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GREGORY BATESON ON DEUTERO-LEARNING AND DOUBLE BIND: A BRIEF CONCEPTUAL HISTORY

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The concepts of *deutero-learning* and *double bind* have acquired an increasingly important status in various fields of social and behavioral science, particularly in psychiatry, psychotherapy, organization, and policy science. With this proliferation, however, their original meaning and significance has become increasingly muted. In this article it is argued that both concepts are important ingredients of a *behavioral* theory of (organizational) learning. To support this argument, the development of both concepts is traced to the work of Gregory Bateson. In Bateson's thinking, the two concepts have a firm base in dyadic behavior and interaction. © 2003 Wiley Periodicals, Inc.

The concepts of deutero-learning and double bind have acquired an increasingly important status in various fields of social and behavioral science. Defined very briefly as, respectively, "learning to learn" and "pathological deutero-learning," the concepts have become influential in the work of the so-called Palo Alto and Milan schools in psychiatry and psychotherapy (Abeles, 1976; Bateson, Jackson, Haley, & Weakland, 1956; Burbatti & Formenti, 1988; Burbatti, Castoldi, & Maggi, 1993; Haley, 1963; Koopmans, 2001; Ruesch & Bateson, 1951; Sluzki & Veron, 1971; Watzlawick, Bavelas, & Jackson, 1967). In more recent years, the concepts have gained prominence in the fields of organization and policy science as an integral part of "organizational learning" (Argyris & Schön, 1978, 1996; Dopson & Neumann, 1998; French & Bazalgette, 1996; Hennestad, 1990; Hirschhorn & Gilmore, 1980; Huysman, 2000; Schön, 1975; Sinkula, 1994; Wijnhoven, 2001).

As often occurs when concepts are transferred to other fields than their original ones, their meaning changes and becomes more diverse. This is especially true for the fields of organization and policy science where theoretical diversification and "paradigmatic" proliferation seem to be the rule rather than the exception. Thus, deutero-learning and double bind became subject to different (and increasingly incompatible) reconceptualizations and redefinitions that tended to treat these concepts as properties of individual mental states instead of dyadic interactions. Moreover, the concepts came to be treated separately, where in their original conceptualization they were closely tied together.

It may be persuasively argued that deutero-learning and double bind are important ingredients of a *behavioral* theory of learning. They hold out the promise of simplifying and integrating different theories of organizational learning by focusing on observable interactions instead of largely unobservable individual variables. This article contributes to this argument by tracing the development of both concepts to the life and work of their intellectual father, the scientist Gregory Bateson.

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The work of Bateson is characterized by an unusual breadth of scope, contributing to such disparate fields as anthropology, biology, psychiatry, psychology, ecology, communication, and so forth. Rather than attempting to provide an overview, this article is confined to Bateson's work in psychology and psychiatry, particularly in learning and communication. Although it is tempting to trace the influence of Bateson's ideas to modern fields of science, such as nonlinear system dynamics and ecological psychology, this temptation has been resisted for reasons of brevity and article size and scope.

Therefore, in this article the early development of the concepts of deutero-learning and double bind during the 1940s and 1950s is discussed first. In the next section an experiment on deutero-learning (the "creative porpoise") is treated in some detail, after which a more final formulation of both concepts is given.

Early Development of the Concepts: 1942–1963

By 1942, Gregory Bateson (1904–1980) was already well known in the field of anthropology with his studies of the Balinese and Iatmul tribes. An Englishman from a family of renowned scientists (his father was a famous biologist, who translated Mendel and corresponded with Darwin), he received his formal education in anthropology at Cambridge. From his early upbringing, Bateson had retained a strong ambivalence about genetics and their influence on behavior. He came to support the views of Baldwin and Waddington on genetic assimilation, holding that the environment does have effects on the development of the genome. Further, from his Cambridge years Bateson took over a fundamentally psychological approach to anthropology, which he combined with a conception of evolution as a process of learning and communication (Wardle, 1999). In addition, he was skeptical about the then prevailing Freudian influences in anthropology in which common denominators in culture and personality were sought in instinctual drives. Instead, Bateson adopted a learning approach: "[Man] appears to us . . . as a creature who *learns.* The face of human flexibility under environmental experience determines the main focus of our scientific attention" [quoted in Lipset (1980, p. 171); see also Levy & Rappaport (1982)].

