one can only obtain organism and environment (through provisional abstraction) once a unitary living process is at hand. In other words, a *physical* separation of the organismic and environmental phases of a living process is a *logical* impossibility. The phases are distinctions made within the dynamics of the whole system; to separate these phases would be to destroy the system and thus the basis for distinguishing them in the first place. This point was made by Sumner (1922), who observed "the organism and its environment constitute an inseparable whole. . .if we could detach all environmental elements from this complex there would be no organism left" (p. 231).

The status of *organism* as a low-grade characterization diminishes the clarity with which such points can be made. In unconsciously complying with the almost irresistible tendency to imbue synonymy to *organism* and (skin-bound) *body*, some readers will find themselves thinking that of course the organism (read *body*) and environment (read *surrounds*) can be morphologically separated (or, for that matter, connected). Terminological clarification is needed.

Dewey offered a starting point in his informal musings on the etymology of *organism* penned in a 1948 memorandum to Bentley:

> "Organism" as "an organized *body*" [Dewey's emphasis] is as late as the middle of the nineteenth century; harmless enough as a synonym for a living creature, but I'd be inclined to bet that it was through use in *anatomical* study of the living body that "organism" got so overloaded on the isolated side that even the hyphenated expression, organism–environment, fails to strike people as a name for what anyone can directly see when he opens his eyes. . . .I am inclined to think we should try to find and use a word that wouldn't be handicapped, as the *word* "organ*ism*" (like other Isms) has now been loaded down. I'll bet ninety readers out of a hundred wouldn't stop to think twice, coming across the expression "a dead organism." The damn "body" has got away with it. One can at least use "medium" as a synonym for "environment" when advisable. But unless one keeps saying "living being," "living creature," etc [misunderstanding is possible]; it's too bad there isn't a noun to go with biological. (in Ratner & Altman, 1964, p. 592)

Recall that Angyal's *biosphere* was offered as just such a noun for the reasons Dewey here outlines. It is a shame that *biosphere* has long secured an alternative (though related) usage (see Vernadsky, 1926/1998). In the interest of unambiguous designation, the term *bioprocess* will be employed as an alternative name. *Bioprocess* is a convenient abbreviation of Angyal's *biological total process* (i.e., as a synonym for *biosphere* in his usage). Further, *bioprocess* captures the dynamic nature of the entity it is being used to designate, speaking directly to Dewey's concerns when he:

[21] I use the word *transdermal* in A. F. Bentley's (1941b) sense of extending across the skin of the organism's body.

> . . .got to mulling over the difficulty there seems to be in getting over to readers the organic–environmental activity as one "thing" and as in process. I concluded it was because the word "Organism" (especially in the *ism*) carries with it a kind of readymade hypostatization. (Ratner & Altman, 1964, p. 592)

In the context of etymological concerns, it is illustrative to note that *organism* is a historical combination of *organize* and *ism*. Here the suffix *ism* forms a simple noun of action from a verb, as when the act of *baptizing* becomes *baptism*. *Organism* can be read as a noun denoting the process, act, or result of *organizing*. The verb *organize* combines *organ* in the sense of *tool*, *instrument*, or *functioning component of a greater whole* with *ize* in the sense of *to make into*.[22] This sense is consistent with Angyal's analysis of the organism as a realm of increasingly (but never completely) autonomous organization whereby the organism (as ongoing process of *organizing*) continuously assimilates (and eliminates) previously "external" or "chaotic" material into functioning components of the *organized* total process. Von Uexküll (1926) similarly discussed the ". . .unorganized forces of Nature. . .on which organization is imposed by the organism. . ." (p. 352), observing that "as soon as living organisms are made, their organization enables them to lay hold of the world and systematize it" (p. 352).

