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## UNDERSTANDING BATESON AND MATURANA: TOWARD A BIOLOGICAL FOUNDATION FOR THE SOCIAL SCIENCES\*

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*The attempts to clarify (purify) the conceptual foundations of family therapy by means of “epistemology” have bred excitement, boredom, irritation and confusion. In the belief that at least the confusion can be alleviated, the present paper is offered as a study guide and something of a Rosetta Stone for translating the work of Gregory Bateson and Humberto R. Maturana. The paper demonstrates that Maturana’s work is highly compatible with that of Bateson. In addition, several major points of contrast are argued: (1) Maturana’s concept of structure determinism is an explicit ontological claim which directly implies an epistemology, whereas Bateson delineated an epistemology, but never clearly developed a corresponding ontology; (2) structure determinism is a more general concept than Bateson’s concept of “mind” (i.e., cybernetic epistemology); (3) structure determinism deletes the remnants of objectivity from Bateson’s theory (i.e., “the difference that makes a difference”); and (4) Maturana’s concept of instructive interaction is a more general, nonsystemic version of what Bateson meant when he used the term “epistemological error.” Finally, it is claimed that the emphasis on epistemology has distracted proponents and detractors alike from the essential message of Bateson and Maturana: social systems and all human endeavor must be understood in light of our existence as biological entities that are coupled to a medium. The biological ontology implicit in Bateson’s writings and explicitly delineated in Maturana’s may (at long last) provide a sound foundation for the social and behavioral sciences.*

### THE EPISTEMOLOGY OF GREGORY BATESON

It was Gregory Bateson who first brought epistemology to the attention of the family therapy field and it is upon his work that other family therapists have built. Bateson (1972, 1979) has long insisted that epistemology is vital to any coherent science of the living. Thus, he applied epistemology to a wide variety of matters, including biology, ecology, psychotherapy, learning, psychopathology, cybernetics, systems theory, and human planning. Bateson’s writings, however, are not easy to understand—in part because he used the word “epistemology” in at least five different ways.

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### *Five Meanings of "Epistemology"*

1. *Epistemology as theory of knowledge.* Philosophers define epistemology as the study of the theory of knowledge. To philosophers, epistemology is that branch of philosophy which investigates the origins, structure, methods, and validity of knowledge. Bateson, however, often used the word "epistemology" to mean other things than the philosophers mean by it. Bateson seemed to use the word in at least four additional ways: (a) as a synonym for paradigm or *Weltanschauung*, (b) as a biological cosmology, (c) as a science, and (d) as the fundamental premises which underlie the behavior of an organism.

2. *Epistemology as paradigm.* Although it is probably the least important of Bateson's uses of the word, epistemology-as-paradigm (or *Weltanschauung*) seems to be the usage that has become most popular in the family therapy field today. Thus, we hear of linear epistemology (Auerswald, 1972; Hoffman, 1981; Keeney, 1979a), conventional epistemology (Bateson, 1976), thingish epistemology (Bateson, 1976), dualistic epistemology (Bateson, 1972; Dell & Goolishian, 1981), circular epistemology (Hoffman, 1981), cybernetic epistemology (Bateson, 1972; Keeney, 1982b, 1983), systemic epistemology (Colapinto, 1979; Dell, 1982; Selvini Palazzoli, Boscolo, Cecchin & Prata, 1980), ecological epistemology (Auerswald, 1972), ecosystemic epistemology (Keeney, 1979a, 1982a; Wilder, 1980; Wilder & Wilson, 1976), evolutionary epistemology (Dell & Goolishian, 1981), Aristotelian epistemology (Dell, 1980a; Schefflen, 1978), Newtonian epistemology (Dell, 1980b; Keeney, 1982b), post-Einsteinian epistemology (Schefflen, 1978), modern epistemology (Guntern, 1981), power epistemology (Bateson, 1972i), epistemology of pattern (Dell, 1980b; Schefflen, 1978), epistemology of behavioral form (Schefflen, 1978), epistemology of emotions (Schefflen, 1978), epistemology of traits (Schefflen, 1978), event-centered epistemology (Schefflen, 1978), people-centered epistemology (Schefflen, 1978), individual-oriented epistemology (Colapinto, 1979), family epistemology (Dell, 1980b), open systems epistemology (Allman, 1982), medical epistemology (Colapinto, 1979), body-mind epistemology (Colapinto, 1979), psychoanalytic epistemology (Colapinto, 1979), and even British epistemology (Colapinto, 1979). Bateson was not explicit about what was and what was not "an epistemology." Presumably, "an epistemology" (in the sense of paradigm) provides a grammar of reality; it specifies how the objects and events of the world should be punctuated. Schefflen (1981) has suggested that, whereas a paradigm is "a body of theories, methods, and findings about a *particular* phenomenon" (p. 124), "an epistemology is much broader than a paradigm, for it is a way of thinking about all phenomena, about all of nature" (p. 124). Whatever the appropriate definition of "an epistemology" may be, it seems likely that the term "epistemology" has often been used by family therapists when the word "theory" would be more modest and, perhaps, more accurate.

3. *Epistemology as biological cosmology.* The third meaning which Bateson has attributed to the word "epistemology" is quite daring. He considered his biological cosmology to be the correct epistemology of the world of the living. Bateson began with the question, "What is the pattern which connects all the living creatures" (Bateson, 1979, p. 8), and concluded that the answer is "epistemology." In Bateson's view, all living creatures are connected by, and constitute the epistemic. He believed that there is a "sacred unity of the biosphere" (Bateson, 1979, p. 19) which possesses the properties of *mind*.

Bateson (1979) specified six criteria of mind: (a) "A *mind* is an aggregate of interacting parts or components"; (b) "The interaction between parts of mind is triggered by difference"; (c) "Mental process requires collateral energy"; (d) "Mental process requires circular (or more complex) chains of determination"; (e) "In mental process, the effects of difference are to be regarded as transforms (i.e., coded versions) of events which preceded



them”; (f) “*The description and classification of these processes of transformation discloses a hierarchy of logical types immanent in the phenomena*” (p. 92).

Bateson claimed that any system which possesses the properties of mind is inherently epistemic. It is in this sense that he claimed that *Creatura*, the world of the living, is an organized coherent mind that processes information. The whole of *Creatura* (the planetary ecology) and each of its components (individual organism, interactional systems, local ecosystem, etc.) have mental processes. *Creatura*, in all its manifestations, is mind. Thus, Bateson (1979) insisted that the fundamental characteristic of biological systems is that they possess the ability to know, think, and decide. Because he believed the world of *Creatura* to be inherently epistemic, Bateson provided his own unique answer to the fundamental philosophical question concerning the nature of knowing. Specifically, he stated that the personal knowing of any given organism is “a small part of a wider integrated knowing that knits the entire biosphere or creation” (Bateson, 1979, p. 88). Thus, for Bateson, biology and ecology are epistemology. That which lives is fundamentally mind-like and epistemic.

