Primary natural relationship: Bateson, Rosen, and the Vedas

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Abstract

Purpose – To propose a conceptual paradigm for unifying concepts of material, living and spiritual nature, based on the natural philosophy of Gregory Bateson and the more formal relational theories of Robert Rosen.

Design/methodology/approach – The paper combines Bateson’s natural philosophy with the relational meta-theory of Robert Rosen to develop the world view we believe Bateson argued for. It shows that the assumptions of this view correspond with Vedic philosophy. An integral view of nature that can underlie mechanicistic and relational science is provided.

Findings – Bateson’s natural philosophy can be interpreted in terms of Rosen’s relational concepts to provide a unifying view of nature based on information entailments. This is described in terms of an irreducible complementarity between abstract and material aspects of nature (corresponding to Bateson’s “mind and nature”) that forms a causally effective, or “necessary” unity. Encoding and decoding relations correspond with Bateson’s ideas of patterns and information. The general application of this view suggests a reality not unlike the “immortal luminous being” described in the Vedas and Upanishads of India.

Originality/value – The paper shows why the dualistic/mechanistic view of nature is inadequate for understanding living systems and natural complexity. It describes a more general foundation from which living and generative aspects of nature can be studied. This corresponds with the Vedic concept of intrinsic value (divinity) in nature, and lends support to deep ecology ethics. As Bateson argued, the relational view can be an ethical instrument, leading away from conflict as to understand better the roots of interconnectedness.

Keywords Complexity theory, Cybernetics, Communication

Paper type Conceptual paper

Introduction

If I am right, the whole of our thinking about what we are and what other people are has got to be restructured . . . The most important task today is . . . to learn to think in the new way (Bateson, 1972).

Gregory Bateson professed that there is more to nature than can be described from the traditional mechanistic view; that to understand living nature we must think differently and escape the machine metaphor. Many times his writings emphasize that the Newtonian world view, and its scientific dualism, must give way to a high order systems or cybernetic understanding of how nature works, at least with regard to living systems. He argued for a relational perspective on nature, which we might
understand as information relationships communicating through patterns. The unity of mind and nature he spoke of suggests an integral philosophy. Another great theorist of his time, Robert Rosen[1], similarly argued that a relational view uniting nature and aspects of mind is the appropriate way to think of complex nature.

We begin with a quote that Bateson employed from Alfred Korzybski: “The map is not the territory.” This truism underlies what we will discuss, for in dealing with a complex reality we must consider not only how territories inform maps, but also how maps inform and change territories. Our traditional mechanistic view of nature divides this two-way relationship, presuming that what nature does, and will do, can be described by general laws (the “map”) that are independent of the territory they describe. Bateson referred to such laws, perhaps a little unkindly, as “tautologies” because their truth is established by logic and computation rather than experiment.

One of Bateson’s strongest points was that there is no reason why the ability to describe precise events in mechanistic science should be taken to infer that nature itself comprises such distinct events. Observed states and boundaries, in his view, are part of a system of description; whereas nature itself has a seamless quality that is capable of spawning many ways of seeing such differences. Bateson expressed this as a distinction between different conceptual types, “amount” and “quantity” (quantity labels amount). He insisted that the “differences” we see exist in the perception and measure of nature, which itself is not differentiated aside from such concepts. Rosen expressed the same idea in terms of “modeling relations.” Both scientists sought a new world view in systemics and cybernetics, to replace the one in which “material” nature is explained in terms of material objects. Instead, they saw that material nature is somehow drawn out of a more complex and less defined reality – a concept that is more typical of Far Eastern views of nature.

A theoretical foundation for these ideas can be derived by combining Bateson’s and Rosen’s philosophies. Where Bateson provided eloquent description and example of relational thinking, Rosen created a formal mathematical treatment of it. In particular, Rosen’s modeling relation (Figure 1) may be interpreted as a natural philosophy and a foundation for relational complexity (Kineman and Kineman, 1999; Kineman, 2002). The modeling relation comprises two-way information relations between nature and symbolic representations of nature (e.g. our mental pictures and models). Applying this idea as a natural philosophy means that natural systems are themselves to be seen as interconnected by such relations; that nature in essence “models” itself. Rosen showed that all natural systems can be analyzed in terms of relational mappings. From that we

Figure 1.
Rosen’s “modeling relation”
infer that the most fundamental of these in nature is the equivalent of a modeling relation. Relational analysis is performed in category theory (Louie, 1985), in terms of constructible mappings[2], of which modeling relations are composed. This is a new way of thinking about how nature may be causally related, or “entailed”; which we believe can be applied to both living and non-living systems.