During World War II Bateson was employed by the U.S. Office of Strategic Services, where he attempted to make anthropological insights useful in the allied war effort. Preparing a article for the second symposium on science, philosophy, and religion in 1942, Bateson pondered ways to connect basic findings of learning experiments to broader notions of culture and personality. Regarding the learning experiments, Bateson had been introduced to behaviorism by his wife and coworker, Margaret Mead, during the 1930s. He also reviewed two important behaviorist books for the *American Anthropologist* (Bateson, 1941a,b). It was a conversation with psychologist Lawrence Frank, however, that sparked his interest. Frank told Bateson about a commonplace phenomenon in psychological laboratories. Animals who are subject to a series of different experiments become "test-wise," that is, they learn different tasks faster than naive animals who enter an experiment for the first time (Lipset, 1980).

In his symposium article ["Social Planning and the Concept of Deutero-Learning", reprinted in Bateson (1972, pp. 159–176)], Bateson used this observation to distinguish two types of learning—simple, operational learning and Gestalt learning (alternatively referred to as "acquisition of insight" and "apperceptive habits"). Regarding the latter, Bateson noted, "these sorts of habit . . . are, in some sense, byproducts of the learning processes . . . We are raising questions one degree more abstract than those chiefly studied by the experimental psychologists, but it is still to their laboratories that we must look for our answers" (Bateson, 1972, p. 166).

Simple learning was denoted as "proto-learning," the adaptation of behavior in response to contingencies of reinforcement. Gestalt learning was defined as deutero-learning, the changes in proto-learning as a result of "insight" in the structure (or class) of the situation in which proto-learning takes place. In experimental terms, proto-learning may be visualized through a simple learning curve in which the percentage correct responses increases with the number of consecutive trials in an experiment. In each successive trial, the subject solves the problem posed by the experimenter, more rapidly. When the same subject has been exposed to a series of identical or different learning experiments, it is usually found that the proto-learning curves will become steeper in each successive experiment, denoting an acceleration in proto-learning. In experimental terms, deutero-learning may be visualized by plotting the percentage correct responses after some definite number of trials against the number of consecutive experiments.

As a second step in the article Bateson pointed to the "acquisition of insight" outside the laboratory, in the complex world of relationships and cultural phenomena the individual inhabits. Here cultures could be classified as classical Pavlovian, instrumental reward, instrumental avoidance, or rote learning according to the prevailing context of proto-learning. Bateson considered the possibility that a person, reared under Pavlovian conditions, could adopt different beliefs and attitudes than a person brought up under conditions of instrumental reward.

In its first conceptualization, the concept of deutero-learning thus held the broad middle ground between experimental evidence and various aspects of national culture and personality, between behaviorism and anthropology as it were. This combination of high-level concepts and low levels of observation was typical for Bateson. His research style was unconventional to the extent that theory took precedence over empirical observations. Instead of inductive generalization, Bateson favored abduction, where he used empirical data as an illustration of his concepts, not as empirical proof. He often collected small amounts of data that were discarded when the thinking they were intended to support was done (Levy & Rappaport, 1982; Lipset, 1980).

At the time of the symposium article, Bateson had developed various of these broad concepts. However, he lacked an overarching theoretical framework in which these concepts could be related to one another. This changed when Norbert Wiener and two coauthors published a small article that is commonly regarded as the beginning of cybernetics (Rosenblueth, Wiener, & Bigelow, 1943). In 1942 Bateson attended a conference (hosted by the Josiah Macey Jr. Foundation) with, among others, John Von Neumann, Warren McCulloch, Walter Pitts, Mead, and Frank as participants. At this conference there was much informal discussion about the article by Wiener that attracted Bateson's attention at once (Lipset, 1980).

Another Macy conference in March 1946 was especially important for Bateson's intellectual development. It was at this conference (whose participants included Kurt Lewin, Claude Shannon, Donald Marquis, Heinz Von Foerster, Wiener, McCulloch, and Von Neumann) that the term cybernetics was first coined. Here, Wiener and Von Neumann presented Bateson with an array of concepts from mathematics and engineering (e.g., analogical and digital coding, positive and negative feedback, servomechanisms, circuits, information, and entropy) that had a major theoretical impact on the rest of his work. To Bateson, cybernetics "seemed to promise a unified structure for the whole of behavioral science—a disciplinary utopia of virtually unrestricted use" (Heims, 1977; Lipset, 1980, p. 182).