4. *Epistemology as science.* The fourth meaning which Bateson (1979) attributed to epistemology is that it is a science—specifically, a branch of natural history. He defined epistemological science to be “the study of how particular organisms or aggregates of organisms *know, think, and decide*” (Bateson, 1979, p. 228). A particular concern of Bateson was that living organisms do not obtain objective information about the world around them. The Adelbert Ames experiments (see Bateson, 1979), which demonstrated so forcefully how the senses can be fooled, had convinced Bateson of the impossibility of objectivity. He was certain that one could never know the *ding an sich* (the thing-in-itself) (Bateson, 1972e, 1972i, 1979). Accordingly, for Bateson, a major requirement of epistemological science is that it must be able to adequately describe and explain the impossibility of objectivity. Bateson had been particularly influenced by the important work on perception which had been conducted in Warren McCulloch’s laboratory (e.g., Lettvin, Maturana, McCulloch & Pitts, 1959) and was interested in the fact that neurophysiological structure seemed to be the mechanism which prevented objective information from being transmitted to the observer. In any case, Bateson contended that the investigation of all such epistemic processes was the province of science. In fact, he claimed that epistemology is nothing less than the premier science and first principle of all biological phenomena. He considered epistemology to be “an indivisible, integrated metascience whose subject matter is the world of evolution, thought, adaptation, embryology, and genetics” (Bateson, 1979, p. 87).

5. *Epistemology as character structure.* The fifth way in which Bateson used the word “epistemology” is that character structure is one’s own personal epistemology. This idea is not only the most clinically interesting of Bateson’s five meanings of epistemology, it is also the most revealing of his entire epistemological project, for it indicates “the road not taken” in Bateson’s thinking. In his classic paper, “The Cybernetics of ‘Self’: A Theory of Alcoholism,” Bateson (1972c) described the relationship between epistemology (i.e., the study of how we know what we know) and ontology (i.e., the study of the nature of being). Ontology, he said, has to do with “the problems of how things are, what is a person, and what sort of a world this is” (p. 313). This is an informal but adequate definition of ontology. His definition of epistemology, however, is another matter. Bateson claimed that epistemology has to do with the problem of “how we know what sort of a world it is and what sort of creatures we are that can know something (or perhaps nothing) of this matter” (p. 313). The question of “what sort of creatures we are” is certainly relevant to epistemological inquiry, but it is, nevertheless, an ontological question (i.e., the study of human *being*), not an epistemological one. Thus, Bateson’s description of epistemology is one that expropriates territory which properly belongs to ontology.



Bateson argued that character structure should be understood to be a “body of habitual assumptions” (Bateson, 1972c, p. 314). Specifically, he claimed that character structure is “a net of epistemological and ontological premises” (Bateson, 1972c, p. 314) which specifies how the person must understand and relate to the world around him or her:

In the natural history of the human being, ontology and epistemology cannot be separated. His (commonly unconscious) beliefs about what sort of world it is [i.e., ontological premises] will determine how he sees it [i.e., epistemological premises] and acts within it, and his ways of perceiving [i.e., epistemological premises] and acting will determine his beliefs about its nature [i.e., ontological premises]. The living man is thus bound within a net of epistemological and ontological premises. . . . It is awkward to refer constantly to both epistemology and ontology and incorrect to suggest that they are separable in human natural history. . . . I shall therefore use the single term “epistemology” in this essay to cover both aspects of the net of premises which govern adaptation (or maladaptation) to the human and physical environment. (Bateson, 1972c, p. 314)

This quotation is significant because it reveals the parameters of Bateson’s thinking in regard to epistemology. By claiming that epistemology is inseparable from ontology, Bateson is once again blurring the boundaries between two different (even if interrelated) fields of study. Moreover, by deciding to refer to both epistemology and ontology “by use of the single term ‘epistemology,’” he is giving epistemology priority over ontology. Thus, ontology constitutes “the road not taken” in Bateson’s thinking. His decision to concentrate solely upon epistemology is directly responsible, I think, for the simultaneously profound, and yet, difficult-to-grasp quality of much of his writing.

For Bateson, almost everything is epistemology. To review briefly, first, he had a cosmology of the living world. Nevertheless, Bateson called it an epistemology. Second, Bateson insisted that the various life sciences are subsumed by a metascience—epistemology. Third, Bateson contended that a living organism’s character structure is actually its own personal epistemology. Thus, there seems to be little room for anything but epistemology in Bateson’s worldview. Like a black hole, Bateson’s epistemology seems to attract and devour everything in its vicinity. This has, I think, two major consequences for Bateson’s theory. First, he is left with an unannounced cosmology that is labeled “an epistemology.” Second, and more significant, Bateson’s epistemology has no ontology upon which to found itself. The lack of this foundation badly weakens Bateson’s efforts to describe what I think is the enormously valuable (albeit inflammatory) concept of *epistemological error*.

Whereas Schefflen (1978) claimed that epistemologies are neither true nor false, Bateson was clearly insistent that an epistemology could indeed be false. During the last 10–15 years of his life he frequently spoke about epistemological errors, epistemological mistakes, epistemological fallacies, and incorrect epistemologies (Bateson, 1972j, 1979). “Any error,” said Bateson, “will propose pathology” (Bateson, 1977, p. 238). In other words, Bateson believed that human psychopathology is fundamentally rooted in epistemological errors, for example, (a) believing in objectivity, (b) engaging in actions that ignore the circuitry of a system, and (c) attempting to control any part of the system to which we belong (e.g., the local ecology, our friendship network, our family, and even ourselves). Bateson was especially bothered by the use of power. He insisted that the use of power to enforce control was a particularly dangerous, anti-ecological form of “epistemological lunacy” (Bateson, 1972i, p. 487): “there is no area in which false premises regarding the nature of the self and its relation to others can be so surely productive of destruction and ugliness as this area of ideas about control” (Bateson, 1972h, p. 267).

When Bateson said that such thinking and actions were wrong, he did not mean that they were merely in disagreement with his views; he meant that they were in



disagreement with how the world *is*. In other words, Bateson's statements about epistemological error are claims about how the world *is*, and therefore imply an ontology. This, I think, is the major lack of closure in Bateson's thinking. His cosmology portrays the biological world as an ecosystemic mind, but he neither develops this ontology nor explains how it is that the world must inevitably assume this systemic form.

What circumstances cause the world of *Creatura* to become mind-like? How is it that the world is organized in terms of circular causality? What is it about the nature of things that makes objectivity unattainable? What makes control impossible (other than Bateson's cosmology)? How does it happen that our world is this way? These are questions that Bateson does not and cannot answer within the framework of his epistemology (cosmology) of ecosystemic mind. All of his arguments remain tautological and a bit mystical because he justified his epistemology solely in terms of his epistemology. He lacked an ontology in which to ground his arguments. Without an ontology, Bateson's epistemological project accomplishes less than it might; it is incomplete. This is unfortunate because the issues that Bateson struggled with for so many years have major relevance for the enterprise of psychotherapy. The family therapy field has recognized this relevance, but has become the heir to Bateson's lack of clarity in these matters.

Finally, it must be emphasized—for it is (surprisingly) too often forgotten—that Bateson spoke as a *biologist*, not as a philosopher. His writings constitute a lifelong attempt to explore the implications of our existence as living creatures who are inseparable from our ecosystem. His philosophical assertions about epistemology were always directly contingent upon his cosmology of *Creatura*.

