

*Gregory Bateson's Theory of Mind:
Practical Applications to Pedagogy*

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November 1992

Gregory Bateson was one of the first scholars to appreciate that the patterns of organization and relational symmetry evident in all living systems are indicative of mind. We should not forget that due to the nineteenth century polemic between science and religion, any consideration of purpose and plan, *e.g.*, mental process, had been *a priori* excluded from science as non-empirical, or immeasurable. Any reference to *mind* as an explanatory or causal principle had been banned from biology. Even in the social and behavioral sciences, references to mind remained suspect. Building on the work of Norbert Wiener and Warren McCulloch,¹ Bateson realized that it is precisely mental process or *mind* which must be investigated. Thus, he formulated the *cybernetic epistemology* and the *criteria of mind* that are pivotal elements in his “ecological philosophy.” In fact, he referred to cybernetics as an epistemology: *e.g.*, the model, itself, is a means of knowing what sort of world this is, and also the limitations that exist concerning our ability to know something (or perhaps nothing) of such matters. As his work progressed, Bateson proposed that we consider *Epistemology* as an overarching discipline of the natural sciences, including the social and behavioral sciences: a meta-science whose parameters extend to include the science of mind in the widest sense of the word.

Ideally, teaching should entail an unending search for theoretical and methodological perspectives that inspire and challenge teacher and students alike. In that spirit, this essay presents an overview of the cybernetic principles that influenced so much of Bateson’s work, and discusses his understanding of the concepts *information* and *communication*, which are pivotal elements of his “cybernetic epistemology” and his theory of mind. The essay concludes with a brief rendering of Bateson’s “learning theory,” and since the essay reflects the highly abstract and formal tone of Bateson’s work, at various junctures along the way some of the practical applications that this complex material may have for pedagogy are indicated.

The Cybernetic Paradigm: A Brief Introduction

The term *Cybernetics* was coined by Norbert Wiener, at the end of World War Two, in reference to the, “entire field of control and communication theory, whether in the machine or in the animal.”² As such, cybernetics has become a master concept which assimilated a number of analytic methods, including computerization and simulation, set theory, graph theory, net theory, automata theory, decision theory, queueing theory, game theory, and general systems theory. As is apparent in the wealth of available literature, cybernetic processes became discernible to many theorists, not only in biological systems, but also in the sub-organic and supra-organic world—from microphysics to organic life, through social groups, to the biosphere of our planet, and beyond.

The introduction of cybernetic principles led to the identification of *systemic invariance* or *isomorphisms* throughout the observable cosmos. Here we should note that whether or not employment of the cybernetic paradigm has been appropriate in each instance remains an area of dispute. Nevertheless, once perceived, the recognition of such patterns has fostered a valuable epistemic shift: from consideration of discrete “entities,” to the discernment of whole systems. The recognition of systemic patterns also initiated further disclosure of the logic evident in the behavior and *interaction* of systems, enabling theorists to frame the formal characteristics inherent in whole (*e.g.*, cybernetic) systems. The properties of such a system are identified as fourfold:

1. The system is a *holistic* and cannot be reduced to its parts without altering its pattern. Artificially composed aggregates, wherein the constituent elements can be added or subtracted without altering the overall system are not included.

2. The system is *self-regulating*, stabilizing itself through negative feedback loops. Thus, cybernetic systems respond to *information*. They scan their behavior to determine its outcome, and if this “input” or feedback communicates a match with the system’s “coded requirements,” the system maintains its output, its behavior, in order to maintain the match (*i.e.*, it maintains a steady-state). If the system “learns” that its coded requirements are not being matched, it modifies its behavior on the basis of such information.

3. The system is *self-organizing*. If a mismatch between sensory input and “internal code” persists, the system searches for, and encodes a new pattern with which to operate. Thus, in the passage of time, differentiation and complexification of the overall system may emerge through positive feedback.

4. Moreover, the system is understood as a differentiated sub-whole within a *systemic hierarchy*. The “environment” in which a system exists is also a whole system, a meta-system. Whether

ecosystem, animal, organ or cell, systems consist of subsystems that operate within a hierarchy of progressively inclusive meta-systems. As a subsystem, the system's characteristics and operations are co-determinative components of the larger system within which it is an integral component. Thus, a system may be understood as Janus-faced. As a whole, it faces inward, *i.e.*, the system is concerned with maintaining its internal steady state; as a sub-whole, the system faces outward, responding to its environment (a meta-system) in a potentially infinite regression of relevant contexts.

Spurred by the enthusiasm with which cybernetics was received, systems research has been applied to many fields of scientific enquiry. Such research supports the evolutionary view that over time, through self-organization and mutual adaptation, systems tend to form structural hierarchies, *i.e.*, they fashion progressively larger, more inclusive systems out of preexisting sub-systems. Furthermore, in the patterns they exhibit, these new systems generate unique qualities, including more complex organization and inherently novel forms of operation.

The view which has subsequently emerged discerns a complementary relationship between the morphic nature of systemic integration and systemic differentiation within a hierarchical universe. Systemic differentiation and integration are conventionally understood as delimited by the channeling of energy, matter and information to maintain and generate form.³ Also, through the cybernetic interaction of their patterns of operation, systems tend to complexify and form hierarchies. Hence, in the realm of astronomy, hierarchical restraints are understood as gravitational; in the hierarchy from microphysics to organic life, cybernetic restraints are understood as electrochemical forces; and in social and cognitive hierarchies, such constraints are understood as operating in the communication of symbols.⁴

Notably, such research has also revealed that this phenomenon is delimited by *hierarchical restraints* of a morphic nature.⁵ That is, in each of these realms the hierarchical constraints are related to pattern formation, not substance or quantity. Each step between the hierarchies advances the development of *form* toward increasingly complex organization. Also, systems proponents point out that in asserting the irreducibility of levels, the hierarchical view of cybernetic/systems theory conflicts with traditional monism, as well as with dualism and pluralism.⁶ That is, since hierarchical constraints produce both novelty and organization, causal or generative relations necessarily exist *between* the levels.

Hence, the cybernetic/systems view of observed reality is hierarchical: the universe is understood as a hierarchy of systems, wherein each higher level of system is composed of systems of

lower levels. In this view, each level of the hierarchy cybernetically builds on more basic levels of organization: integrating pre-existing subsystems and micro-hierarchies into novel patterns; and fashioning new, more inclusive systems. Therefore, as observed in embryology, evolution and child development, growth and learning occur incrementally or step-wise. Whole systems never begin from scratch. Their growth is inevitably based upon the organization of pre-organized components. They are both delimited and enabled by hierarchical constraints that permit stability, economy, and speed in the unfolding of new forms of life *and* more inclusive hierarchical levels.

Since their introduction, investigation of the holistic, self-stabilizing, self-organizing and hierarchical traits formally identified in cybernetic systems has also spread into the social and behavioral sciences. Thus, the *informational* nature of cybernetic processes: including the concepts of feedback, mutual causality, and self-regulating systems—*i.e.*, that cybernetic systems adapt to *and* alter their environments through *sequences* of self-stabilization around steady states—have been adopted and fruitfully employed in these disciplines.