Wiener in particular impressed him and after the conference Bateson adopted him as his intellectual mentor. The two men shared an interest in cross-disciplinary principles, and both favored a heuristic, intuitive use of the exact theorems of physics and mathematics in appli-

cation to other fields. One of these theorems was Russell and Whitehead's "theory of logical types", which Wiener — who had been a student of Russell — introduced to Bateson.

Stated briefly, the theory of logical types asserts three things. First, no class can be a member of itself. Classifying the name with the thing named amounts to an error in logical typing, comparable to "eating the menucard instead of the dinner" (Bateson, 1972, p. 280). Second, a class cannot be one of those items that is correctly classified as its nonmembers. For example, we can establish the class of "chairs" and note that tables and lamps are members of the class of "nonchairs". It would be formally incorrect, however, to classify the "class of chairs" among the class of "nonchairs." Third, if these two rules are contravened, a paradox will occur. In the world of logic, the occurrence of a paradox will negate a chain of propositions and reduce it to zero. In the real world, however, there is always time involved that prevents a total negation of events. As an example, Wiener described the response of a computer when confronted with a Russellian paradox — an eternal oscillation between yes-no-yes-no. Bateson had been concerned with deutero-learning and "it was apparent that learning about learning could lead to something analogous to a Russellian paradox" (Heims, 1977, p. 150).

After World War II Bateson held a series of temporary appointments at various institutes. From 1948 to 1950, he collaborated with the Swiss psychiatrist Jurgen Ruesch on a book in which the new cybernetics was introduced into psychiatry. Applying the theory of logical types to communication, Bateson was the first scientist to note that analogic messages (i.e., nonverbal aspects like tone of voice, facial expression, and physical gesture) are of a higher logical type than digital messages (i.e., verbal content) and thus constitute a communication about the communication or metacommunication. Confounding these message levels may lead to pragmatic paradoxes, as evidenced in play, humor, pathology, therapy, and creativity (Ruesch & Bateson, 1951).

The notions of message levels and paradox led to an important step in the development of the concept of deutero-learning. In a letter in 1954 Bateson noted, "Type confusion leads to paradox when both message and meta-message contain negatives. On this principle we can imagine the generation of paradox in the deutero-learning system when an organism experiences punishment following some failure and learns that it must not learn that punishment follows failure" [quoted in Lipset (1980, p. 205)]. This became the leading thought in the conceptualization of the double bind, later defined as "pathological deutero-learning" (Bateson, 1963, p. 180). A mother who punishes her child for a certain behavior, namely, yelling, and then also punishes the child for learning that punishment will follow yelling, induces a paradox in the child by combining negative proto-learning with negative deutero-learning. The child is thus put in an untenable position because every reaction he or she displays will lead to punishment. A prolonged exposure to such double-bind communication and learning, Bateson believed, could be related to schizophrenia, especially when the child could not leave this situation or comment on it (Lipset, 1980).

The study of learning and communication in schizophrenic families along these lines gradually emerged when, after his work with Ruesch, Bateson received an appointment as an ethnologist at the VA Hospital near Palo Alto, California. In 1953 he assembled a research group, initially consisting of Jay Haley, John Weakland, William Fry, and Don Jackson, which marked the beginning of the "Palo Alto school" in psychiatry and psychotherapy (Haley, 1976; Lipset, 1980). This group further developed the concept of double bind, which finally led to a conceptualization of a communication pattern with the following four characteristics (Bateson, Jackson, Haley, & Weakland, 1956, 1968; Sluzki & Veron, 1971; Watzlawick, 1963; Weakland, 1977):

1. Two or more persons are involved in an intense relationship with a high (physical or psychological) survival value for at least one of them (e.g., mother and child).
2. In this relationship messages are regularly given that at one level of communication assert something, but at the other level negate or conflict with this assertion. The first message often takes the form of a negative injunction, threatening some behavior with punishment, and is usually communicated verbally. The second message conflicts with the first at one or more points and is also enforced by punishments or signal that threaten survival; this message is usually communicated by nonverbal means.
3. In this relation the receiver of the incongruent messages is prevented from withdrawing from the situation or commenting on it. The receiver may be prohibited from escaping the field, or he or she may not have learned on which level of communication to respond.
4. Double binding in this sense is a long-lasting characteristic of the situation, which, once established, tends toward self-perpetuation.