#### THE ONTOLOGY OF HUMBERTO R. MATURANA

Toward the end of his life, Bateson was asked who else was carrying forward the study of the epistemology of *Creatura*. In reply, Bateson stated that "the center for this study is now in Santiago, Chile under a man named Maturana" (Keeney, 1979b, p. 23). It is my contention that Maturana's work contains the ontology that Bateson never developed (but which, arguably is to some degree, implicit in Bateson's writings).

Maturana has wrestled with two major questions: (a) What takes place in the phenomenon of perception? and (b) What is the organization of the living? His illuminating insight has been to see that the two phenomena—cognition and the process of living—are actually one and the same (Maturana, 1970a, 1970b). "Cognition," he claims, "is a biological phenomenon and can only be understood as such" (Maturana, 1970b, p. 7). Every biological entity both has and *is* a way of knowing: "living, as a process, is a process of cognition. This statement is valid for all organisms, with and without a nervous system" (Maturana, 1970b, p. 8). Thus, for Maturana, "to know has become to live" (Maturana, 1982a, p. 18) and to live has become to know. Maturana's equating of cognition with living precisely parallels Bateson's equating of mind with *Creatura* (the world of living systems). Accordingly, Maturana would agree with Bateson's claim that an adequate understanding of epistemology must include such various knowings as: how to learn, how to grow into five-way symmetry, how to count to seven, how to invent and drive a car, and even, how to evolve (Bateson, 1979).

The central feature of Maturana's understanding of the organization of the living is that "it is the circularity of its organization that makes a living system a unit of interactions, and it is this circularity that it must maintain in order to remain a living system" (Maturana, 1970b, p. 9). This seemingly modest characterization of living systems contains within it a profound insight that (a) led Maturana one step closer to ontology and (b) allowed him to describe an epistemology of living systems (which was implied by his theory of the organization of the living).



Specifically, Maturana noted the following: if the organization of a living system is circular, then that organization is a *closed* organization—not thermodynamically closed, but organizationally closed. The significance or organizational closure is that it directly implies autonomy (Maturana & Varela, 1973). Organizationally closed systems are autonomous systems (see, especially, Varela, 1979). Each living system has its own autonomous individuality because the nature of its structure fully specifies how the system will behave under any and all interactions. Interactions do *not* specify how the system will behave; the *system* specifies how it will behave. More accurately, the structure of the system specifies how it will behave. Because interactions with the environment cannot specify how an organizationally closed living system will behave, it therefore must be the case that such systems do not have inputs (and outputs) (Maturana & Varela, 1973)! Said differently, they can receive no information. Such systems, as Ashby (1956) noted long ago, are thermodynamically open, but “closed to information” (p. 4)—they are “information tight” (p. 4). Because all living systems (as well as man-made systems such as computers) are closed in this fashion, Maturana was forced to the startling conclusion that there is no such thing as information.

Now, obviously, virtually everyone is convinced that information does exist and that one receives information for an infinite variety of sources. And yet, we all know that different people receive different “information” from the “same input.” And the reason that they receive different “information” is that each person is different, and, being different, each person “responds” differently to the “same” thing. This is precisely Maturana’s point. It is the system that specifies how it will behave, not the “information.” The information has no existence or meaning apart from that given to it by the system with which it interacts. The system specifies not only what *is* an interaction (for it), but also what *kind* of interaction that a given interaction is. Thus, information can have no objective existence. And, because objectivity is intrinsic to our conventional understanding of the term, “information,” Maturana claims that there is no such thing as information.

This matter of information is a point of sharp contrast between Maturana and Bateson. Whereas Maturana claims that information does not exist, Bateson (1972e) made information (“information . . . is a difference which makes a difference,” p. 453) a foundation stone of his biological epistemology.

Maturana claims that our notions of information and communication are fundamentally misleading:

Communicative and linguistic interactions are intrinsically not informative; organism A does not and cannot determine the conduct of organism B because due to the nature of the autopoietic organization itself every change that an organism undergoes is necessarily and unavoidably determined by its own [structure which embodies its] organization. (Maturana & Varela, 1973, p. 121)

Our everyday ideas about information and communication are misleading because we tend to think of communication and information as being like the mythical golden touch of King Midas (Maturana & Guilloff, 1980). That is, just as King Midas could cause objects to behave as he wanted them to (i.e., to turn into gold), so do we, all too often, believe that information and communication can determine and specify how a living organism will behave. This is not the case. So-called “information” does not and cannot instruct the behavior of a living system. What we typically label as information is merely something which we observe to be interacting with the system. In any given interaction, the system always behaves according to its structure. In other words, such systems are deterministic.



*Structure Determinism: Why Maturana Refutes the Concept of Causality*

Although initially concerned solely with the determinism of living systems, Maturana (1978) came to see that a particular kind of determinism is the *sine qua non* of science. *Without this determinism, science could not proceed* (and we and the universe which we know could not exist). An orderly world depends on determinism. Without some kind of ontological determinism, all would be chaos and everything would behave without rhyme or reason. Such a world could have no existence as we understand it and no science could investigate it.

Although it is rarely mentioned, Bateson, too, was a determinist. Whereas Maturana moved from the specific determinism of living systems to the more general structural determinism which applies to both the living and the nonliving, Bateson did the opposite. He fled from the all-encompassing physical determinism of Newtonian mechanics to the more circumscribed “mental determinism” (Bateson, 1972j, p. 465) of the world of *Creatura*:

... in addition to (and always in conformity with) the familiar physical determinism which characterizes our universe, there is a mental determinism. This mental determinism . . . is especially complex and evident in those sections of the universe which are alive or which include living things. (Bateson, 1972j, p. 465)

Maturana’s ontological claim is that the world is structure-determined (Maturana, 1975, 1978). What he means by this is that the behavior of all composite unities, whether they be living systems or inanimate objects, are fully determined by their structures (i.e., by the components of the unity and by the relations among those components). In other words, Maturana’s concept of structure determinism generalized his earlier thinking about the closure of living systems. The behavior of a living system in its medium is a specific case of the general—that we live in a world of structure-determined entities!

The structure of an object determines its behavior by specifying all of the interactions that it can undergo. That is, the structure of an object specifies which events in its medium it can interact with, and how it will behave under each and every one of these interactions. Finally—and this is important—in order to avoid confusing Maturana’s concept of structure with other notions of structure which the reader may previously have encountered—it is crucially important to keep in mind that *structure is not a static thing*. Structure alters with every interaction that it undergoes; this is especially true with regard to dynamic living systems which are constantly undergoing changes in their components and the relations among those components.<sup>1</sup>

With this single bold insight (i.e., structure determinism), Maturana has retrieved the grand mechanistic universe that was envisioned by Newton—but with a difference. Maturana’s determinism differs from that of Newton in a way that elegantly suits today’s relativistic, Einsteinian world. Newton portrayed a mechanistic world wherein forces and impacts *causally determined* the behavior of objects. Maturana insists that this view of causal determinism is ontologically impossible. Forces and impacts cannot and do not determine, specify, or instruct the behavior of an object. They are merely the historical occasion for the system to continue its structure-determined behavior.