Arguably, the most significant contribution of cybernetics to these disciplines stems from an appreciation of the *informational* character of the processes evident in cybernetic systems. Along with other vital insights, this view supports a collapse of the supposed dichotomies between “subjective” and “objective” data. Consequently, through the employment of the cybernetic paradigm, phenomena previously dismissed as non-empirical—including feeling, emotions, cognition and perception of meaning—were judged accessible and relevant to scientific inquiry. In summary, we may note that the principles underlying the cybernetic paradigm have been recognized as a valuable means of conceptualizing humankind, not only as a biological entity, but also as a social and cognitive being.⁷

Some scholars have objected to the “dehumanizing” effect of applying principles derived from machines to the study of human beings. Yet, the aim of employing cybernetic theories in the social and behavioral sciences has never been to *reduce* identity formation—*e.g.* subjective learning processes, unconscious symbolic processes, *etc.*—to the principles of system organization. What is claimed, is that cybernetics provides a legitimate *analogy*, although not an exact one, “which explains a much wider variety of outcomes in terms of the significance of information,” than has previously been available.⁸ As such, cybernetic principles also hold valuable insights for the field of pedagogy.

For instance, we may assume that a classroom of students (including the instructor) rapidly becomes a holistic system comprised of *self-stabilizing*, *self-organizing* personalities, each of whom perceives the class through their own set of past experiences, and each of whom is concerned with

maintaining an internal, or personal, balance of predefined expectations and goals. Hence, any “new information” that enters the holistic, and mutually causal system of the class will be uniquely perceived and responded to by each personality within the class. Each personality within the class will receive-organize-translate information according to their own set of self-stabilizing patterns—patterns that have succeeded, over time, in allowing the “individual” to “fit” within the context of a learning environment. From this perspective teaching is a *dialogical process* in which the teacher’s primary role is one of establishing or *communicating contexts* wherein the students may effectively perceive and assimilate “new information.”

Since every person in the classroom is a holistic, self-stabilizing, self-organizing system, but also a participant in a larger more inclusive system—*e.g.*, the learning environment or class, which also operates as a holistic, self-stabilizing, self-organizing system—a crucial component of the *dialogical teaching process* must include a recognition and enhancement of the “feedback circuitry” that enables the larger context of the class to operate as holistic system. As a holistic unit, the class develops its own history of interaction, and as anyone who has led a class will note, no one part of the system can effectively exercise unilateral control over the entire system. In short, the class co-evolves, and every member of the class develops their own strategies for appropriately responding to the messages of interrelationship(s) that govern a class’ becoming. In this intricate and complex process, an effective teacher must be skilled at dialogical and trans-contextual communication: *i.e.*, communicating contexts wherein diverse systems (personalities) can effectively exchange information; recognizing and effectively responding to various manifestations of negative, positive and regenerative feedback; and, assisting students in the largely unconscious processes of learning to learn.

Envisaging the Negentropic Realm of Mind: A Realm of Communication, Information, and Learning

Our consideration of Bateson’s model of mind, his cybernetic epistemology, and his theory of learning, necessarily begins with his *criteria of mind*. The criteria listed below are intended to differentiate the phenomena of thought from the much simpler phenomena observed in material events. Hence, the six criteria of mental process are intended to provide a list, “such that if any aggregate of phenomena, any system, satisfies all the criteria listed, I shall unhesitatingly say that the aggregate is a mind and shall expect that, if I am to understand that aggregate, I shall need sorts of explanation different from those which would suffice to explain the characteristics of its smaller parts.”⁹

*Criteria of Mind*¹⁰

- 1) *A mind is an aggregate of interacting parts or components.*
- 2) *The interaction between parts of mind is triggered by difference, and difference is a nonsubstantial phenomenon not located in space or time; difference is related to negentropy and entropy rather than energy.*
- 3) *Mental process requires collateral energy.*
- 4) *Mental process requires circular (or more complex) chains of determination.*
- 5) *In mental process, the effects of difference are to be regarded as transforms (i.e., coded versions) of events which proceeded them. The rules of such transformation must be comparatively stable (i.e., more stable than the content), but are in themselves subject to transformation.*
- 6) *The description and classification of these processes of transformation disclose a hierarchy of logical types immanent in the phenomena.*

Bateson argues that using the above criteria the mind-body dilemma is soluble. He also asserts that, “the phenomena which we call *thought, evolution, ecology, life, learning*, and the like occur only in *systems* that satisfy these criteria.”¹¹

From the above discussion of the cybernetic paradigm, the degree to which the informational nature of cybernetic process has informed Bateson’s criteria is readily apparent. One might insist that he has reduced mental process to the operations of cybernetic systems. However, he consistently maintained that the criteria are intended to be employed as an analogous and metaphoric *model* of mind. Above all, the criteria are intended for use as a tool of *abduction*, e.g., comparing that which is shared among apparently unrelated phenomena.

In part, the aim in this essay is to consider how the model of mind, or mental process that emerges from Bateson’s *criteria of mind* relate to the phenomena of learning. After all, it is “mind” that learns. Therefore, we should examine each of the criteria before moving on to discuss the practical applications of Bateson’s theory of learning.

1) *A mind is an aggregate of interacting parts or components.* The model of mind mapped out by Bateson’s criteria is holistic, and as with all serious holism it is premised on an interaction of *differentiated* (as opposed to separate or individual) ‘parts.’¹² Holistic systems require a differentiation of parts, or there can be no differentiation of events and functioning. Therefore, mind is understood as an aggregate of differentiated parts, which at their primary level are not themselves mental. These ‘parts’ *in combined interaction* constitute wholes, or whole mind systems. In more

complex instances, some of the ‘parts’ of a *mind system* may fulfill all the necessary requirements of the criteria. In this case, these ‘parts’ are also recognized as *minds*, or *subminds*. In either case, mind or mental process is understood as *immanent* in, and emergent from “certain sorts of *organization* of parts.”¹³

With this foundation for understanding mental process, we may now consider the nature of the *relationships* within which mind is immanent, or out of which mind emerges, *i.e.*, how the relationships between the ‘parts’ interact to create mental process.

2) *The interaction between parts of mind is triggered by difference, and difference is related to negentropy and entropy rather than energy.* Here, the informational nature of cybernetic process is first incorporated into the criteria, and we encounter a clarification of the concept “information,” as distinct from “energy” and “matter.” We are also introduced to the limitations of knowing in this model of mind.

Beginning with an *idea* as the basic unit of mental process, Bateson defines an *idea* as, “A difference or distinction or news of differences,” adding that more commonly we refer to complex aggregates of such units as *ideas*.¹⁴ Of course *difference* is a *nonsubstantial phenomenon* that cannot be located in space or time. The difference between an egg and an apple does not lie *in* the egg or *in* the apple, nor does it exist *in* the space between them.

In agreement with Kant, Bateson notes that even the simplest of objects “contain” an infinite number of differences, but only *differences which make a difference* are used in forming mental images—ideas, or aggregates of ideas. Mind responds only to the differences in its environment that it is able to discern. And in this process, the holistically bonded ‘parts’ that comprise *mind systems* act as a sort of filter or sieve, sorting, selecting and collecting and subsequently decoding *information, i.e.*, differences, or news of difference.¹⁵ *Ideas* (news of difference, images, maps) about *things* is what get into the working circuitry of mind, but mental systems know nothing of “things-in-themselves” (*Dinge an sich*).¹⁶ In short, mind systems are influenced by *maps*, never *territory*.

This suggests why Bateson feels cybernetic models and metaphors are most appropriately applied to the realm of mental process, *i.e.*, mind systems. Given the importance of information and communication in cybernetic theory, and the unique status of *information* (news of difference) as a *nonsubstantial* phenomenon that nevertheless influences, governs and controls a cybernetic system, it ought to be evident that cybernetic models best exemplify *mental* process. Thus, the use of *energy* and *matter* as explanatory principles is clearly inappropriate—except in those instances where they function as *information* and thus have *communicational* value.