Bateson's work with the Palo Alto group continued until 1962. Throughout that period Bateson acted more as an observer and anthropologist than as a clinician or therapist. When the emphasis in the Palo Alto activities gradually shifted from etiology to therapy, differences of opinion began to emerge between Bateson and the other group members. Jackson and Haley considered power and control as central elements in any relationship, including the therapeutic one. Bateson, however, strongly objected to these elements, which to him represented the illusion of conscious purpose, commonly adhered to in Western society. Furthermore, Bateson had little interest in experiments with and regular practical treatment of schizophrenic families (Lipset, 1980).

Experimental Evidence and Final Formulation: 1963–1971

In 1963 Bateson left for the Virgin Islands to study communication in dolphins (or porpoises). In 1964 he moved to the Sea Life Park in Hawaii with the same research purpose. His interest in porpoises resulted from his inclination to discover "patterns which connect" between different species. Before coming to Palo Alto, Bateson had studied the behavior of otters for a while to research differences in digital and analogic communication. The dolphins, with their rich sound "vocabulary" and reportedly high intelligence, seemed a logical choice for further study (Lipset, 1980).

At Sea Life Park, Bateson again met with behaviorism. Under the direction of Karen Pryor, the dolphins in the park were trained according to the principles of B. F. Skinner's operant conditioning to perform in public shows. Bateson's position on this kind of behaviorism was clearly negative. He abhorred the deliberate manipulation involved in operant conditioning, a stand consistent with his earlier position in the power and control debate with Jackson and Haley. However, the conditioned porpoises were to provide the first experimental evidence for deutero-learning in an experiment on "creativity in dolphins."

There were two creative dolphins, of which one became creative by accident, the other on experimental purpose. The first porpoise, named Malia, was selected as the subject in a public show on "the first steps of dolphin training." To demonstrate early conditioning in consecutive shows, the trainers had to pick a new behavior in every show. After 14 shows in three days, the trainers ran out of new behaviors to reinforce. In the 15th show and thereafter, Malia suddenly and spontaneously began to emit a whole array of novel behaviors, some of

which were quite extraordinary for dolphins (e.g., leaping upside down and swimming with the tail stuck in the air) (Lipset, 1980; Pryor, 1975).

Bateson was fascinated and delighted. In Malia's new performance he saw an instance of deutero-learning in which coercive, potentially double-binding training techniques had led to creativity. If a dolphin proto-learns that a certain behavior at the onset of a certain stimulus will be reinforced, it deutero-learns at the same time that proto-learning takes place in an interactive sequence (or context) between herself and the trainer, which serves as a model for future proto-learning. Malia had escaped a potentially double-binding situation by learning a "rule" or "principle," namely, that only new behaviors will be reinforced. Bateson urged Pryor to repeat the whole sequence with another porpoise under strictly controlled experimental conditions, to record the results, and to write a scientific report about it (Lipset, 1980; Pryor, 1975).

Thus a second porpoise, named Hou, was subjected to the same treatment as Malia under experimental conditions. Pryor acquired the assistance of two graduate students from the University of Hawaii, Richard Haag and Joseph O'Reilly, to act as observers and to perform some corroborative statistics afterward. Hou, however, was much less adept than Malia in learning the "rule". During the first 15 sessions, when Hou's first response was not being reinforced, it ran through its repertoire of behaviors reinforced in the previous sessions. When thereafter still no reinforcement was forthcoming, the animal resorted to a rigid pattern of porpoising, inverting, and circling. To interrupt this pattern and to prevent a low level of reinforcement from leading to extinction of all responses, certain behaviors were shaped in the porpoise. Occasionally Hou even received a fish for nothing. Between the 15th and 16th sessions the animal suddenly appeared much excited. After coming on stage, it spontaneously performed eight conspicuous pieces of behavior, four of which never before had been observed in this species (Pryor, 1969, 1975; Pryor, Haag, & O'Reilly, 1967, 1969).

After successful completion of this "rule learning," Bateson suggested that a second rule be imposed, namely, "only *one* type of new response will be reinforced." Following the same procedure, Hou learned this rule throughout sessions 17–36. During these sessions Hou less often resumed the stereotyped behavior pattern when no reinforcement came up. She also was much more generally active and showed more signs of frustration and aggression than in the first 16 sessions. After 32 sessions, however, the behavior of the porpoise became so complex that it could no longer be reliably discriminated and described by the observers, at which point the experiment was terminated (Pryor, 1969, 1975; Pryor, Haag, & O'Reilly, 1967, 1969).