Wiener (1954) spoke to this interpretation using the metaphor of a message (see also Goodwin, 1989, p. 29):

> Organism is opposed to chaos, to disintegration, to death, as message is to noise. To describe an organism, we do not try to specify each molecule in it, and catalogue it bit by bit, but rather to answer certain questions about it which reveal its pattern: a pattern which is more significant and less probable as the organism becomes, so to speak, more fully an organism.
>
> We have already seen that certain organisms, such as humans, tend for a time to maintain and often even to increase the level of their organization, as a local enclave in the general stream of increasing entropy, of increasing chaos and re-differentiation. Life is an island here and now in a dying world. The process by which we living beings resist the general stream of corruption and decay is known as *homeostasis*.
>
> We are but whirlpools in a river of ever-flowing water. We are not stuff that abides, but patterns that perpetuate themselves. (pp. 95-96)

Another important contribution is Maturana and Varela's (e.g., 1980, 1987) definition of an organism as a physically realized *autopoietic* organization. The

[22] Compare two definitions of *organic* from the OED: "relating to an organ, instrument, or means" and "of, pertaining to, or characterized by systematic connexion or coordination of parts in one whole; organized; systematic."

nature of autopoietic organization is continuous self-production with no separation between producer and produced:[23]

> The living organization is a circular organization which secures the production or maintenance of the *components* that specify it in such a manner that the product of their functioning is the very same organization that produces them. (Maturana & Varela, 1980, p. 48)

Maturana and Varela explain how this circular *organization* is maintained while the *structure* (the particular components and relations between components) by which it is physically realized undergoes continuous change.[24]

There is a case, therefore, that with respect to living systems the words *organizer*, *organizing*, and *organized* are three different ways of designating a *single* ongoing process; this is the essence of *organism* emerging from the combination of its etymologically-original meaning with the insights of such observers as Angyal, Von Uexküll, Dewey, Wiener, and Maturana and Varela.

Despite such rationally defensible conclusions, it remains difficult to resist viewing the organism as an already-existing, object-like agent (typically centered on or in the body) to which various verbs are secondarily attached (e.g., *lives*, *organizes*, *perpetuates itself*, *behaves*). As Dewey and Bentley (1949) noted, subject–predicate syntax[25] gets us into trouble by slicing one process into actor *and* action:

> The organism, of course, seems in everyday life and language to stand out strongly apart from the transactions [read *unified organic–environmental processes*] in which it is engaged. This is superficial observation. One reason for it is that the organism is engaged in so many transactions. (p. 138)

Further, where Dewey points out that the phrase "dead organism" is an oxymoron (if, that is, we are using *organism* in the present sense of *bioprocess* and not of *body*), "living organism" is, conversely, a tautology. As Angyal (1941) put it, "in the last analysis 'organism' and 'life' are identical concepts" (p. 20). Life is not something the organism *has* or *does* but precisely what it *is*.

On a related linguistic front, an increasingly common "solution" to the "problem" of getting organism and environment back together once they have been

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[23] Compare with Goodwin's (1989) statement "all living beings are both cause and effect of themselves, pure self-sustaining activity" (p. 31).

[24] Maturana and Varela's distinction between the structure and the organization of living systems may be usefully compared with Dewey's (in Dewey & Bentley, 1949) distinction between medium and life-activity and Bateson's (1979) distinction between pleroma and creatura.

[25] Interestingly, a central feature of Whitehead's (1929/1978) theoretical system, which he called the *Philosophy of Organism*, was its "abandonment of the subject–predicate forms of thought. . ." (p. 7). The direct result, in Whitehead's own words, was that "the 'substance quality' concept is avoided; and that *morphological description is now replaced by description of dynamic process* [italics added]" (p. 7).

conceptually separated is to employ the hyphenated term *organism–environment* or *organism-plus-environment* (e.g., Bateson, 1979; A. F. Bentley, 1941b; Järvilehto, 1998a; Lotka, 1925/1956; Oyama, 2001; Sumner, 1922; Warren & Shaw, 1985). As Dewey noted above, this strategy is itself problematic in that *organism* has come to so strongly connote an isolated, structurally defined *body*. Additionally, in taking two words and putting them together, *organism–environment* linguistically contradicts the needed strategy of starting with one thing from which the two phases may be provisionally abstracted. A single term, whether *bioprocess* or some other, is preferable in this respect.

Contrasting Two Alternatives: Organism as Body versus Organism as Bioprocess

Figure 2 compares the morphological and bioprocess-based conceptions of organism and environment. Plate A illustrates the traditional morphological conception of an organism as a skin-bound object surrounded by an environment. Plate B illustrates a dynamical alternative in which a unified bioprocess (biological total process or organism–environment system) is designated or distinguished from the surrounding world on the basis of a continuously changing boundary. The conception illustrated in Plate B is intended as a preliminary step toward sharper designation of *organism*.