Bateson (1972b, 1972f, 1979) made a similar distinction between Newtonian mechanics and the world of mental process, but tended to portray the distinction in terms of *energy*. He noted that, “when I kick a stone, I give energy to the stone, and it moves with that energy; and when I kick a dog, it is true that my kick has a partly Newtonian effect . . . but that is not the essence of the matter. When I kick a dog, it responds with energy got from metabolism. . . . The energy is already available in the respondent, in advance of the impact of events” (Bateson, 1979, p. 101). Bateson at one point conceded that “I oversimplify the matter by focusing only on the energetics because there is also the generalization . . . that only difference can trigger response” (Bateson, 1979, p. 102).

This qualification brings Bateson's analysis close to that of Maturana, but the gap between the two thinkers remains sizable; Bateson continued his analysis of differences (which make a difference) in terms of "coding, and the genesis of hierarchies of meaning" (Bateson, 1979, p. 102), both of which Maturana explicitly rejects.

How are we to understand our conviction (and our experience) that one thing *causes* another to happen? For Maturana, the word "cause" is synonymous with *instructive interaction*—a phenomenon which is impossible. In instructive interaction, A *unilaterally* determines how B will respond: a professor's lecture causes every student in the class to attain an identical understanding and, thereby, identical answers on their examinations; a therapist uses a particular intervention which always produces the exact same response in every client and family; and so on. Thus, when Maturana says that causality is impossible, he means that the professor's lecture did not determine the response of his students (that would be instructive interaction). The professor's lecture *selected* the student's responses, but their structure *determined* their responses. Selecting is akin to pushing the Sprite button on a Coke machine. Pushing the button selects the response of the machine (it gives you a Sprite), but it does not determine that the machine gives Sprites when the button is pushed. In essence, Maturana is claiming that our everyday use of the word "cause" always implies or threatens to imply a determining in the sense of instructive interaction—whereas "causation" is always only a selecting. Thus, he says causality is impossible. (For evidence that Maturana's concern about our understanding of "causality" is warranted, see Dell, 1984a.)

Instructive interaction, by the way, is lineal causality. Bateson came close, but never quite described lineal causality as a phenomenon which would entail instructive interaction. All of his efforts to describe lineal causality were inseparably tied to circular causality. I think that time will prove the dichotomy of instructive interaction vs. structure determinism to be more useful than the dichotomy of lineal vs. circular causality.

It is Maturana's contention that our conviction regarding the occurrence of causation is an epistemic consequence of our ontological status: (a) we exist in the physical world, and (b) we operate as observers in that world (Maturana, 1978). As observers, we *punctuate* what we see as involving causality and, in turn, characterize the world in which we live as a causal one.

The notion of causality is a notion that pertains to the domain of descriptions, and as such it is relevant only in the metadomain in which the observer makes his commentaries and cannot be deemed to be *operative* in the phenomenal domain, the object of the description. (Maturana, 1980b, p. xviii, emphasis added)

From our perspective as observers, we give causal priority to the *active agent* which "causes" (but is actually only *selecting*) another object to undergo some particular change (e.g., the moving cue ball in billiards "causes" the stationary ball to carom away). By punctuating the interaction in this fashion, we are ignoring the fact that it is the structure of the second object (i.e., the stationary ball) which determines that it *may* be perturbed, and *how* it will be perturbed, by other objects:

The states and the transitions of states of any system is determined by its organization [today, Maturana would say *structure*]. Accordingly, the states of the sense organs and of the organism (nervous system) as well as their transitions are necessarily determined by their organizations [again, Maturana would now say *structures*], and the environment as perturbing agent can only act as a historical instance for their occurrence, not however for their determination. (Maturana, 1974, pp. 458–459)<sup>2</sup>

Bateson (1979) referred to this same phenomenon of granting priority to the "causal" agent (and ignoring the structure of that which is "acted upon") as invoking "dormitive



principles" (p. 85). In Moliere's *Le Malade Imaginaire*, "we see on the stage a medieval oral doctoral examination. The examiners ask the candidate why opium puts people to sleep. The candidate triumphantly answers, 'Because, learned doctors, it contains a dormitive principle'" (Bateson, 1979, p. 85). Accordingly, Bateson sardonically referred to such one-sided explanations of "causal" interaction as "dormitive explanations" (Bateson, 1979, p. 85).<sup>3</sup>

When we are ineffectively coupled to some aspect of our world, we *begin* to be able to see that A does not unilaterally cause B. For example, Bateson (1972d, 1972g) was fond of describing the difficulties that were experienced by Lewis Carroll's Alice (in Wonderland) when she attempted to play croquet with a flamingo for a mallet and a hedgehog for a ball. The flamingo (mallet), who was being swung by her feet so as to crash the side of her head into a large insectivore (ball), was unwilling to accept this fate and repeatedly moved her head so as to avoid such indignity. Similarly, the hedgehog (ball) taking a dim view of being smacked with a long-legged bird, would alternately scuttle out of the way and curl up into a dangerously spiny ball (which, of course, only served to increase the flamingo's motivation to contort her body so as to avoid multiple impalements). Needless to say, Alice had extreme difficulty in coupling herself to the flamingo and the hedgehog in such a way as to "cause" the ball to go through the wickets. During this game, she obviously had very little experience being able to "cause" things to happen.

What is crucial to understand at this point is that there is no fundamental difference between our everyday interaction with the world and Alice's interaction with the flamingo and the hedgehog. All interaction involves structure-determined couplings between objects. If we are able to couple ourselves to objects in such a way that we can bring about a predicted or desired outcome, then we will have the psychological experience of causality.

The psychological experience of "causality," however, can never entail instructive interaction. Interactions consist of (and can only consist of) fit, match, or coupling. In order for us to have the psychological (and epistemological) experience of causing something to happen, *we must fit ourselves to the situation*. We must fit our structure to the structures with which we are dealing. For example, an adult can walk on this planet only because he or she matches, or has become coupled to, gravity. A mother's child-rearing techniques may work well with her first child but fail miserably with her second child. Why? Because it is the structure of the child that determines how he or she will behave, not the mother's child-rearing techniques. Therefore, if the mother wants to be effective with her second child, she must discover and use only those methods which fit that child, those which match his or her personality or disposition. In short, Maturana's concept of structure determinism forces us to reexamine much of our undifferentiated thinking about the nature of causality.

#### *Consequences of Structure Determinism*

With the preceding introduction to structure determinism, it can now be said that there are (at least) six major implications of Maturana's ontological claim that we live in a structure-determined world. First, the epistemological consequence is that objective knowledge is impossible. We can receive no objective information about the world. What we can know is always a function of the *interaction* between the operation of our structure-determined bodies and the world "out there":

Knowledge implies interactions, and we cannot step out of our domain of interactions, which is closed. We live, therefore, in a domain of subject-dependent knowledge and subject-dependent reality. . . . In fact, any knowledge of a transcendental absolute reality is intrinsically impossible; if a supposed transcendental reality were to become accessible



to description then it would not be transcendental because a description always implies interactions and, hence, reveals only a subject-dependent reality. (Maturana, 1978, p. 60)

Thus, we can only know the world through the structure-determined “lenses” of our own bodies. For this reason, Maturana puckishly insists that, “We are in the world like hanging from a string, immersing ourselves in various soups and describing the world by our changes of state according to the particular soup in which we are immersed” (Maturana, 1981).