Our objective is to show how Rosen’s modeling relation applies as an explanation of the causal structure of nature (its “entailment”). By this approach we can capture the relational qualities of nature that Bateson spoke of, at a fundamental level. We will also see that this allows for the mechanistic view as a special case. We present this in the Kuhnian sense of a new world view and foundation for advancing relational theory. We discuss this view from three theoretical perspectives, represented by Bateson, Rosen, and Vedic philosophy.

An irreducible relationship
Both Bateson and Rosen argued that relational thinking could transcend “Cartesian dualism,” as Bateson called it, which separates the symbolic from the natural. They both claimed that this could be made fully compatible with scientific thinking. Rosen’s approach was to propose an entailment structure that relates a “Natural System” and a “Formal System” (Figure 1) through intrinsic information relations (“encoding” and “decoding”). This is a modeling relation, which actually specifies a “complementarity”[3] relation between symbolic and natural aspects of an otherwise unified reality.

Rosen initially described this relation as a picture of science, that is, an epistemological model (Rosen, 1985). He also described how two natural systems can act as “models of each other” (Rosen, 1991, pp. 62-3) in the sense of analogs. He wrote: “Analogy is like a modeling relation except that it relates two natural systems” (Rosen, 1991, p. 119). But modeling relations are not limited to epistemology. Natural instantiation of modeling relations is implicit in this theory. In his introduction to anticipatory systems, Rosen (1985, p. v.) refers to organisms as having and using “internal predictive models of themselves and their environments”. Much of his work was about the realization of such relations in living systems. Natural models need not be thought of as specific identifiable components of a system, but rather as systemic, or intrinsic, to the overall organization, and implicit in the analysis. The case we are personally familiar with, where symbols can be experienced and manipulated as mental concepts, is thus a more evolved example of this fundamental principle. Rosen claimed that, through relational analysis, biology can “inform physics”; that the relational view is the general view explaining complexity[4] and mechanism. We must then suppose that natural modeling relations can be seen in the very fabric of nature, at every level: the new “building blocks” that the atomic model did not find.

If the modeling relation pictures reality, it suggests that nature is similarly entailed; that interacting systems, in a sense, measure and inform each other. We will see that this corresponds with Bateson’s definition of information as “a difference that makes a difference”, for it is a process whereby one system induces change in the other, corresponding to the attributes (patterns) that are mutually encoded. Rosen describes this process as an “act of abstraction”[5] (Rosen, 1985, p. 128), which is imparted to the “Formal System”. This is a picture of complexity because such relations involve causal loops that equate to mathematical “impredicativities” (Rosen, 1991, p. 86-90). These loops are highly problematic in the mechanistic view, and generally excluded from it, because they do not have closed form mathematical solutions. It is clear that the
modeling relation itself defines an impredicativity – the very thing that mechanism excludes and that Rosen claims is most characteristic of life.

Systems that are partially closed by virtue of internal causal loops are less constrained than mechanisms. It appears that such partial closure prevents relational entailments from being reduced by the sum of outside entailments (this bears similarly on the “measurement problem” or “observership” discussed in quantum physics). Erwin Schrödinger’s great insight in his famous book, *What is Life* (Schrödinger, 1943), was just this: living systems somehow “internalize” some of their own causes (part of their ontology). But the idea was never fully developed (Rosen, 1991, Chapter 1). Internalizing causality produces internal order and greater freedom from the external environment.

Perhaps, surprisingly, the information entailments specified in modeling relations lie outside the specific systems being related. This means they exist in the context of those relations, and that context can have an effect on the information relation. It is just this contextual relationship that distinguishes a complex system from a mechanism. Rosen points out that a mechanism is implied as soon as there is a largest complete system model that is computable. Consequently, for complex systems, an infinite contextual series of modeling relations is implied (Figure 2). This shows that the modeling relation is logically irreducible, and accordingly it implicates a holarchy, where every system can be related to larger and smaller compositions. Such holarchies are often inferred in ecology. For example, the relationship between an organism and its habitat also has larger system relations with the ecosystem, the physical environment, human exploitation or management, and so on.

The infinite series that is implied should not be disturbing. It is an important and desired property of the analysis. It is a cost of defining this analytical way of viewing relationships, just as the mechanistic view has its singularities and infinities of a different kind in order to achieve its purpose. By allowing the holism of nature to be represented as an infinite series, we gain the ability to explore complexity and to

![Figure 2. Infinite context of modeling relations](image-url)
examine any proximal relationship of interest without reducing it to a mechanism. We will see that it also implies a very different ultimate reality than the mechanistic view.