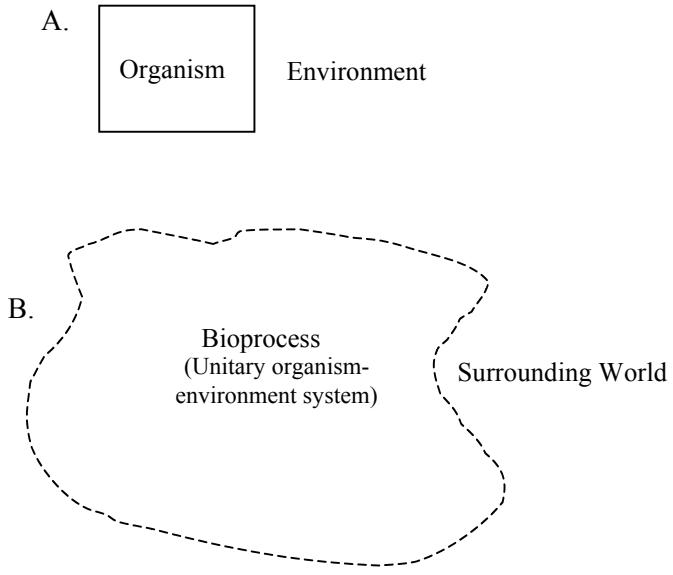

Figure 2: The morphological (Plate A) and bioprocess (Plate B) conceptions of organism and environment.

To sharpen the contrast I reiterate the following similarities and differences. The two different conceptions of organism distinguish a focal unity (i.e., an existence, entity, or object) from a background or surrounding world. The two conceptions differ, however, about the unity distinguished. In the morphological conception (Plate A) the focal unity is the organism's body (i.e., an object in space), whereas in the dynamical alternative (Plate B) the focal unity is the entire bioprocess or organism–environment system (i.e., a process in space–time). The two conceptions adopt different criteria of distinction (this is necessarily true; identical criteria would yield identical unities). In the morphological conception the criterion is skin. In the dynamical alternative the criterion is the extent of the living system's ongoing self-organization (or autonomy). The latter criterion is not clear-cut in the same sense as there is no clear-cut line between a whirlpool and the surrounding water or a fire and the surrounding air. Moreover, the boundaries of such dynamic unities are in continual flux (making the static dashed line in Figure 2 potentially misleading).

A second similarity between the two conceptions is that both retain a place for the words *organism* and *environment*. They differ, however, in the unities these words are used to distinguish or designate. In the morphological conception the word *organism* is used to designate the initially distinguished entity (i.e., the skin-bound body) and the word *environment* is applied to the background surrounding this entity. In the non-morphological alternative exemplified by Angyal, Dewey, Ashby, and Järvilehto, both words designate dynamical complements *within* (and secondary to distinction of) bioprocess or unitary organism–environment system. In this alternative conception, environment and surrounding world are distinct, whereas in the morphological conception they are equivalent.

Anticipated Objections

Several objections may be anticipated to the above contrast. Here I examine three.

On Specifying the Fuzzily Bounded. One objection pertains to the fuzziness of the line distinguishing the bioprocess from the surrounding world (indicated in Plate B of Figure 2 with a dashed line). I have followed Dewey and Bentley (1949) in emphasizing psychology's need to move beyond characterizations, which are relatively vague, to specifications, which are relatively accurate. At the same time I am recommending a perspective on the organism as a bioprocess with diffuse and shifting boundaries. The two arguments may appear to contradict one another. The apparent contradiction is resolved by considering that the relative accuracy of the word *bioprocess* pertains to its *usage*. The word *bioprocess* can be used to accurately designate living entities with diffuse boundaries. As Goodwin (1989) has put it:

> If we wish, we can separate different states of organization of matter, such as the living and the nonliving, liquid and solid. But because one can transform into

> the other, the boundaries are always fuzzy, and the different states become united under transformation. (p. 29)

Consider blocks of ice suspended in warm water. The blocks may be distinguished from the water despite being continuously transformed at their outer edges into water, with no unequivocal line at which block stops and water starts. The same goes for the relation between bioprocess and surrounding world, where parts of the surrounding world are transformed into parts of the bioprocess and vice versa. A letter arriving in the mail, for example, becomes part of the medium through which the life process of the recipient proceeds, and may eventually leave that bioprocess (possibly to become part of the medium through which processes in the recipient's fireplace proceed). Yet, there is no unequivocal point at which either transformation can be said to have taken place.