Consider the fact that in the realm of communication and information, zero has a “causal” value because it represents a difference, *it is different from one*, and zero (quite literally, no ‘thing’) may thus be used to explain a response in both the realms of communication and mental process. In this context, quantifiable concepts such as power, gravity, and energy, *etc.* are applicable only in the so-called “hard sciences”—*i.e.*, realms of explanation used in exploring the physical realm of material events. In contrast to cybernetic systems (including our computers), atoms, molecules and stones do not respond to *information*. There is no evidence that these entities scan their behavior for its result, nor do they modify future behavior on the basis of such information.

Thus, in contrast to Laszlo and others, Bateson feels we should reject the application of cybernetic feedback principles in describing and explaining atomic, subatomic and electrochemical realms of physical existence. He also believes that given the preponderance of metaphors and explanatory principles borrowed from the energetics and hard sciences, we must totally re-think most of the theoretical basis underpinning much of the social and behavioral sciences.

3) *Mental process requires collateral energy.* Although the interactions of mental process are *triggered* by difference, “difference is *not* energy and usually contains no energy.”¹⁷ Mental process requires some amount of energy (apparently very little), but as a stimulus the nonsubstantial phenomenon of *difference* does not provide energy. The respondent mind system has collateral energy, usually provided by metabolism. If we kick a stone, it receives energy and it moves with that energy. However, if we kick a cat or a dog, our kick *may* transfer enough energy to move the animal, and we may even imagine placing the animal into a Newtonian orbit, but living organisms generally respond to stimuli with energy from their own metabolism. In the control of animation by information, energy is already present in the respondent, the energy is available in advance of the “impact” of events.

4) *Mental process requires circular (or more complex) chains of determination.* Since the central themes of this holistic model are drawn from the recursive nature of cybernetic systems, there is a fundamental emphasis on circular causal chains in mental process. Here again, mind is understood as *immanent* in the combined interaction of the differentiated ‘parts’ of the system, and this interaction depends upon the existence of a network of circular, or more complex, chains of determination, *i.e.*, the parts of the system are connected and interact within a closed circuit. Since the system is circular (*i.e.*, recursive), effects of events at any point in the circuit will move around or throughout the system, eventually producing changes at the point of origin. Thus, “a special sort of holism is generated by feedback and recursiveness,” in the system.¹⁸

Moreover, in accordance with the regularities discovered in cybernetic systems, the closed circuitry—in combination with the effects of time—generates a holistic matrix in which *no one part of the system can exercise unilateral control over the system as a whole*. Each part is controlled by *information* moving throughout the closed circuitry of the whole system. Such systems are subject to the effects of time, and therefore, each part must adapt to the time characteristics of the system. Thus, each part must adapt to the effects of its own past action within the system.¹⁹ Hence, the mental properties of the system are understood as *immanent*, not in any one part, but within *the system as a whole*. For example, mental process (*e.g.*, mind) is understood as immanent in the circuits of the brain which are *complete within* the brain; mental processes are similarly immanent *in the circuits* which are complete *within the system*, brain-plus-body; and mind is immanent in *the larger system* — person-plus-environment.²⁰ The resulting image requires that we eliminate the commonly held notion that mind is to be identified as residing only within the boundary of our physical body, and is somehow radically separate from others:

. . . there is no requirement of a clear boundary, like a surrounding envelope of skin or membrane, and you can recognize that this definition [of mind] includes only some of the characteristics of what we call “life.” As a result it applies to a much wider range of those complex phenomena called “systems,” including systems consisting of multiple organisms or systems in which some of the parts are living and some are not, or even to systems in which there are no living parts.²¹

The resulting image also suggests that authoritative methods of teaching are not going to be as effective as apprenticeship methods of instruction. Like it or not, instructors cannot effectively foist their will upon the mind system of a class, nor upon any “individual” student within the class. One may exercise authority, but unilateral control is not a valid option, and any attempt to exercise dominance will only succeed if the student(s) “submits.” The end result of an authoritative “lesson” of dominance cannot be predicted or controlled, and although the students are often unaware of the fact, they are in control of their personal and collective dialogical learning processes.

We might want to pause here and consider how this inclusive image of mind suggests that the context of a classroom or a learning environment full of students ‘is’, or becomes, a holistic mind system —comprised of teacher, students, and technological extensions of mental process (books, computers, microscopes, *etc.*). Also, consider how the physical context of the classroom contains “context markers” (blackboards, desks, visual aids, the flag, *etc.*), that communicate the message(s) (information available only to mind systems) that this context is different from other locations, it is a learning environment.

We should also note that the feedback loops which maintain the holistic nature of the larger more inclusive mind system identified as “a class,” represent a fundamentally dialogical process. Thus, each person in a learning environment operates as a holist mind system in dialogue with themselves, while simultaneously participating in the (often silent) dialogue of the larger mind system that can be recognized as persons-*plus*-environment. Moreover, the mental phenomena described here undoubtedly reflect not only primary and autonomic process, but also the complex interaction of social behavior. If we are going to effectively create contexts in which students can learn, we would do well to have our methods parallel the dialogical principles that bond mind systems across a broad spectrum of primary and social levels of mental process.

5) *In mental process the effects of differences are to be regarded as transforms (i.e., coded versions) of events which proceeded them.* The phenomena of coding, an integral element of feedback in cybernetic systems, is incorporated into the model through this criterion; and again, we should note that the model assigns unequivocal limitations as to what mind systems are capable of knowing, largely due to this phenomena. That is, the process in which information is translated and encoded into a new form—for only then is information available for further stages of a system’s performance—limits the perception of mental systems to *images* that are reminiscent of the shadows in Plato’s allegory of the cave.

The perspective added to the model by this criterion emerges out of information theory, but this is not a “garbage in, garbage out” use of the information processing model. After all, Bateson was one of the founders of the family therapy movement, and he does not suggest that our minds are simply an information processing apparatus. He vehemently opposed such simplistic and vulgar application of cybernetic theory. The model of mind drawn by the criteria applies to all mental *systems*, but on a gradation of complexity. The concept of “information in,” “information out” is appropriate enough for computers, and perhaps single cell animals; but clearly not for the complex interaction of families and classrooms, nor the personalities who—when bonded together through communication—form these more inclusive mind systems. The transformation of information referred to in this criterion is intended to include influences from the sum total of a personality’s contextual learning experiences, *e.g.*, a construct of biological, cultural and social habituation.

This criterion also effectively places mental process in what Bateson refers to as “the world of communication,” which is a *realm of explanation* wherein the only relevant entities or “realities” are messages. This is the realm of mind, in which relationships and metarelations, context, and the context of context—all of which are complex aggregates of information or *differences which*

make a difference—may be identified in a potentially infinite regress of relevant contexts. Consider Bateson’s comparison of the Newtonian world and the world of communication:

The difference between the Newtonian world and the world of communication is simply this: that the Newtonian world ascribes reality to objects and achieves its simplicity by excluding the context of the context—indeed excluding all metarelations—a fortiori excluding an infinite regress of such relations. In contrast, the theorist of communication insists upon examining the metarelations while achieving its simplicity by excluding all objects.²²

Bateson suggests that the world of communication (the realm of mental process, and learning) is a Berkeleyan world, but the good bishop was guilty of understatement. “Relevance or reality must be denied not only to the sound of the tree which falls unheard in the forest but also to the chair that I can see and on which I may sit.”²³ Our perception of a chair is *communicationally* real, but in the realm of mental process—the world of communication—the chair on which we sit is only an idea, a *message* in which we put our trust. There are in fact no chairs or tables, no birds or cats, no students or professors *in* the working circuitry of the mind, except in the form of “ideas.” *Dinge an Sich* or things-in-themselves are inaccessible to direct inquiry. Only ideas (difference, news of difference, images or maps) and information (*differences which make a difference*) about “things” are accessible to mind:

Ideas (in some very wide sense of that word) have a cogency and reality. They are what we can know, and we can know nothing else. The regularities or *laws* that bind ideas together—these are the (eternal) *verities*. These are as close as we can get to ultimate truth.²⁴

At this juncture, considering the importance of “context” in learning and pedagogical theory, we should pause and consider what exactly context might “be”? The list of criteria we have thus far examined suggests that: A context is *nonsubstantial phenomenon* which cannot be located in space or time. Or perhaps we should say that a context is a constellation of differences; not a ‘thing’, but rather a mental image or a map—a recognition of the differences that make a difference within a set of relationships. Here, it is interesting to note that the Artificial Intelligence movement (which has little in common with Bateson’s ideas, other than it also grew out of cybernetic theory) falters on the concept of context. The most powerful computers cannot be programmed to recognize and distinguish the *differences* that mark a given context as separate or different from any other context.