The entailment structure we are thus concerned with in nature consists of analogous encoding and decoding relations between observed and symbolic natural systems, and with contextual systems. This means that abstractions of one system (encodings) are actualized\[6\] (decoded naturally) in related or contextualized systems. There can be an unlimited number of such relations. Figure 1 shows the singular case which can be constructed indefinitely by matching natural and formal systems. Figure 2 shows contextual embedding which is also unbounded. These influences may have synchronous and/or asynchronous effects. The system is thus informed by aspects of many other systems and its own models, and the result is to create a suit of potentials, or system attractors. We must think of these as simultaneous possibilities that feed forward and resolve as present events to form history.

The effect of external relations thus depends on how they affect the internal models of a semi-autonomous system. This can make a big difference in behavior where external entailments involve similar content to internal processing, and thus can be modified by it. For example, organisms are certainly subject to physical laws that they are unable to modify internally. But where information, for example from climate patterns, can be used for internal regulation (Rosen and Kineman, 2004), the resulting behavior can be dependent on both external and internal relations. In summary, there are many possible encoding relations and therefore many possible ways they may be actualized in such an exchange, giving rise to the uncertainties we observe in complex systems.

**Pattern and potential**

Modeling relations thus allow us to think about aspects of living nature that cannot be represented as mechanisms. These have to do with the system organization. But the theory must also connect with observables. While we cannot measure or represent natural systems or natural models without reducing them, it turns out that the encodings have a direct meaning that can be tracked. Specifically, they represent abstraction and inferences in terms of structure (encoding) and function (decoding), respectively. Biological and ecological functions are thus given complementary status with material structures (Rosen, 1991, p. xvii; Rosen, 1973). These functions are as important to know as system states (structures). Neither can be fully accounted for, but this form of analysis allows one to look at the proximal relations of interest or dominance.

We can now address the question of where functions exist as potential effects, before one or more is actualized and others foreclosed. Also we can look at the role of pattern. Rosen (1973) defines function as what a system does in another system. Hence, functions are associated with the effect of a model (what it does) in relation to a natural system. The effect can be captured in the idea of a pattern that induces the natural system. It is not just the material aspect of a pattern that is meant here, such as the shape of a house, but the information value of that shape in a contextual or otherwise related system, say the environment, the reaction of wildlife, the mind of occupants, the economic system, the shaping of childhood and adult experiences, and so forth. The function and context decode and realize a pattern that, as a result, has ontological meaning (the natural system). This is the inverse of abstraction which encodes a pattern that has epistemological meaning (a model). Thus, the information entailments of a modeling relation basically communicate pattern, which induces...
change in the system it is imparted to. This explicitly represents Bateson’s idea of patterns that connect. While we can say that pattern is quite measurable in a material sense, its semantic relations must also be retained.

In contrast to this rich picture, mechanism essentially involves fully commuting, or reduced, modeling relations, making model and system synonymous and implying computability. This makes influences summable, and response reactive rather than anticipatory – a great simplification of the entailment structure, but one that is irreversible. Rosen found it axiomatic that there can be no finite set of such reduced relations that will yield the same result as complex entailment. In the relational view, the mechanical condition thus appears as a very special case. Only an infinite set of hypothetical mechanisms might be said to converge on the complex condition. Interestingly, the reverse may also be true in the case where there are no causal closures internalized within system boundaries, for example as the classical world is defined and appears to our senses. An infinite set of fully interacting modeling relations, without other causal boundaries, might be shown to imply a mechanistic system. It appears that the two views of nature, relational and mechanistic, may be treated as practical alternatives, each suited for representing the aspect of nature it was designed for. The relational theory, being the more general, can allow us to relate both forms of analyses, whereas the mechanistic view cannot.

Mind and Nature: A Necessary Unity (Bateson, 1979)
As we have seen, each interaction in the relational theory involves a necessary unity of information entailments represented by a modeling relation. We can now see that Rosen’s diagram can also be understood as an explicit representation of Bateson’s unity between Mind and nature. Bateson defined “mind” in terms of the presence of six natural conditions (Bateson, 1972):

1. an aggregate of interacting components;
2. interaction triggered by difference;
3. collateral energy;
4. circular (or more complex) chains of determination;
5. effects of difference acting as transforms (coded versions) of the difference which preceded them; and
6. an implicit hierarchy of logical types immanent in the phenomena.