Both Maturana and Bateson agree on the impossibility of objective information, but with a very important difference. Bateson’s position entails a subject-dependent epistemology, whereas Maturana’s stance involves both a subject-dependent epistemology and a “subject”-dependent or relativistic ontology. That is, two structure-determined systems are able to interact because their structures mutually specify that they are *capable* of being perturbations for one another; they interact because they *can* interact. Maturana’s structure determinism says nothing about a “real” or objective world. Bateson’s position, on the other hand, retains notable traces of objectivity. In particular, he speaks of the concept of *difference* as though it were objective. His phrase “news of difference” (Bateson, 1979, p. 29) implies that there are objective differences “out there.” Those differences which we receive “news of,” he called “effective differences” (Bateson, 1979, p. 99) or differences which make a difference. Differences which we do not receive news of, he called “potential differences” (Bateson, 1979, p. 99) or “latent differences, i.e., those which for whatever reason do not make a difference” (Bateson, 1979, p. 97). Bateson (1979) believed that “all perception of differences is limited by threshold” (p. 29): “Differences that are too slight or too slowly presented are not perceivable” (p. 29). In short, Bateson’s discussion of differences seemed to claim that there *is* an objective world “out there,” but that we cannot receive unfiltered information about it. This objectivity which is unmistakably entailed by Bateson’s discussion of differences is probably a direct consequence of Bateson’s focusing on epistemology while ignoring ontology. That is, Bateson insisted that objective knowledge (i.e., epistemology) was impossible; *his failure to squarely confront ontology, however, allowed objectivity to continue to exist—“out there.”* It is just that we cannot know it (i.e., we cannot know the *ding an sich*).

A corollary of Maturana’s understanding of the impossibility of objective knowledge is his insistence that an organism does not possess an internal representation or coding of the external world. Maturana’s position is in sharp contradistinction to that of Bateson who placed such coded representation at the heart of his understanding of mental process: “*In mental process, the effects of difference are to be regarded as transforms (i.e., coded versions) of events which preceded them*” (Bateson, 1979, p. 92). Maturana found that such a position (as Bateson’s) was not defensible when, for example, he demonstrated that no correlation could be established between colors (as defined by spectral energies) and the relations of activity of retinal ganglion cells of either pigeons or human beings (Maturana, Uribe & Frenk, 1968). Instead, he found that the nervous system demonstrated its own *internal* correlations: the relations of activity of retinal ganglion cells correlated with color-naming behavior of the organism (but did not correlate with the actual colors as defined by spectral energies)! The implication of this finding is that the nervous system functions as a closed, internally consistent system and does *not* contain representations or coded transforms of the environment:

notions of representation and of coding of information have validity only for describing the interactions of the observer with the observed organism when he considers the nervous system as an open system, and not for the characterization of *its* organization as a neuronal network. In other words, the observer, who sees the organism in its interactions with the environment, can treat the changes that the organism undergoes as



representations of the circumstances of its interactions, and describe it in these terms, but by doing this he describes a system different from the one that the organism with its nervous system is. (Maturana, 1974, p. 469)

Second, as already described, a causality that involves instructive interaction is ontologically impossible.

Third, because such causality is impossible, control is impossible too. Systems may be coupled to one another, (e.g., the mother who uses effective child-rearing techniques), but control (in the sense of instructive interaction) is ontologically impossible. As noted earlier, Bateson, too, for reasons different from those of Maturana, considered all attempts at control to be an epistemological error: "We do not live in the sort of universe in which simple lineal control is possible. Life is not like that" (Bateson, 1972a, p. 438).

It is often claimed that systems are hierarchically organized. This claim is made because it is convenient for an observer to describe or punctuate a system in terms of the metaphor of hierarchy. Nevertheless, it must be understood that all notions of hierarchical control are subject to the same restrictions mentioned above. The apparent hierarchies which we perceive in families and other systems are due to our focusing on a particular, discrete, sequence of behavior. Any sequence of behavior which has been isolated from the whole of the system will *necessarily* appear to be hierarchical. That is, one component of the sequence of interaction will always be seen to "control" or trigger the behavior of one or more other components.

Fourth, structure-determined systems are necessarily "perfect." In what sense are they "perfect"? Structure-determined systems are perfect in the sense that they *never* make mistakes; they always behave according to their structure. Therefore, whenever we claim that an organism has made a mistake we are using the unachieved goal as our point of reference; we are *not* using the organism's structure as our referent. If the organism's structure were our point of reference, then we would see (a) that it is behaving "perfectly," and (b) that it is behaving in the only way that it can behave in those circumstances: it is behaving according to its structure. It is ironic to note in this regard that it is only *because* structure-determined systems are perfect that those behaviors which we call "mistakes" can occur in the first place! That is, *it is only because a system behaves according to the autonomous dictates of its own structure that it can be "out of sync" with its environment*: "if it were not the case that perturbations only constitute triggering<sup>4</sup> circumstances for internally determined changes of state, inadequate behavior, that is, behavior that for an observer appears out of context, would never take place" (Maturana, 1975, p. 327).

The extent to which the preceding argument, regarding the perfect functioning of structure-determined systems, strikes the reader as difficult, and/or trivial, and/or annoying is a measure of how committed he or she is to semantic or contextual explanation as opposed to structural explanation. Semantic and contextual explanations take the form of: "He is doing that 'because of' (something which is happening or has happened)"; "she is doing that 'in order to' (accomplish something in the environment)"; "the function of his behavior is' (to accomplish this, cope with that, etc)." This brings us to the next major implication of structure determinism.

Fifth, a structure-determined system functions solely according to its structure—not according to purposes (Maturana, 1974, 1975, 1978, 1980a, 1980b, 1982a; Maturana & Varela, 1973). Such meaningful interpretations of the operation of a structure-determined system exist *only* in the domain of descriptions of an observer:

the semantic value of an interaction . . . is not a property of the interaction, but a feature of the description that the observer makes by referring to it as if the changes of state of the interacting systems were determined by their mutual perturbations, and not by their respective individual structures. (Maturana, 1975, p. 330)



In other words, explanations in terms of purpose and function (i.e., those which meaningfully relate the behavior of an organism to its context) are of the same kind as explanations of evolutionary adaptation which claim such things as “*Homo sapiens* developed an opposable thumb *in order to* manipulate tools.” Accordingly, Maturana flatly insists that any semantic/contextual description “which is not intended as a mere metaphor, is intrinsically inadequate and fallacious” (Maturana, 1975, p. 322).

Bateson’s views on this matter *appear* to be quite different. He considered context to be essential to all mental process: “Without context, words, and actions have no meaning at all. This is true not only of human communication in words but also of all communication whatsoever, of all mental process, of all mind, including that which tells the sea anemone how to grow and the amoeba what he should do next” (Bateson, 1979, p. 15). Actually, however, Maturana would substantially agree with Bateson, but would proceed to argue that Bateson’s position will inevitably lead him astray because Bateson does not include structure determinism in his understanding of context.