6) *The description and classification of these processes of transformation disclose a hierarchy of logical types immanent in the phenomena.* This final criterion applies the concept of logical types to the mutual causal and hierarchical characteristics of the cybernetic paradigm, and

employs the result in the model of mental process. We have previously observed that mental process requires circular or more complex, causal relations, and that the *closed* circuitry of whole mind systems generates a holistic matrix in which the mental properties of the system are *immanent* within the working circuitry of the system as a whole. Thus, mental process is *both* immanent in, and *inseparable from* the realm of physical appearances. Mind is *immanent* in, and emergent from certain sorts of *organization* of parts. Nevertheless, mental systems are not isolated monads. They have the capacity to unite with other similar systems, thus forming *systemic hierarchies* comprised of differentiated sub-minds.

This view requires that we regard mind as an interpenetrating process that includes (or, is included within) other mental systems, in sequential moments of time. The mind system(s) in which sub-minds participate is thus discerned as a meta-system, where perceived *levels of difference* separate progressively abstract and inclusive levels of logical types. The mental properties of a sub-mind are co-determinative and mutually causal components of the larger mind system within which it is an integral component. Again, we find that like cybernetic systems, mind systems are Janus-faced: as a whole, the system “faces” inward, *i.e.*, its dialogue with itself is concerned with maintaining the integrity of its internal steady state (the system’s knowing *is* its being); as a sub-whole, the system “faces” outward, responding to perceived differences in its environment, and differences communicated to it through pathways or networks of recursive circuitry within the larger mind system—the meta-system of which it is a differentiated part (knowing how to appropriately fit and adapt preserves the system’s being). All of which occurs within a virtually infinite regress of relevant contexts.

“Any object may become a part of a mental system, but the object does not then become a thinking subsystem in the larger mind.”²⁵ When mental systems do unite with other *similar* systems, they become operational (*i.e.*, “thinking”) subsystems, or differentiated *sub-minds* within a larger mind that is subsequently formed. Mental systems are thus understood as forming *hierarchies of levels of difference*; *i.e.*, such difference as is evident “between a cell and tissue, between tissue and organ, organ and organism, and *organism and society*”:

These are the hierarchies of units or *Gestalten* [whole mental systems], in which each subunit is a part of the unit of the next larger scope. And, always in biology, this difference or relationship which I call “part of” is such that certain differences in the part will have informational effect upon the larger unit, and *vice versa* [the larger unit will have to have informational effect upon the subunit].²⁶

With informational effects moving between or being exchanged throughout the system, the non-substantial phenomenon of difference produces substantial, *i.e.*, “real”, effects. In keeping with *Gestalt* theory, this is a uniting or combining of information that results in a new order of information or the creation of a logical product—something more than simple addition. An apt analogy is that of self-organizing Chinese boxes, each one dialogically fashioning itself to fit inside the other, *ad infinitum*. This combining of ‘parts’ results in something more on the order of multiplication or fractionation,²⁷ with each level of difference in the *systemic hierarchy* forming a pattern of interaction that represents a difference of logical type.

Bateson’s intent with this final criterion seems to mean that the description and classification of mind systems discloses a *dialogical* hierarchy of logical types, where each logical type—each level of mental process—is distinguished by a level of difference. Each level of difference also represents a *context* where similar systems may form larger *Gestalten* and operate as subsystems. Thus, viewed through the hierarchic structure of thought and the “world of communication” proposed by cybernetic theory, the *hierarchies of levels* of difference evident in the natural world are a result of *informational* patterns of interaction.

Self-organization, self-stabilization and mutual adaptation (all governed by informational feedback loops) act as hierarchical restraints that regulate something like an “osmotic” flow of information that is *dialogically* exchanged within and between the differentiated levels. Levels of knowing that we experience (for instance) as the “self;” that separation between our personal knowing/being and the knowing/being of the living environment—the natural world in which we live, sharing our interpretation of experience, learning, adapting, and growing; the world of mental process with which we co-evolve.

Characteristics and Potentialities of a Mind System

Below is a list of the distinctive traits and potentialities of mind systems that exhibit the six criteria. This includes all living organisms, as well as any component of a living system that fulfills all the criteria, and thus exhibits a degree of autonomy in its self-regulation and operation: for example, individual cells; organs; and aggregates of organs.

The model of mind advanced in this essay is a radically inclusive paradigm: extending the meaning of mind well beyond its previous boundaries; and where warranted, recognizing mental process in systems that do not include living components. Here we should also note that this model totally discredits the traditional view of arrogating mind to our species, alone. As we review these

characteristics and potentialities of mind systems, we should bear in mind that the six criteria propose a holistic model of mind which operates as a totally integrated system. They are useful as a description and explanation of mental process only in combination, and we should expect any such mental system to exhibit the following distinctive traits or attributes:

1. Mind systems will exercise some degree of autonomy or self control: the recursive nature of feedback loops within the system's circuitry give the system information about itself and allow the system to exercise self-regulation.
2. Mind systems will exhibit a capacity for death: either through the randomization or disassembly of the multiple parts of the system or through the breaking of the circuitry that gives the system information about itself, thus destroying its autonomy.
3. Mind systems will exercise the capacity of self-correction: thus, we may recognize that they exercise purpose and choice.
4. Mind systems will adapt to their environments through *sequences* of self-stabilization around steady states: therefore they exhibit stability (steady state), extreme instability (runaway), or some mixture of these two.
5. Mind systems will learn and remember: they exercise the ability to change and adapt in response to internal or external differences in their environment; and they fashion some degree of ordering or predictability through the stochastic process of trail and error.
6. Mind systems will exhibit some capacity to store energy.
7. Mind systems will be influenced by "maps," never "territory."
8. Mind systems will be subject to the fact that all messages are of some logical type: thus, the possibility always exists that they will commit errors in logical typing.
9. The culmination of our synopsis is the principle that mind systems will have the capacity to unite with other similar systems, and thus create still larger wholes.

The Logical Categories of Changing Mind: Bateson's Theory of Learning

While highly formal and abstract, Bateson's *criteria of mind* and the model of mind he presents offer valuable insights for pedagogy. His model of mind is intended to be understood as a *relational process* rather than a 'thing' that is somehow disassociated or separable from another 'thing' (the "body"). His insights introduce a rigorously formulated basis for what I call removing "ego" from the process of teaching, replacing authoritative modes of instruction with more dialogical modes of instruction, such as mentoring and apprenticeship. Taken seriously, his concept of mind

insists that teaching must address the whole person—physical, emotional and intellectual—in dialogues that cut across a wide range of contextual boundaries and communication pathways.

One significant implication of Bateson’s holistic and dialogical notion of mind is that when the *patterns of interaction* we commonly refer to as “minds” actually do connect *via* communication, the relationship thus established triggers or releases a potential for change that may bring about a profound transformation of the “entities” involved, as well as the larger mental systems in which they are embedded. Hence, the insight that mental systems become thinking subsystems of larger holistic minds (more inclusive *Gestalten*) suggests that when genuine dialogue occurs, we enter into a process that holds the *possibility* of experiencing one another in a manner that is as integrative and consequential as that which is evident in the integration of a living organism.