Conceiving of living processes as continuous with (i.e., not *sharply* distinct from) the cosmos is consistent with the arguments of ecologists about the fuzzy boundaries among components of ecosystems (not to mention among ecosystems themselves). In his classic paper on ecological dynamics Lindeman (1942, p. 399) discussed "the difficulty of drawing clear-cut lines" between the so-called living components of ecosystems and their non-living surroundings. For Lindeman, both were completely integrated in the "more basic functional organization" of the ecosystem (p. 400). Because any given bioprocess is always nested within a greater ecosystem, accuracy of designation is *advanced* by acknowledging their continuity with one another (i.e., their fuzzy, ever-changing boundaries).

Things are different in the morphological conception, in which *organism* purportedly designates a living creature ending at its skin. While the skin may seem like a clear-cut boundary, and while it may bound the body, it cannot coherently bound the life process (bioprocess). From a morphological starting point, the term *organism* ends up vacillating in meaning between *body* and *life process*, unconsciously dragging the latter toward the former. By giving the *illusion* of a non-fuzzy boundary, therefore, a morphological usage of the word *organism* is an inaccurate, ambiguous characterization (and not specification).

To sum up, the morphological conception relies on what appears to be a clear-cut boundary (the skin) but that is in actual application vague. The present non-morphological alternative, by contrast, uses the term *bioprocess* to designate fuzzily bounded living systems with relative accuracy.

What Practical Difference Does It Make? A second possible objection is that the contrast seems purely theoretical and makes no practical difference to the everyday conduct of psychological science. Lacking space to comprehensively indicate practical, empirical implications of a non-morphological conception here, I make a few preliminary remarks.

The morphological conception supports a conceptualization of psychology's subject matter in terms of, among other things, organism–environment or behavior–environment interactions or relations. From such a starting point, experiments are designed to elucidate such relations. In operant psychology, for

example, experiments set out to demonstrate orderly relations between independent environmental variables and dependent behavioral (i.e., organismic) variables. The morphological conception thereby directs experimental design (e.g., scheduled environmental reinforcement of behavioral responses), data collection (e.g., of stimulus vs. response events), and interpretation (e.g., whether or not environmental control of behavior was obtained). From the alternative conception sketched here, such experiments examine not relations between environment (stimulus) and organism (response) but the dynamics and organization of one system. Rather than asking whether the environment controlled the organism (or vice versa), an alternative is to ask to what degree the participant bioprocess managed to bring certain events (such as lever depression and food delivery) within autonomous regulation. From such a perspective, as Ashby (1960) has noted, the experimenter's actions are included as part of the system under observation.

In cognitive psychology, alternatively, experiments are designed toward the end of supporting hypotheses about the structure of internal information processing mechanisms (which are incomprehensible without the underlying morphological conception). What are seen as superficial individual differences are averaged out to get at the standardized inner core. From the present non-morphological standpoint, what is averaged away is the essence of psychology's subject matter (i.e., the organization of selected regions of the bioprocess). The alternative thus has practical implications for both theoretical and practical empirical work in psychology (see Järvilehto, 1998a, for a similar argument).

What About the Body? A third possible objection to the conclusions argued here is the belief that the body is ignored or denied. What of the body? As an enduring physical object (or in the words of the OED a "material frame") the body is a salient component of the bioprocess. For this reason it is perhaps understandable that it has largely come to constitute that which the term *organism* designates. Noting, however, that the body only retains its status as an object while it remains a component of a living process (otherwise tending to decompose or become *disorganized*), the body is better conceptualized as a salient (and relatively enduring) region of that broader process.

The issue becomes clearer by emphasizing the time scale of observation. Warren and Shaw (1985) noted that "the universe is in process, and objects may be considered only as more or less persistent regions in an onslaught of spatio-temporal change" (p. 6). Indeed, the body is an ongoing (if slow) process, as becomes evident by increasing the time-scale with which it is observed (cf. Pronko & Herman, 1982, pp. 247-249). We then observe changes in posture, color, height, width, and shape. Further, as we zoom in on component organs such as the skin, liver, stomach, heart, and brain and then to the component neurons and other cells, we move from the relatively persisting to the relatively transient. The body literally writhes as a massively complex web of nested and interlocking component processes, many of which extend through and beyond the skin (e.g., perspiration).