The sixth major implication of structure determinism is perhaps the most important of all. Structure determinism directly implies a phenomenon that Maturana calls *structural coupling* (Maturana, 1975, 1978, 1980a, 1980b, 1982b; Maturana & Guiloff, 1980). Structural coupling is Maturana’s description of the relationship between a structure-determined entity and the medium in which it exists. The significance of structural coupling is that it is *the* fundamental phenomenon of structure determinism. Structural coupling is the process which has given us the organized universe in which we live. It organizes, and is constitutive of, every complex system that has ever been in existence. Epistemologically, structural coupling is the phenomenon which gives us science. Ontologically, structural coupling is synonymous with existence. Phenomenologically, it is the process in living systems which has often been misidentified as “homeostasis,” “hierarchy,” or the “rules” of the system (Dell, 1982, 1984b).

Let us begin with ontology. That which exists *must* be structurally coupled to the world (in which it exists); that which is not structurally coupled to the world cannot exist (in that world). “Structural coupling as the relation of complementarity between a unity and its medium . . . is a constitutive condition of existence for every unity” (Maturana, 1982b). A structure-determined object is coupled to the world (in which it exists) as long as the interactions with that world do not lead the object to disintegrate. If the interactions do lead the object to disintegrate, then the object no longer exists and, of course, it is no longer structurally coupled (to the world in which it used to exist). At first glance, this equating of structural coupling with existence seems to be almost trivial. After all, what is to be gained by claiming that a rock, because it exists, is structurally coupled to its world? Much.

To being with, structural coupling is the phenomenon which underlies and, in fact, constitutes that which we usually refer to as “cognition” (Maturana, 1970a, 1970b, 1974) or “intelligence” (Maturana & Guiloff, 1980), and that which Bateson (1972, 1979) has called “mind.” To be structurally coupled is to behave intelligently (Maturana & Guiloff, 1980). The most fundamental behavior is *to exist*; the most fundamental knowledge is *to “know how” to exist*. A rock knows how to exist. In a similar fashion, it can be seen that the most fundamental knowledge that a living organism must possess is to know how to survive. If an organism is able to continue functioning as a living, autopoietic unity, then that organism is structurally coupled to its medium. That is, its interactions with that medium do not result in the organism’s destruction. Thus, as Maturana has pointed out, to know is to live—and to exist as living is to behave intelligently (Maturana & Guiloff, 1980). Everything that psychologists have ever labeled as “intelligence” is founded upon, and is indistinguishable from, the structural coupling that allows an organism to continue living in its environment. Bateson (1979) has said that epistemology must include all the various knowings of which *Creatura* is capable:



in the anything which these creatures variously know, I included “how to grow into five-way symmetry,” “how to survive in a forest fire,” “how to grow and still stay the same shape,” “how to learn,” “how to write a constitution,” “how to invent and drive a car,” “how to count to seven,” and so on. (Bateson, 1979, p. 4)

The implication of Maturana’s work is that ontology includes the most fundamental “knowing” of all—“how to exist.”

Now, it is obviously the case that the complex behavior of mammals appears quite different from the simple behavior exhibited by rocks and the more primitive forms of life. There is something about the nature of a mammal’s structural coupling to its environment that makes us want to call such animals “intelligent,” whereas we resist the idea of rocks or protozoa being “intelligent.” What is this difference?

The most readily apparent difference, of course, is that mammals are more complex than the lower forms of life or nonliving entities. That is, a mammal has a larger domain of possible states than a paramecium or a rock. Complexity, however, is not the crucial difference. The crucial difference is that this complexity is founded upon *structural plasticity*. A structurally plastic system is one which undergoes structural changes as a result of interacting with itself, its environment, or other structurally plastic systems. In other words, although the structure of the system determines how it will “react” to a particular perturbation at a given instant, that interaction, in turn, leads to structural change which will alter the future behavior of the system. Thus, a structurally plastic system is a learning system.

It is structural plasticity which creates the difference in behavior between a mammal and a rock that makes us want to call one intelligent and the other not.<sup>5</sup> That is, whenever a structurally plastic system is structurally coupled to its environment, that system will appear to behave intelligently because its plasticity results in its having continuing *changes* in its “responses” to the environment. And, as long as the animal lives, its behavior will, by definition, be adequate to its environment. This would seem to be the minimal requirement for judging that an organism has intelligence: it fits its environment. Moreover, so long as it survives, its behavior will, over time, become more richly coupled to the regular perturbations of its environment:

If the organism and its nervous system are structurally plastic, the continuous realization of the autopoiesis of the organism necessarily results in a structural coupling of the organism and nervous system to each other, and to the medium in which the autopoiesis is realized. (Maturana, 1975, p. 331)

This phenomenon is profoundly important because *structural coupling is the building block of all human and animal interactional systems*. That is, as long as it survives, a structurally plastic system will automatically and rapidly become richly coupled to its environment. Therefore, if the environment consists of other structurally plastic systems, then it follows that these systems will rapidly become more richly coupled to one another. Moreover, this coupling “is a necessary consequence of their interactions, and is greater the more [that the] interactions take place” (Maturana, 1975, p. 327). Bateson has described this same phenomenon in terms of the *self-healing tautology*: “Left to itself, any large piece of *Creatura* will tend to settle toward tautology, that is, toward internal consistency of ideas and processes” (Bateson, 1979, p. 206).

At this point, part of the significance of Maturana’s ontology for social science becomes apparent: *Structure-determined living systems automatically become organized into interactional systems*. Whenever two or more structurally plastic living systems interact they will begin to co-evolve a closed pattern of interaction. They will form a system. When a system is understood in terms of structural coupling, it can be seen that there is no need to explain the system’s organization in terms of homeostasis, systemic rules, or control hierarchies (Dell 1982, 1984b). The system arises naturally from the

way its structurally plastic components fit together. Such a system results from, and *is*, the structural coupling of its components. The system is the way that its components fit together. Consequently, there are no systemic processes which create, regulate, or maintain the system: all behavior of the system derives directly from the interaction of its structure-determined components. Ideas such as homeostasis, regulation, systemic rules, and so on, are merely an observer's *description* of the functioning of the system. Such descriptions have no explanatory value because they do not refer to any processes which are actually operative within the system: "Control and regulation are not operational phenomena taking place in the actual interactions of the components of a dynamic composite unity; they are descriptions of the course of these interactions, made by an observer . . ." (Maturana, 1982b).

## FROM BATESON TO MATURANA

Bateson invoked *mind* ("an aggregate of interacting parts or components . . . triggered by difference," Bateson, 1979, p. 92) both as an explanatory principle and as his fundamental unit of analysis. In keeping with this, he explained the behavior of any given organism not in terms of the organism itself, but in terms of the organism as an interacting part of the larger mind (see especially, Bateson, 1972c, 1972e). Similarly, Bateson claimed that the fundamental unit of evolutionary survival is not the organism or species, but rather the organism-plus-environment (i.e., mind). He called this view a *cybernetic epistemology*:

The individual mind is immanent but not only in the body. It is immanent also in pathways and messages outside the body; and there is a larger mind of which the individual mind is only a subsystem. This larger mind is comparable to God and is perhaps what some people mean by "God," but it is still immanent in the total interconnected social system and planetary ecology. (Bateson, 1972e, p. 461)

In Maturana's terms, what Bateson called "mind" would be the *structural coupling* of living organisms to one another and to the niche in which they exist. Herein lies the heart of the difference between their views. Bateson posits mind as *fundamental* whereas, for Maturana, what Bateson called "mind" (i.e., structural coupling) is *derivative* (of structure determinism).