Rosen’s concept of mind, like life itself, was as a phenotypic phenomenon that cannot be represented or explained by physical reduction or statistical correlation, the two dominant modes of modern science. Its explanation, he argued, requires the broader entailments of relational theory, which neither of those views can generate (Rosen, 1991, Chapter 6 “Mind as phenotype”). It is easy to see that Bateson’s six conditions of mind correspond precisely to a natural instance of Rosen’s modeling relation. Respectively:

1. “Components” are interrelated, through interaction and context, as modeling relations.
2. Interaction defines and is defined by natural modeling relations. It is thus “triggered” by the natural dynamic between system and model (a complementarity principle).
(3) Natural instances of modeling relations reduce entropy (increase system organization) and dissipate energy – central characteristics of organisms.


(5) The effects of difference (i.e. information), are precisely the transformations (encoding/decoding entailments) between models and system.

(6) Extension of the contextual relation reveals a hierarchy (probably a holarchy) of logical types (Figure 2).

Bateson’s definition of mind is thus synonymous with Rosen’s modeling relation. Bateson’s definition of information as effective differences can also be clearly seen in this relation. As both people said, information is that which is required for effects to be known (a difference in the symbolic or cognitive system) and for effects to occur (a difference in nature). Obviously, the idea of excluding concepts of mind or information from this analysis is tantamount to excluding the analysis.

From this perspective, information is the application of a function – a living system function in this case – that transforms (or defines) states. Bateson’s definition implies, like Rosen’s model, that there is always a third system in any connection between observable systems, which comprises the information entailments themselves[7]. Information can be accordingly presented as comprising all that we traditionally call “causation,” precisely in the sense of a modeling relation. A complex world built on such relations could truly be described as a “necessary unity” between mind and nature.

It is difficult for modern Western scientists to comprehend this “necessary unity.” Bateson attributes this difficulty to the mechanistic epistemology of recent centuries, which sharply separates knower from known, Man (and scientist) from nature, and necessarily Man from our concept of God (Watts, 1960). As a result of this separation, “God” became associated with the mathematics of Platonic laws, imagined to be external to the universe, or handed down from before the big bang; and according to which all action has proceeded since (Jeans, 1930, p. 140). Bateson refers to this separation as “Cartesian dualism” and “the premises that were fashionable in the precybernetic era.”

We saw that information relations are implicitly associated with change as the effect (or product) of interaction between natural systems. This may resolve the dilemma of social constructivism that Bateson seemed to wrestle with – that his classifications as an ethnographer might be entirely self-created – by allowing that perceived boundaries (on which we might base classifications) may be at once both constructed and natural. When such constructivism is re-imported or attributed to nature itself, it becomes both objective and subjective simultaneously (in other words we can see subjective actualization in systems we might study, and our seeing is itself actualizing additional subjectivities). One must thus accept being a participant. Information entailment in this view is accordingly fundamental to any given system in the same degree that space-time geometry is taken as fundamental to dynamics.

The modeling relation allows us to represent duality while retaining non-dual properties in the information entailment relations. This constitutes a new form of analysis in terms of relational wholes. We cannot escape dualism for epistemological purposes, that is, to have a scientific means of knowing about nature conceptually, and
there is consequently a well-known limit to knowability. However, it appears possible to gain more information about a complex system by looking at it relationally, because this mode of analysis preserves complex relations in any decomposition – relations that a mechanistic analysis must destroy irretrievably. Rosen (1991, p. 169) wrote:

... if we try to fractionate a modeling diagram [mechanistically], with all the referents apparently left to one side and all the encodings/decodings put on the other, we lose the commutativity that is the essential feature of the diagram as a whole. I argue if one wants to fractionate [i.e. analyze a complex system] one must do so at another level, at the level of such diagrams, or modeling relations. If one tries to fractionate the diagrams themselves, their basic properties are irretrievably lost.

Exploring nature through introspection
If mind, expressed generally in these terms, can be said to exist in nature, and we are natural, then aside from the epistemological dualism needed to think, introspection should be a valid way to experience nature and to obtain natural information, even if we consider that information only to be an analogy and call it anthropomorphic. As a result of his experience with native cultures, Bateson certainly did not think that “anthropomorphic” necessarily means uninformed about nature, if introspection is not casual and if it is closely tied to natural experience.