After the experiments, Hou and Malia remained highly creative in their behavior, which for Hou in particular involved a definite change in "character." The dolphins became big nuisances, opening gates and even drawing the attention of trainers by leaving the water and sliding on the pool pavement. On one occasion the two porpoises were unintentionally interchanged and had to perform each other's show, although they had been trained to perform quite different acts. The dolphins did all the required acts, but in great agitation and sometimes in the wrong sequence. Still, their performance was good enough to have Pryor and her cotrainer discover only afterward that Malia and Hou had been mixed up. In another experiment, a porpoise, after reliably showing correct responses, deliberately made a long series of 100% wrong choices to communicate the fact that the fish, used for reinforcement, was dried out and inedible. With the advent of fresh fish, the animal went back to a flawless performance (Pryor, 1975).

On the basis of this experimental evidence, his immersion in cybernetics, and his previous thinking, Bateson was able to provide a more inclusive theory of learning during the

1960s. Besides the theory of logical types, Bateson (1972) adopted the ground rule that all biological systems (organisms and their social or ecological organizations) are capable of adaptive change. Such change depends on feedback loops, provided by natural selection and by individual reinforcement. Inherent in these loops is always trial-and-error and a mechanism of comparison. Trial necessarily involves some error that is biologically and psychologically expensive. It follows that adaptive change always must be hierarchic. Because such change involves learning, it also follows that learning must be hierarchic. Learning processes can be ordered at different levels, of which Bateson distinguished four.

Zero-Learning

At the bottom level Bateson posited *zero-learning*, where some entity shows minimal change in its response to a repeated item of sensory input. This may, for example, occur in cases of completed learning, habituation, genetically fixed responses, or in simple electronic circuits. Zero-learning simply involves "the receipt of a signal . . . not subject to correction by trial-and-error" (Bateson, 1972, pp. 248, 287).

Proto-Learning

At the next level stands *proto-learning* or *learning I*, denoting changes in zero-learning. The entity gives a different response at time $X + 1$ than it did at time X. This learning occurs in all classic and operant conditioning experiments in the psychological laboratories.

For this type of learning to occur, it must be assumed that the context of learning can be repeated at time X and time $X + 1$. Without this assumption, all learning would be necessarily of the zero kind, that is, fully genetically determined. To account for contextual change, Bateson introduced the term *context marker*, denoting a signal that informs an organism that context [A] of stimulus [a] is different from context [B] of stimulus [a] and therefore elicits a different response, although the stimulus remains the same. For example, the announcement of a suicide plan is responded to differently whether it occurs in the context of a theater play or in the context of one's immediate neighborhood (Bateson, 1970, 1972).

From the assumption of repeatable contexts it also follows that for every organism the sequence of life events is in some way segmented or punctuated into contexts that may be differentiated or equated by the organism. The distinction among stimulus, response, and reinforcement in an experimental setup here attains the status of a hypothesis about how the experimental subject punctuates that sequence: "in Learning I, every item of . . . behavior may be stimulus, response or reinforcement according to how the total sequence of interaction is punctuated" [Bateson (1972, p. 292); see also Bateson (1970) and Bateson & Jackson (1968)].

Deutero-Learning

As the next level of learning, Bateson proposed *deutero-learning*, also referred to as *learning II*, or *learning to learn*. This type denotes the changes in proto-learning, or defined more precisely, "the change in how the sequence of experience is punctuated into contexts together with changes in the use of context markers" (Bateson, 1972, p. 293).

Deutero-learning acquires particular importance in the field of human relations. Bateson emphasized that such relations have no "thing" quality in themselves. The relationship is immanent in the exchange of messages, "the messages constitute the relationship" (Bateson, 1972, p. 275). Here deutero-learning implies the learning of characteristic patterns of contingency, or contexts of conditioning, in a relationship. Context in a relation is introduced in

two ways. First, a message sent by one person sets the context for a certain class of response by the other person. Second, insofar as such messages are verbal, the nonverbal signs in an interaction function as a context marker of the verbal message, therefore as a "context of context" for the other person. This setting of contexts is inevitable in interpersonal exchange because in interaction the categories stimulus, response, and reinforcement are never "empty." All behavior (verbal and nonverbal) occurring between persons who are conscious of each other's presence has behavioral effects, whether intended or not. Such effects have interpersonal message value and thus are communicative in nature. It follows that in interaction it is impossible not to behave, and therefore impossible not to communicate [Bateson (1963); see also Haley (1963) and Watzlawick, Bavelas, & Jackson (1967)].