Equally significant implications of Bateson’s work emerge when we consider his *theory of learning*. Bateson examined the phenomenon of learning in several essays written between 1942 and 1971. He presented his *theory of learning* from more than one perspective, addressed a number of related agendas, and fine tuned the details of his work over time. Since my aim in concluding this essay with an examination of Bateson’s learning theory is to help us explore the relationship between the phenomena involved in learning and the *contexts of learning* we attempt to establish in a classroom, it is not necessary to detail all the nuances of this sizable body of work.

For Bateson, the key to understanding the learning process is the phenomena of change, context, and the recognition of *context of contexts*. “The whole matter turns on whether the distinction between a *class* and its *members* is an ordering principle in the behavioral phenomena” which we call learning.²⁸

The word “learning” undoubtedly denotes *change* of some kind. To say *what kind* of change is a delicate matter. However, from the gross common denominator, “change,” we can deduce that our descriptions of “learning” will have to make the same sort of allowance for the varieties of logical type which has been routine in physical science since the days of Newton. The simplest and most familiar form of change is *motion*, and even if we work at that very simple physical level we must structure our descriptions in terms of “position or zero motion,” “constant velocity,” “acceleration,” “rate of change of acceleration,” and so on.²⁹

Bateson employs the theory of logical types to delineate a set of five classes of learning labeled Learning 0 through IV, with each higher class encompassing the lower classes of learning. *Learning IV* is a special type of learning that is not readily accessible, and since this level of learning “probably does not occur in any adult living organism on this earth,”³⁰ our focus is necessarily limited to examining Learning 0 through III.

Before continuing, we should note some of the difficulties posed by language. The terms “higher” and “lower” convey a considerable surplus meaning, with “higher” suggesting a “superior” value and “lower” suggesting an “inferior” value. In this discussion of learning theory we should not fail to recognize that the first four levels of learning are potentially available to everyone. Just as the class “furniture” is no better or worse than the subclasses included within it—“table” or “chair,” for example—Learning 0 and Learning I are also to be understood as no better or worse than Learning II or Learning III. All four are potentially a part of the human experience and thus equally important. It is precisely our awareness that this is the case which is commonly difficult to perceive and understand.

Learning 0: Zero learning is “the simplest receipt of information from an external event in such a way that a similar event at a later (and appropriate) time will convey the same information: I ‘learn’ from the factory whistle that it is twelve o’clock.”³¹ This type of learning represents a context where a person exhibits *minimal change* in response to an item of sensory input, be it simple or complex. Learning 0 lacks any stochastic process, *i.e.*, it does not contain components of trial and error, and it is typified “by *specificity of response*, which—right or wrong—is not subject to correction.”³² This level of learning may be identified in phenomena that occur in various contexts, and here a brief list of such contexts may help illustrate the intended meaning:

- (a) In experimental settings, when “learning” is complete and the animal gives approximately 100 per cent responses to the repeated stimulus.
- (b) In cases of habituation, where the animal has ceased to give overt responses to what was formerly a disturbing stimulus.
- (c) In cases where the pattern of the response is minimally determined by the experience and maximally determined by genetic factors.
- (d) In cases where the response is now highly stereotyped.
- (e) In simple electronic circuits, where *the circuit structure is not itself subject to change resulting from the passage of impulses within the circuit—i.e.*, where the causal links between “stimulus” and “response” are as the engineers say “soldered in.”³³

Although Learning 0 does not contain a component of trial and error, at this level of learning we are capable of at least two types of “error.” If the context offers a set of alternatives to choose from, one may correctly employ the information that signals these available alternatives, but choose

the wrong alternative; or, one may misidentify the context and thus choose from a wrong set of alternatives.³⁴

If now we accept the overall notion that all learning (other than zero learning) is in some degree stochastic . . . it follows that an ordering of the process of learning can be built upon an hierarchic classification of the types of error which are to be corrected in the various learning process. Zero learning will then be the label for the immediate base of all those acts (simple and complex) which are not subject of correction by trial and error. Learning *I* will be an appropriate label for the revision of choice within and unchanged set of alternatives; and Learning *II* will be the label for the revision of the set from which the choice is to be made; and so on.³⁵

Learning I: In common, nontechnical parlance this level of learning is generally what we mean by the term “learning.” It is often referred to as trial-and-error learning, instrumental learning, or conditioning. “These are cases where an entity gives at time two a different response from what it gave at time one.”³⁶ This level of learning covers a broad range of phenomena, including rote learning, a rat learning which turn to make in a maze, and a person learning to play a Bach fugue. In essence, *Learning I* may be recognized when, *with repeated practice*, new responses occur.

Here, it is important to note that without the assumption of *repeatable contexts* there can be no learning of this sort . . . “we may regard ‘context’ as a collective term for all those events which tell the organism among what *set* of alternatives he must make his next choice.”³⁷

Without the assumption of repeatable context (and the hypothesis that for the organisms which we study the sequence of experience is really somehow punctuated in this manner), it would follow that all “learning” would be of one type: namely, all would be zero learning.³⁸

If all learning were zero learning, all behavior would be genetically determined, and we would be little more than genetically programmed automatons, in which case our physical, emotional, and intellectual life would amount to Pavlovian responses. However, if the premise of repeatable context is correct, “the case for logical typing of the phenomena of learning necessarily stands, because the notion ‘context’ itself is subject to logical typing.” Either we reject the notion of *repeatable* context or we accept it, and by accepting it, we “accept the hierarchic series—stimulus, context of stimulus, context of context of stimulus, *etc.* This series can be spelled out in the form of a hierarchy of logical types as follows”:

- a) Stimulus is an elementary signal, internal or external.
- b) Context of stimulus is a *metamessage* which *classifies* the elementary signal.
- c) Context of context of stimulus is a meta-metamessage which classifies the metamessage. And so on.³⁹

Bateson insists that the concept of repeatable context—and by extension the above hierarchic series of contexts—is a necessary premise for any theory that defines learning as *change*. Moreover, “this notion is not a mere tool of our description but contains the implicit hypothesis that . . . the sequence of life experience, action, *etc.*, is somehow segmented or punctuated into subsequences or ‘contexts’ which may be equated or differentiated by the organism.”⁴⁰

This all raises the question as to what sort of creatures we are that we can identify a context, or further, that we can recognize a repeatable context, or a context of contexts? Since we may respond to the “same” stimulus differently in differing contexts, what is the source of information necessary for us to recognize the difference between Context *A* and Context *B*? To answer these questions, Bateson introduces the term “context markers,” and employs this term to designate the *signals* or labels with which humans and quite likely many other organisms classify or differentiate between two contexts.

When we enter a classroom on the day of an exam, everyone in attendance knows that on this day, for the duration of the examination, their activities will differ from those of other times in the “same” classroom. Similarly, it is reasonable to assume that when a harness or some other apparatus is placed on a dog, who has had extended experience in a psychological laboratory, the smell and feel of the equipment, as well as the setting of the laboratory, all act as signals with which the animal marks that he is about to undergo a series of not unfamiliar contexts. Such sources of information may be referred to as “context markers,” and at least for humans, there must also be “markers of contexts of contexts.”⁴¹

When we attend the performance of a play, the playbills, the stage, the curtain, and the seating arrangement, *etc.*, act as “markers of context of context.” If a character in the play commits a crime, we do not go out and summon the police, because through these “markers of context of context” we have received *information* about the context of the character’s context. We know we are watching a play. In contrast, Shakespeare uses a twist of irony in *Hamlet* when, precisely because Claudius ignores several “markers of context of context,” the King has his conscience prodded by the play within the play.