Bateson had claimed that the systemic view constitutes the correct epistemology of the living world, but his thinking does not explain how this should be the case. Maturana's structure-determined ontology provides an answer to that question. The living world is organized systemically because systemic organization (i.e., structural coupling or mind) is a necessary consequence of the interaction of structure-determined living systems. As long as they live and interact together, living systems will automatically become structurally coupled to one another such that they form a closed interactional system. In other words, Maturana's concept of structure determinism generates and elaborates Bateson's cybernetic epistemology. Moreover, structure determinism clarifies Bateson's work by removing the remaining traces of objectivity (see pp. 21–22 of this paper).

With his ecosystemic view of the world, Bateson elevated cybernetics and systems theory to the status of "an epistemology." Moreover, he seemed to claim that the epistemology of the systemic outlook is the correct epistemology of the world. In his view, failure to recognize that we live within a cybernetic epistemology almost always results in epistemological error. Accordingly, Bateson often preached against the dangers of epistemological error which could, he claimed, provoke interpersonal and ecological catastrophe. The primary directive that issues from Bateson's epistemology is that "no part of such an internally interactive system can have unilateral control over the



remainder or over any other part” (Bateson, 1972c, p. 315). Epistemological error occurs whenever this directive is not obeyed.

Bateson’s concept of epistemological error is really a statement about the nature of causality. In fact, Bateson’s views about epistemological error were actually a reiteration of his longstanding disenchantment with the notion of lineal causality. During the 1950’s, Bateson realized that the circular organization of a system precluded the operation of lineal-causal processes within that system. Systems, according to Bateson, are characterized by circular or mutual causal processes. Eventually, Bateson came to believe that the entire world of the living was one gigantic system, “a sacred unity.” This insight, of course, further discredited lineal causality for Bateson because he had come to believe that *the entirety of Creatura is ruled by circular causal processes*. As a consequence, Bateson’s cybernetic epistemology leaves no room for lineal causality—at least in the world of the living. Any attempt to introduce lineal causality into the realm of Creatura was branded as an epistemological error. Why? Because “no part of such an internally interactive system can have unilateral control over the remainder or over any other part.”

In a structure-determined world, it is not possible for an object to instruct the behavior of another object. Bateson’s dictum, that the part cannot control the whole, is probably the way that structure determinism and the impossibility of instructive interaction manifested themselves to him. The impossibility of lineal control *within* a system is, however, only a specific case of the general (phenomenon of structure determinism). That is, Bateson argued that the part cannot control the whole because the part is, indeed, *part* of the system and is, thereby, *itself* subject to the circular causal processes in which it participates. Nevertheless, even if the part were *external* to the system, it still could not exercise control because structure determinism makes instructive interaction ontologically impossible. Thus, it can now be seen that what Bateson called “epistemological error,” Maturana would call the *myth of instructive interaction* (see Dell, 1984a).

## BIOLOGY AND THE SOCIAL SCIENCES

The efforts to provide a solid foundation for the social and behavioral sciences have been notoriously unsuccessful. As Bateson (1972j) has noted, the social sciences are composed of (a) a maze of “imperfectly defined” (p. xviii) concepts, (b) which are poorly related to one another, and (c) which have no common foundation such as that which is possessed by the concepts which are found in chemistry and physics. Theorists in the behavioral sciences have vacillated, on the one hand, between (unsuccessful) attempts to emulate the hard sciences and, on the other hand, insistent declarations that the social sciences are radically different from physics or chemistry. Through the years, various explanatory metaphors (e.g., Newtonian mechanics, electricity, hydraulics, thermodynamics, information processing, etc.) have been used to generate theories of social phenomena. Each of these metaphors has proved to be interesting, and ultimately, unsatisfactory. This chronic situation of (ultimately) inadequate theory has left social scientists on the defensive vis-à-vis their colleagues in the hard sciences.

The difficulties intrinsic to the social sciences are at least twofold. First, any rigorous attempt to study the realm of human beings is quickly confronted with the problem of the observer and the question regarding the epistemological status of objectivity. In contrast, the hard sciences are only sporadically afflicted with such nettlesome issues. Second, *understanding*, a capacity with which only human beings are blessed, is intrinsic to the very essence of any social science (*Geisteswissenschaften*). The subject matter of the hard sciences (*Naturwissenschaften*) has no need—and, indeed, no place—for understanding. They proceed via scientific explanation. Many theorists believe that the divi-



sion between the social sciences and the natural sciences, between understanding and explanation, is so deep and so fundamental that a true science (i.e., science as it is conceptualized by hard scientists) of the social realm is simply impossible. Thus far, no social scientist or philosopher of science has succeeded in proposing an adequate (i.e., generally acceptable) foundation for the social sciences. It is at this juncture that Maturana's work may be of help.

Maturana's ontological biology (in conjunction with the highly compatible cybernetic epistemology of Bateson) may finally provide a foundation for the social sciences<sup>6</sup> because his work simultaneously addresses (a) the problem of the observer, (b) the epistemological status of objectivity, and (c) the relation between *Geisteswissenschaften* and *Naturwissenschaften*. Put simply, Maturana's generative hypothesis (of the structure-determined functioning of the autopoietic unity in structural coupling with its medium) provides a single consistent explanation of how human language arises, of what language consists, and of the three above-mentioned problems.

Maturana (1978) has shown that language is not located in the brain; rather it arises and exists solely as a concrete elaboration of our structural coupling with other highly structurally plastic organisms in our medium. This particular form of structural coupling (i.e., coordination of conduct about coordination of conduct) is constitutive of our existence as human beings and appears to be possible under certain circumstances in chimpanzees, gorillas, and, perhaps, dolphins. It is through this elaboration of structural coupling that the making of distinctions becomes possible and that objects arise (Maturana contends that objects do not exist prior to language).

An organism which can make distinctions (because it coordinates conduct about coordination of conduct with other organisms) is an *observer*. Given the closure of the nervous system, it can be seen that the observations of an observer cannot be objective. Why? Observations cannot be a grasping of objective truths about the world, because they are always only structural interactions with the medium. Thus, the distinctions which arise through perception in language are determined by the structure of the organism and not by the medium which he or she observes. Does this mean that the observer can make *any* observation (i.e., is this a solipsistic observer)? No. The observer cannot make just any observation; he or she can only make those distinctions which are *allowed* by his or her operation in structural coupling with the medium. My structural coupling with the medium is such that I cannot distinguish any gralnicks (whatever they might be). My structural interaction with the medium does not allow such a distinction.

What is important to understand here is that perception is not and never can be objective—and yet, *all* observations have equal validity, even the pink elephants seen by the hallucinating alcoholic. The classical Freudian may distinguish an oedipal complex when (a) a Kleinian would distinguish projective identification, (b) a structural family therapist would distinguish diffuse boundaries, (c) a strategic therapist would see more of the same solution being applied, and (d) the drunk would see still more pink elephants. None of these observations are objective, but all of them are valid in that they are specified by the structure of the observer in conjunction with what that observer's interaction with the medium allows. For these reasons, Maturana insists that all realities which we bring forth are legitimate.