Now consider the tendency to equate the organism with its body, and to then treat this organism–body as a platform for the ascription of psychological properties (e.g., behaviors, representations, consciousness). This ossifies a relatively persistent (and thus salient) region of a single process then talks as if this region is separate from the less persistent regions with which it is continuous. This is not to deny that the realm of phenomena scientists distinguish and study as physiological is more closely associated with the body than the psychological realm. Many physiological phenomena (but, again, not all, as in the case of sweating, eating, eliminating, and breathing) can be investigated intradermally, assuming that the equally integral dermal and extradermal components of the bioprocess are nonetheless present. So the tendency psychologists have to verbally confine physiology to the body (e.g., Roche & Barnes, 1997, p. 609) is understandable despite its factual crudity. Most, if not all, psychological phenomena, on the other hand, necessitate a transdermal frame of reference.

An interesting consequence of this interpretation concerns Gibson's (1979/1986, p. 41) suggestion that an object (e.g., an item of clothing or a pair of scissors) can change from environment to organism by becoming attached to the body. While Gibson correctly notes that various objects may become part of the organism, this conclusion can be reached in a more compelling way from a dynamical conceptualization (as opposed to Gibson's morphologically influenced conceptualization) of organism. From the present perspective, the reason a pair of scissors (or any other object) becomes part of the organism is not that they become *attached to* the body of the organism but that they become *integrated with* (or *assimilated by*) organism as ongoing organization (i.e., as bioprocess). Rather than moving from a morphologically conceptualized *environment* (read *surrounds*) to a morphologically conceptualized *organism* (read *body*), the scissors move from the background of a unified bioprocess to carry out a part function within that bioprocess.[26] Once inside the bioprocess (as medium) the scissors can participate in processes that differ in their autonomy (as, following Angyal, the inverse of heteronomy). While the degree of attachment to the body and the degree of participation in the bioprocess often correspond, this correspondence is not necessary. The mouse cursor on the computer screen, for example, may be as autonomously regulated as the mouse despite the mouse being more attached to the body of the computer user.

Summary and Conclusion

Psychologists commonly conceptualize organisms as bodies separated from surrounding environments by skin. There are two steps. First, the body is distinguished from its background and called *organism*. Second, the background is called *environment*. This conception is morphological. On scrutiny, it is

[26] Compare with Dewey (1911/1978): "All the tools and devices of all the arts, although outside the body, operate in behalf of the functions of life just as do the eye, stomach, hands, etc" (p. 439).

problematic. Organism, as process, cannot be consistently distinguished from environment at the skin.

This paper reviewed and integrated four attempts at improved conceptions of organism and environment. All four distinguished a unitary, dynamic, and transdermal life process from a background, *only then* distinguishing organism and environment as complementary phases *within* that life process. Such an approach is consistent with the etymological relation of the word *organism* to the words *organ* and *organize*. It is likewise consistent with analyses of organism as ongoing *autopoietic* organization, with no separation between organizer, organizing, and organized. From this perspective life is not something an organism *has* or *does* but precisely what it *is*. The organism is not merely *alive* but literally *a life*.

The word *bioprocess* was offered as a provisional alternative to *organism*, which is ambiguous between *body* and *life process* (which *bioprocess* abbreviates). The reduction of such ambiguity is a hallmark of psychology's needed progression from loose *characterizations* to accurate *specifications* (Dewey & Bentley, 1949). As transdermal organic–environmental process, *bioprocess* encompasses physiology *and* psychology's subject matters, inviting revision of traditional perspectives on the relation of the organism to psychology.

This concludes an attempt to clarify some conceptual problems in psychology. The problems stem from a morphological conception of an organism as an object in space partitioned from an environment by a skin. I want to finish by emphasizing that one may accept the problem identified in the first part of the paper without accepting the attempt to overcome it offered in the second. The problem outlined at the beginning *is* a problem regardless of whether the subsequent section is considered an adequate step towards its resolution. The author's efforts will have been justified if this paper prompts others to clarify what they name with the words *organism* and *environment*. At the very least, it is time to bring the ubiquitous morphological conception out into the open. It will impede scientific psychology as long as it is left lurking in the shadows.

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