In the complex social life of humans, a diverse set of events can be identified as “context markers.” If I pick up my keys, for whatever reason, my wife is apt to ask where I intend to go. In this instance, my keys are a “context marker” that for my wife signals my intention of leaving the house. By way of example, Bateson offers the following list:

- (a) The Pope's throne from which he makes announcements *ex cathedra*, which announcements are thereby endowed with a special order of validity.
- (b) The placebo, by which the doctor sets the stage for a change in the patient's subjective experience,
- (c) The shining object used by some hypnotists in "inducing trance."
- (d) The air raid siren and the "all clear."
- (e) The boxers handshake before a fight.
- (f) The observances of etiquette.⁴²

The notions of *repeatable context* and defining "learning" as *change* are not foreign to the field of pedagogy. For centuries, instructors have tacitly recognized and fashioned *context markers* (employing visual aids, and other less obvious means), as I indicated earlier in this essay. What I find most valuable (most practical) in this theory of learning is the elegant clarity with which Bateson focuses our attention on the phenomena of *context*, *repeatable context*, and *context markers* as somehow central to understanding and encouraging those changes we designate as "learning."

Learning II: The next higher level or logical type of learning entails changes in the process of Learning I, or learning about learning.⁴³ Learning II is recognizable as "corrective change in the set of alternatives from which choice is made," and this includes "changes in the manner in which the stream of action and experience is segmented or punctuated into contexts together with changes in the use of context markers."⁴⁴

Simply put, Learning II represents the generally unconscious phenomena wherein we learn about and *classify* the contexts in which learning takes place. For example, when we first learn to play a musical instrument, it usually takes a considerable amount of time to play with few errors. Yet, as we continue to play and learn new pieces, the speed with which we learn to play at the same level of performance increases. We have learned a pattern or *class* of behaviors, for instance "guitar playing," and we are able to progressively transfer skills acquired in learning one member of that class, "folk guitar," to another, "classical guitar." For anyone who has contemplated the processes involved in this type of learning (riding a bicycle, mathematical and language skills may also be included as examples) it is evident that much of this kind of learning takes place outside of our awareness.

Bateson argues that, "an essential and necessary function of all habit formation and Learning II is an *economy* of the thought processes (or neural pathways) which are used for problem-solving or Learning I."⁴⁵ The phenomena of learning occur within a hierarchy of perceived and classified contexts and *meta*-contexts in which our percepts are continually being verified or contradicted.

However, as with typing or riding a bicycle, Learning II affords us the advantage of not questioning the details of our actions. We may carry on “without thinking.”⁴⁶

Some types of knowledge can conveniently be sunk to unconscious levels, but other types must be kept on the surface. Broadly, we can afford to sink those sorts of knowledge which continue to be true regardless of changes in the environment, but we must maintain in an accessible place all those controls of behavior which must be modified for every instance. The economics of the system, in fact, pushes organisms toward sinking into the unconscious those generalities of relationship which remain permanently true and toward keeping within the conscious the pragmatic of particular instances.⁴⁷

Learning II amounts to habit formation, *e.g.*, it allows generalities of relationship that remain true to settle progressively further into the unconscious, and we should note that this pattern of learning is not restricted to classifying the contexts of acquired skills, such as operational tasks. Consider the premises for what is generally referred to as “character,” or definitions of “self.” In this instance, Learning II saves us from having to continually re-examine the abstract, philosophical, aesthetic, and ethical aspects of many sequences of life. For precisely this reason, Learning II can create problems for anyone attempting to reconstruct the context of the classroom system.

. . . Learning II is a way of *punctuating events*. But a way of *punctuating* is not true or false. . . It is like a picture seen in an inkblot; it has neither correctness nor incorrectness. It is only a way of seeing the inkblot. . .

The practitioner of magic does not unlearn his magical view of events when the magic does not work. In fact, the propositions which govern punctuation have the general characteristic of being self-validating. What we term “context” includes the subject’s behavior as well as the external events. But this behavior is controlled by former Learning II and therefore it will be of such a kind as to mold the total context to fit the expected punctuation.⁴⁸

In other words, patterns of learned behavior regarding our interrelationship with the milieu in which we are embedded tend to become more and more generalized and come to determine the bias of a person’s global expectations. Consequently, one may then anticipate that one’s existence is orderly and structured, or simply chaotic; mostly punishing, or mostly rewarding. These more general relational patterns develop early in life and quickly drop out of awareness, and since what is learned is a way of punctuating events, what then happens is that we tend to mold our environment to fit the expected punctuation.⁴⁹

The self-validating nature of this process renders it notoriously difficult to reverse because the personality involved is unaware, and he or she will unconsciously manipulate their perception of the environment to fit their expectations, and subsequently bypasses other learning opportunities. For

instance, overcoming the expectations of a “fit and proper” learning environment, whether from students, parents or administrators—expectations controlled by former Learning II, and therefore, largely unconscious—poses a difficult task for anyone attempting to reconstruct the learning contexts of the classroom system.

Still, we are called upon to “educate” our students, and a close analysis of the words we use to describe the patterns of relationship and definitions of “self” commonly called “character” reveals that no one is dependent, liberated, or competitive, *etc.* in isolation—*all perception and all learning are essentially interactional*. It follows that if (as scholars such as Bateson and Klaus Krippendorff suggest) in the operation of our perception we are all cartographers, then our role as educators is to communicate contexts and *meta*-contexts wherein our students may construct, explore and reexamine some of their most fundamental reality constructs. The “context markers” we broadcast will signal meta-metamessages with which the students may choose to punctuate or classify the context of their lives. If we are successful in our task, the dialogical learning environments we fashion can offer our students an experience “like entering the cartographer on the map he or she is making.”⁵⁰ Like the border on a map, our “context markers” frame the information within the dialogue, setting the stage for the emergence of self-discovery.

In such systems, involving two or more persons, where most of the important events are postures, actions, or utterances of the living creatures, we note immediately that the stream of events is commonly punctuated into contexts of learning by a tacit agreement between the persons regarding the nature of their relationship—or by context markers and tacit agreements that these context markers shall “mean” the same for both parties.⁵¹

In the above quotation, note that Bateson brings the contemplation of “contexts of learning” back to a discussion of *systems*, involving two or more persons, and the nature of their relationship. Although he does not plainly state his intention, we can fairly assume this reference to *systems* is a context marker that refers to his theories concerning mental process. Also, note the importance of “tacit agreement” and “context markers” in the operation of the stream of events that may lead to the change in punctuating events that he designates Learning II, *e.g.*, the largely unconscious process of “learning about learning.” This suggests that in structuring the contexts of our classroom(s), we must be able to present and successfully communicate context markers in our postures, actions, and utterances—as well as in the physical layout of the learning environment—such that the students can enter into the tacit agreements that enable Learning 0, Learning I, and Learning II.

The above leads to our consideration of *Learning III*. This type of learning involves a radical modification or *expansion* of one's set of alternatives, *e.g.*, "Learning III is change in the process of Learning II, *e.g.*, a corrective change in the system of sets of alternatives from which choice is made."⁵² This level of learning can be identified as a radical shift in perspective, or as developing the ability to cross the "boundaries" of different learning types.