Deutero-learning in human relations also implies that subjects improve their ability to deal with contexts of conditioning. For example, a person who is reared under or subjected to a prolonged situation of classic conditioning will increasingly expect a world (context) in which signs of future reinforcements can be detected, but nothing can be done to influence the occurrence of reinforcement. In mental terms, such a person is likely to adopt an attitude of fatalism. Such experience with earlier contingency patterns in its turn leads to a habit of acting as if all new contexts exhibit the same pattern. This habit of expecting a certain punctuation of events tends to become self-validating (and hence self-fulfilling) by promoting certain behaviors and by discouraging others (Bateson, 1958, 1963; Watzlawick, 1984).

All references to mental states can be redefined in terms of transactions between the person and his or her social and physical environment. Characteristics like fatalism or superstitiousness do not exist in a vacuum, but characterize a relation between a person and somebody or something else. In such transactions one can readily discover contexts of proto-learning that bring about that deutero-learning to which the mental state refers. In relationships stimuli, responses, and reinforcements acquire meaning in contingency patterns of interchange. These patterns are defined by the participants as certain characteristics of the relation, depending on their subjective punctuation of events. For example, when in ongoing interchange person A always provides stimuli and negative reinforcements or punishments and person B only responds to A, one could characterize the relationship between A and B in terms of dominance and dependence (Bateson, 1963, 1972; Bateson & Jackson, 1968).

Trito-Learning

Returning to the levels of learning, Bateson finally proposed *trito-learning*, or *learning III*. It referred to learning about the contexts of the contexts of proto-learning. Given the self-validating nature of the habits acquired in deutero-learning, trito-learning is probably quite difficult and rare, even among humans. Changing such habits involves a profound redefinition of a person's character or self, the aggregate of his or her past deutero-learning. Such change may occur in psychotherapy, religious conversion, or result from an important reconstruction of life (courtship and marriage, initiation, etc.). Change of this kind, however, almost exclusively occurs at the unconscious levels and only afterward is given a rationale (Bateson, 1963, 1972).

CONCLUSION

The development of the concepts of deutero-learning and double bind in the work of Gregory Bateson occurred in several stages. Deutero-learning was first conceptualized on the basis of experimental evidence on second-order learning in psychological laboratories. Bateson related this evidence to a classification of cultures in terms of learning contexts. In the

late 1940s, Bateson became influenced by the newly developing field of cybernetics, from which he borrowed an overarching framework for his various scientific concepts. Inspired by Wiener and others, Bateson developed the notion of double bind. This referred to a pathology in deutero-learning, occurring in a situation in which an organism is subject to prolonged punitive proto-learning and punitive deutero-learning, from which it cannot escape or about which it cannot communicate. In the 1950s and 1960s, Bateson further refined his thinking about deutero-learning and double binds on the basis of his work with the Palo Alto group and the study of dolphin behavior and communication. In his final formulation, Bateson distinguished four levels of learning, of which deutero-learning became the third level.

In all stages of their development, the concepts of deutero-learning and double bind were closely related to behavior. In its first formulation, deutero-learning was considered as a "byproduct of the learning processes," still discernible in experimental evidence. In later refinements, the two concepts became part of Bateson's developing thinking on communication and interaction. Although the first empirical evidence on deutero-learning emerged from an operant conditioning experiment, Bateson interpreted the results in terms of interaction, rather than individual behavior. For Bateson, the dyad (and the interaction involved) constituted the appropriate unit of analysis, which set him apart from most behavioral scientists in his days. Additionally, Bateson was skeptical about the value of mental variables like need, drive, and instinct. Ultimately, such variables could always be redefined in terms of relations between persons and their social and physical environments. When Paul Watzlawick, Janet Bavelas, and Don Jackson wrote their influential book *Pragmatics of Human Communication,* largely on the basis of Bateson's thinking, they stated the interactional basis in the following clear terms, with which this article ends:

> Because this communicational approach of human behavior, both normal and abnormal, is based on the observable manifestations of *relationship* in the widest sense, it is conceptually closer to mathematics than to traditional psychology, for mathematics is the discipline most immediately concerned with the relations between, not the nature of, entities. Psychology, however, has traditionally shown a strong trend toward a monadic view of humans and toward a reification of what now reveal themselves more and more as complex patterns of relationship and interaction. (Watzlawick, Bavelas, & Jackson, 1967, p. 22)

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