The implication of all this is that we, as human beings who live in language, live in a *multiverse* rather than a universe. That is, each of the various distinctions which we bring forth in our structural interaction with the medium is uniquely legitimate, inherently whole, and nonintersecting (with other distinctions which are drawn by the same observer or by other observers). Distinctions which *seem* to overlap or which one can apparently collapse into one another (e.g., *pages* and a *book*) are no exception to this rule. The distinctions *page* and *book* are fundamentally nonintersecting and are only



seen to overlap when an observer collapses the multiverse into a universe because he or she believes that objects have an objective existence (i.e., independent of the observer and his or her distinctions). In a multiverse, truth is not objective and unitary; rather, it is manifold. Truth, then, is manifest to the observer in each and every distinction which he or she draws.

Social systems (such as families) are distinctions which are drawn by the observer when he or she distinguishes an organized pattern of interaction among living organisms. There is, however, no objective social system—no way, for example, that the Smith family *is*. Instead, each observer (who distinguishes what he or she calls “the Smith family”) will make his or her own unique distinction. Thus, in keeping with this point, therapists from different schools of family therapy will each draw different distinctions. Ivan Boszormenyi-Nagy, Murray Bowen, Dick Fisch, Carolyn Attneave, and Sal Minuchin will each bring forth very different systems which all of them will call “the Smith family.” And, despite the fact that each has brought forth a very different reality, a very different truth, each will probably be able to work effectively with “the” Smith family.

This, then, makes it abundantly clear that questions pertaining to the appropriate unit of treatment (i.e., couple, nuclear family, extended family, network, etc.), diagnosis, and the nature of pathology can never be resolved by appealing to a supposedly objective system which lies before us. There is no objective system; there are only the various distinctions that different observers draw.

### *Reprise: Biology of Cognition and Cybernetic Epistemology*

The work of Maturana is a set of distinctions brought forth by an observer who is operating in structural coupling with his medium. Like all other distinctions, those of Maturana are uniquely legitimate but have no claim to the status of being objectively truthful. Still, they are an enormously comprehensive and powerful set of distinctions. With full awareness of his inability as an observer to avoid illusion or to operate outside of language, Maturana has proceeded to set forth a generative hypothesis: we are structured-determined autopoietic unities who operate in structural coupling with our medium. In turn, this hypothesis has proved able to generate (and, thereby, to explain) (a) the relation between the organism and its medium; (b) the nature of the structural coupling of organisms to one another; (c) the nature of social systems; (d) the manner in which language arises; (e) the nature of language; (f) the nature of the observer; (g) the manner in which we, as observers, operate in language, make distinctions, and call forth realities; and thereby, (h) how Maturana himself, as such an observer, has been able to advance the very generative hypothesis which specifies all of the above, including his own functioning as a human being who makes such distinctions and advances such hypotheses. In other words, without escaping his constitutively limited standpoint as a human observer, he has delineated a generative mechanism which has enormous explanatory power and, yet, is fully congruent with his constitutively limited standpoint as a human observer.

Finally, it must be emphasized that, like Bateson before him, Maturana has approached human and social phenomena as a biologist (not as a philosopher). By returning us to the biological roots of our existence—not in the reductive fashion of biological psychiatry or sociobiology, but in terms of ontological biology—Maturana (and Bateson) may at long last be providing us with the sound foundation which the social and behavioral sciences so sorely need.

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## NOTES

<sup>1</sup>Until his delineation of the concept of structure determinism and its implications, Maturana had been thinking as an epistemologically oriented biologist; since then, he has, in my opinion, been thinking as a biologically oriented ontologist. There is far greater convergence between the ideas of Maturana and Bateson during Maturana's earlier period (Maturana, 1970a, 1970b, 1974; Maturana & Varela, 1973) than is the case with Maturana's more recent thinking (Maturana, 1975, 1978, 1980a, 1980b, 1982b) which explicitly focuses on structure determinism.

<sup>2</sup>Maturana's concept of structure determinism is strikingly similar to Leibniz' windowless monads: “each monad is self-sufficient; its concept contains all its predicates, past, present and future, and hence it may not be acted upon by anything outside itself” (McMullin, 1978, p. 30). Thus, “strictly speaking, a body which strikes another is an occasion for the active forces internal to the second to manifest themselves, rather than a *cause* of its consequent motion” (McMullin, 1978, p. 31).

<sup>3</sup>NOTE: Bateson most often used the term, “dormitive explanations,” to refer to empty explanations (e.g., explaining a person's depressive behavior as follows: Q. Why is that person behaving that way? A. Because she is depressed). Only in one of his last publications (1979) does Bateson use the label, “dormitive explanations,” to refer to one-sided explanations.

<sup>4</sup>Maturana is adamant about using the word, *triggered*, (as opposed to “caused”) to describe the nature of structure-determined interaction. It is interesting to note that Bateson is equally



<sup>4</sup>Maturana is adamant about using the word, *triggered*, (as opposed to “caused”) to describe the nature of structure-determined interaction. It is interesting to note that Bateson is equally insistent upon this point, but for somewhat different reasons (see p. 8 of this article): “it is clear that mental processes are triggered by difference” (Bateson, 1979, p. 100). Bateson goes on to say that, with the regard to this quotation, “the word *triggered* was used with intent. The metaphor is not perfect, but it is at least more appropriate than those metaphoric forms which ascribe relevance to the energy contained in the stimulus event” (Bateson, 1979, p. 101). In further discussing the matter, Bateson also offered the word “released” (Bateson, 1979, p. 102) as an acceptable alternative to “triggered.” In his Spanish language writings, Maturana frequently uses the word, “*desencadenar*,” which means “to release.”

<sup>5</sup>Interestingly, Bateson also compared the ongoing survival of a rock to that of a living creature:

the rock’s way of staying in the game is different from the way of living things. The rock, we may say, *resists* change, it stays put, unchanging. The living thing escapes change either by correcting change or changing itself to meet the change or by incorporating continual change into its own being. “Stability” may be achieved either by rigidity or by continual repetition of some cycle of smaller changes, which cycle will return to a *status quo ante* after every disturbance. (Bateson, 1979, p. 103)

The difference between the ontological “intelligence” of a rock and Bateson’s position lies largely in Bateson’s preference for contextual as opposed to structural explanation. By choosing to explain the behavior of things in terms of context, Bateson is led to describe objects and organisms in terms of surviving versus changing. This is an observer’s *punctuation* of the interaction. More important, however, Bateson portrayed stability or survival as an *active* opposing of change via resisting, correcting, adapting, or incorporating. To punctuate the interaction in such a fashion is to commit the “fallacy of resistance” (Dell, 1982) which assumes that environmental events *ought* to change a system and, that if they do not change the system, that the system’s stability must be *explained*—via notions of resistance, homeostasis, correcting, adapting, incorporating, and so on (see also Dell, 1984a, 1984b).

<sup>6</sup>In fact—and this claim is so startling that I consign it to a footnote so as not to overly disturb the reader—Maturana’s ontological biology even provides a foundation for physics: biology of physics.