The very definition of this type of learning suggests that paradoxes and logical difficulties arise when we attempt to apprehend such phenomena in logical discourse. Yet, without claiming personal knowledge, we may suppose that at this level of learning previously constricted awareness is released and new frames of reference are accessible. Here, Bateson cautiously observes that:

Learning III is likely to be difficult and rare even in human beings. Expectably, it will also be difficult for scientists, who are only human, to imagine or describe this process. But it is claimed that something of this sort does from time to time occur in psychotherapy, religious conversion, and in other sequences in which there is profound reorganization of character.⁵³

The profound reorganization of character that characterizes Learning III limits the usefulness of this level of learning for our discussion, but may disclose something of the nature of learning that has been left out of our previous discussion. First we should note that there can be a replacement of premises at the level of Learning II *without* the achievement of any Learning III. Hence, the profound reorganization of character indicative of Learning III is not a transposition of subclasses at the level of Learning II. However, such a transposition (exchanging one set of habituation for another) in and of itself must certainly be an accomplishment worth noting. Yet, the question remains, how are such transpositions achieved.

Bateson suggests that one is "driven" to level III by "contraries" generated at level II, and it is the resolving of contraries that constitutes "positive reinforcement" at level III. I would suggest that since all learning cannot be the product of rote memorization, the experience of contraries, and their subsequent resolution, is the key to understanding much of what "moves" one through each of the previously discussed levels of learning: Learning 0, Learning I, and Learning II. Therefore, we may employ Bateson's concept of Learning III as an extreme example of all transitional experience "between" the levels of learning.

Precisely because it constitutes learning *about* Learning II, Learning III proposes paradox. Learning III may lead to *either* an increase *or* a limitation, and possibly a reduction of the habits acquired in Learning II. "Certainly it must lead to a greater flexibility in the premises acquired by the process of Learning II—a *freedom* from their bondage."⁵⁴ My point is that we may make similar

observations concerning the relationship between the punctuation of experience that occurs between Learning 0 and I, or between Learning I and II.

Beyond the necessary components of rote learning and habituation, one is most likely driven, or nudged, into “higher” levels of learning through paradox and contraries. Similarly, any skill or ability that is integrated into one’s mental system through the process of resolving paradox and contraries will lead to greater flexibility in the premises that govern the “lower” levels of learning. This “resolution of contraries” will, in itself, positively reinforce one’s having learned a given “lesson.” In structuring the contexts of a classroom system, we certainly should not attempt to drive our students into a Learning III experience. However, we should be able to learn how to fashion challenging contexts, which allow for safely experiencing contraries and paradoxes. Apparently, this is the experience that is needed in order to nudge one’s “self” into “higher” levels of learning.

One final word concerning the processes involved in Learning III. In a sense this entire essay has been an invitation to the sort of “reorganization of character” that characterizes Learning III. Our brief examination of the holistic, self-regulating, self-organizing, mutually causal (hence, dialogic), and hierarchic characteristics of cybernetic systems was intended to set the context for considering a major portion of Bateson’s work. Given the fact that it is *mind* that learns, the explication of the holistic and dialogical model of mind which emerges out of Bateson’s *criteria of mind*—including his understanding of information, and his concept of the “world of communication”—was intended to prepare the contextual frame for considering Bateson’s *learning theory*. Clearly, the views thus presented invite the reader to reexamine commonly held dualistic notions concerning the “self,” as well as similar notions concerning the relationship between “self” and “other.”

Bateson’s views thus propose a radical reexamination of the principles that govern the instructor/student/classroom system. To be sure, the principles examined in this essay are not the only means of reaching the conclusions I have incrementally drawn along the way, nor do I claim that the principles here presented, and the conclusions here drawn are the only viable rationale around which we should reconstruct the classroom system. My intent has been merely to offer an alternative optic (one of many such valuable resources) through which we may view learning and pedagogy. These concluding observations are not simply standard disclaimers, offered as a means of conveniently bringing the essay to closure. It is my conviction that if the ideas presented in this essay are taken seriously, they call for a profound reorganization of the way we approach instruction and learning in the classroom. In this sense the above is an invitation to the sort of “reorganization of character” that is the hallmark of Learning III.

WORKS CITED

- Bateson, Gregory. *Mind and Nature: A Necessary Unity*. New York: E. P. Dutton, 1979.
- *Steps to an Ecology of Mind: Collected Essays in Anthropology, Psychiatry, Evolution, and Epistemology*. San Francisco: Chandler Publishing Company, 1972.
- "Afterword." In *About Bateson*, pp. 235-247. Edited by John Brockman. New York: E. P. Dutton, 1977.
- "The Message is Reinforcement," in *Language Behavior: A Book of Readings in Communication*. Janua Linguarum: Studia Memoriae Nicolai Van Wijk Dedicata, Series Maior, no. 41, pp. 62-72. Edited by Johnnie Akin, Alvin Goldberg, Gail Myers, and Joseph Stewart. The Hague and Paris: Mouton & Co., 1971.
- "The Cybernetics of 'Self': A Theory of Alcoholism." *Psychiatry*, 34 (February 1971): 1-18; reprinted in *Steps to an Ecology of Mind*, Part III: Form and Pathology in Relationship, pp. 309-337.
- "Form, Substance, and Difference." *General Semantics Bulletin* 37: 5-13. The Nineteenth Annual Alfred Korzybski Memorial Lecture, delivered at New York, January 9, 1970; reprinted in *Steps to an Ecology of Mind*, Part V: Epistemology and Ecology, pp. 454-471.
- "The Logical Categories of Learning and Communication." in *Steps to an Ecology of Mind*, Part III: Form and Pathology in Relationship, pp. 279-308. [Expanded version of "The Logical Categories of Learning and Communication, and the Acquisition of World Views." Paper presented at the Wenner-Gren Symposium on World Views: Their Nature and Their Role in Culture, Burg Warstein, Austria, August 2-11, 1968.]
- "Style, Grace, and Information in Primitive Art," in *Steps to an Ecology of Mind*, Part II: Form and Pattern in Anthropology, pp. 128-152.
- "Minimal Requirements for a Theory of Schizophrenia." *A.M.A. Archives of General Psychiatry* 2 (May 1960): 477-491; reprinted in *Steps to an Ecology of Mind*, Part III: Form and Pathology in Relationship, pp. 244-270.
- Comment on "The Comparative Study of Culture and the Purposive Cultivation of Democratic Values," by Margaret Mead, in *Science Philosophy and Religion; Second Symposium*, Chapter IV, pp. 81-97. Edited by Lyman Bryson and Louis Finkelstein. New York: Conference on Science, Philosophy and Religion in Their Relation to the Democratic Way of Life, Inc., 1942; reprinted as, "Social Planning and the Concept of

Deutero-Learning,” in *Steps to an Ecology of Mind*, Part III: Form and Pathology in Relationship, pp. 159-176.

Bateson, Gregory, and Bateson, Mary Catherine. *Angels Fear: Towards an Epistemology of the Sacred*. New York: Macmillan Publishing Co., 1987.

Brockman, John, ed.; Bateson, M. C.; Birdwhistell, R. L.; Lipset, D.; May, R.; Mead, M.; and Schlossberg, E. *About Bateson*. New York: E. P. Dutton, 1977. “Afterword” by Gregory Bateson.

Krippendorff, Klaus. “The Power of Communication and the Communication of Power: Toward an Emancipatory Theory of Communication.” *Communication* 12 (July 1991): 175-196.

Laszlo, Ervin. *Introduction to Systems Philosophy*. New York: Harper Torchbook, 1973.

McCulloch, Warren S. *Embodiments of Mind*. Cambridge, Massachusetts: M.I.T. Press, 1965.

Vickers, Geoffrey, Sir. *Value Systems and Social Process*. New York: Basic Books, 1968.

Whyte, Lancelot L. “The Structural Hierarchy in Organisms.” In *Unity in Diversity: A Festschrift for Ludwig Von Bertalanffy*, pp. 271-285; Vol. 1 of 2 vols. Edited by William Gray and, Nicholas D. Rizzo. New York: Gordon and Breach, 1973.

Wiener, Norbert. *Cybernetics—or Control and Communication in the Animal and the Machine*. New York: John Wiley & Sons, Inc., 1948.

NOTES

¹ Warren S. McCulloch, *Embodiments of Mind* (Cambridge, Massachusetts: M.I.T. Press, 1965). McCulloch was a key member of the group that did the original work in cybernetics, and he is referred to by Bateson more often than any other modern scientist.

² Norbert Wiener, *Cybernetics—or Control and Communication in the Animal and the Machine* (New York: John Wiley & Sons, Inc., 1948), p. 11.

³ However, following Bateson many theorists reject the use of *energy* and *matter* in this context—except in those instances where they act as *information* and thus have *communicational* value.

⁴ Ervin Laszlo, *Introduction to Systems Philosophy*, pp. 57-117; also, pp. 177-180.

⁵ Lancelot L. Whyte, “The Structural Hierarchy in Organisms,” in *Unity in Diversity: A Festschrift for Ludwig von Bertalanffy*, pp. 271-285, edited by William Gray and Nicholas D. Rizzo (New York: Gordon and Breach, 1973), p. 275.

⁶ Ervin Laszlo, *Introduction to Systems Philosophy*, p. 175.

⁷ Sir Geoffrey Vickers, *Value Systems and Social Progress* (New York: Basic Books Inc., 1968), pp. 176-209.

⁸ *Ibid.*, pp. 183-184; see also, pp. xi-xxii.

⁹ Gregory Bateson, *Mind and Nature: A Necessary Unity* (New York: E. P. Dutton, 1979), p. 92. (Hereafter — *Mind & Nature*)

¹⁰ *Ibid.*, p. 92.

¹¹ *Mind & Nature*, p. 92 [emphasis mine].

¹² *Ibid.*, pp. 92-94.

¹³ *Ibid.*, p. 212.

¹⁴ “Glossary,” in *Mind & Nature*, p. 228.

¹⁵ “Form, Substance, and Difference,” in Gregory Bateson, *Steps to an Ecology of Mind: Collected Essays in Anthropology, Psychiatry, Evolution, and Epistemology* (San Francisco: Chandler Publishing Company, 1972), pp. 457-461 (Hereafter — *STEPS*).

¹⁶ *Ibid.*, p. 459

¹⁷ *Mind & Nature*, p. 100. Qualifying the word *triggered*, Bateson notes that, “Firearms are a somewhat inappropriate metaphor because in most simple [*nonrepeating*] firearms there is only a lineal sequence of energetic dependencies. . . In biological systems, the end of the lineal sequence sets up conditions for a future repetition,” p. 101*n*.

¹⁸ “Afterword,” in *About Bateson*, Edited by John Brockman (New York: E. P. Dutton, 1977), p. 243.

¹⁹ “The Cybernetics of ‘Self’: A Theory of Alcoholism,” *STEPS*, p. 316.

²⁰ *Ibid.*, p. 317.

²¹ Gregory Bateson and Mary Catherine Bateson, *Angels Fear: Towards an Epistemology of the Sacred* (New York: Macmillan Publishing Co., 1987), p. 19; this work was posthumously reconstructed, edited and co-authored by Bateson’s daughter, Mary Catherine Bateson.

²² “Minimal Requirements for a Theory of Schizophrenia,” in *STEPS*, p. 250.

²³ *Ibid.*

²⁴ *Mind & Nature*, p. 191.

²⁵ *Ibid.*, p. 94.

²⁶ “Form, Substance, and Difference,” in *STEPS*, p. 464.

²⁷ *Mind & Nature*, p. 86.

²⁸ “The Logical Categories of Learning and Communication,” in *STEPS*, p. 282. Bateson addressed learning theory in several essays. The above, written in 1964 and given its final form in 1971, gives his definitive accounting on the topic. Also see, Gregory Bateson, Comment on “The Comparative Study of Culture and the Purposive Cultivation of Democratic Values,” by Margaret Mead, in *Science Philosophy and Religion; Second Symposium*, Chapter IV, pp. 81-97, edited by Lyman Bryson and Louis Finkelstein (New York: Conference on Science, Philosophy and Religion in Their Relation to the Democratic Way of Life, Inc., 1942); reprinted as, “Social Planning and the Concept of Deutero-Learning,” in *Steps to an Ecology of Mind*, Part III: Form and Pathology in Relationship, pp. 159-176; also, “The Message is Reinforcement,” in *Language Behavior: A Book of Readings in Communication*, Janua Linguarum: Studia Memoriae Nicolai Van Wijk Dedicata, Series Maior, no. 41, pp. 62-72, edited by Johnnye Akin, *et al.* (The Hague and Paris: Mouton & Co., 1971).

²⁹ *Ibid.*, p. 283, *n* 3. Subtly maintaining his distinction between the mental and physical sciences, Bateson notes that, “the Newtonian equations which describe the motions of a ‘particle’ stop at the level of ‘acceleration.’ *Change of acceleration* can only happen with deformation of the moving body, but the Newtonian ‘particle’ was not made up of ‘parts’ and was therefore (logically) incapable of deformation or any other internal change. It was therefore not subject to rate of change of acceleration.”

³⁰ “The Logical Categories of Learning and Communication,” in *STEPS*, p. 293. Bateson’s description of *Learning IV* clearly marks it as a special instance of learning: “*Learning IV* would be *change in Learning III*. [Which probably does not occur, but . . .] Evolutionary process has, however, created organisms whose ontogeny bring them to Level III. The combination of phylogenesis with ontogenesis, in fact, achieves Level IV.”

³¹ *Ibid.*, p. 284.

³² *Ibid.*, p. 293.

³³ “The Logical Categories of Learning and Communication,” in *STEPS*, p. 284.

³⁴ *Ibid.*, p. 286. Bateson notes that, “There is also an interesting class of cases in which the sets of alternatives contain common members. It is then possible for the organism to be ‘right’ but for the wrong reasons. This form of error is inevitably self-reinforcing.”

³⁵ *Ibid.*, p. 287.

³⁶ *Ibid.*

³⁷ *Ibid.*, p. 289.

³⁸ “The Logical Categories of Learning and Communication,” in *STEPS*, p. 288.

³⁹ *Ibid.*, p. 289.

⁴⁰ *Ibid.*, p. 292.

⁴¹ “The Logical Categories of Learning and Communication,” in *STEPS*, p. 290.

⁴² *Ibid.*, p. 290.

⁴³ “The Logical Categories of Learning and Communication,” in *STEPS*, pp. 292-293. Bateson notes that “various terms have been proposed in the literature for various phenomena of this order. ‘Deutero-learning,’ ‘set learning,’ ‘learning to learn,’ and ‘transfer of learning’ may be mentioned.”

⁴⁴ *Ibid.*, p. 293.

⁴⁵ *Ibid.*, p. 302.

⁴⁶ “Style, Grace, and Information in Primitive Art,” in *STEPS*, pp. 128-152; see, p. 148.

⁴⁷ “Style, Grace, and Information in Primitive Art,” in *STEPS*, p. 142.

⁴⁸ “The Logical Categories of Learning and Communication,” in *STEPS*, pp. 300, 301.

⁴⁹ *Ibid.*, p. 301.

⁵⁰ Klaus Krippendorff, “The Power of Communication and the Communication of Power; Toward an Emancipatory Theory of Communication,” p. 192.

⁵¹ “The Logical Categories of Learning and Communication,” in *STEPS*, p. 298.

⁵² “The Logical Categories of Learning and Communication,” in *STEPS*, p. 293.

⁵³ *Ibid.*, p. 301.

⁵⁴ “The Logical Categories of Learning and Communication,” in *STEPS*, p. 304.