Given that introspection, or perhaps intuition, might be (perhaps must be) one of the tools in this new science, then we should be interested in introspective wisdom passed down throughout the ages, and we might even hope for some consistency in what was inferred. The “perennial philosophy” (Huxley, 1946) represents what is believed to be a common core of deep intuitive/introspective experience throughout history, most originally recorded in the scriptures of ancient India (the Vedas, Upanishads, and other derivations). These came from a long period of widespread, intense and rigorous meditation involving many methods. At the root of these experiences was indeed a consistent experience, which was reported as a common ground of existence, an eternal, creative principle or “Beingness” that seems to pervade all nature. The non-living is also seen to emerge from this principle. In the Vedic philosophy and most of its derivatives, this term “Beingness” is to be understood more in the sense of an active verb (to be) than a passive noun (“a being” as we would more likely interpret it in the West). As a passive object it implies a separate entity, which is not the meaning. As an action or experience, it is a vital essence that pervades all and is at our own core. It is also called “Atman,” or true Self.

The relational view cannot tell us what the true source of such experience is – it is only a theory structure. But in seeing nature through information entailments linking “mind” and material systems, it provides a scientific view of unity and connectedness that may be compatible with this derived wisdom. We have already seen that it is compatible with mechanistic science as a special case. We can perhaps imagine some sense of beingness in the modeling relation as a complementarity between subject and object, or mind and body, which is retained through all levels. We, of course, cannot cite spiritual scripture to support science, nor vice versa; but if the relational view is consistent with both, it has considerable value as an integral philosophy. Such integration may have profound implications for society, as dreamed of not just by Bateson, but also countless naturalists, humanists, theologians, and philosophers who sought the unity of existence. It was certainly one of Bateson’s hopes to change the
thinking of the industrial world toward a more integral scientific philosophy in which we may better manage ourselves and our resources through an understanding of unity and connectedness. Perhaps, we should not assume out of hand that nature should be like us, but when there is so much evidence that we came “out of nature,” and not “into it” (Watts, 1995), perhaps we should not reject the idea either. Bateson was not much impressed with the arguments against anthropomorphism, our own experience being the one thing we know of directly.

The play of nature
Bateson demonstrated that the vital aspect of relational thinking might be described best in terms of stories, because stories can include both pattern and meaning. The story was to Bateson what the modeling relation was to Rosen – the way mind and nature connect.

Like Bateson’s stories, in Vedantic mythology everything that happens is part of a divine play, or “leela.” Leelas describe the interplay between spirit and natural existence. They are enacted, and thus stories told, by archetypes incarnated in the material world to play various parts, and thus to communicate meaningful principles. Divine nature is partially or wholly forgotten on entering the play, or the world of “Maya” (commonly translated as illusion or form, but also as the world of measurement). In Vedanta, actors on the world’s stage communicate eternal principles through their actions. Inanimate matter also contains the divine essence, temporarily lost due to “the veil of Maya,” but always capable of re-awakening into a living condition. Human consciousness likewise retains the ability to reawaken to a fully divine condition. The relational view analogously represents natural systems as intrinsically complex even if reduced by material interactions.

Complexity and life are the antithesis of mechanism in relational theory, just as divinity, or spiritual life, is the antithesis of Maya in Vedanta. Leelas come from a universal mind that is infinite and unfathomable. This is analogous to the relational concept of an infinite largest system that is not computable. Everything in form, or Maya, is created by the relationship between belief and that which manifests – as in a modeling relation. This is true even for an avatar, who directly represents divinity but “takes form” in answer to the plea and belief of humanity. The guru (teacher), who knows the story and establishes belief among devotees, is thus sometimes said to be greater than the avatar, for without belief the avatar himself could not exist. This describes a complementarity between thought and manifestation.

Bateson and the Vedas
We know that Bateson had direct contact with the ancient ideas of the Far East, particularly the Vedas and Upanishads of India, through one or more of its gurus. A colleague of Bateson’s David Bandy (Bandy, 2006) recalled visits they made together to see Sri Sathya Sai Baba at his ashram (Prashanthi Nilayam) in Puttaparthi, India, in the early 1970s when Sathya Sai Baba was actively granting interviews with Western scientists. Bateson returned with his daughter, Nora, in the early 1980s (Bateson, 2006). Nora recalls that her father and Sathya Sai Baba had conversations of several hours nearly every day for a month. Sathya Sai Baba’s professed mission is to re-introduce the original wisdom of the Vedas, as communicated through the Upanishads and related stories (including the great epics of India such as the Ramayana, Mahabarata,
and others that relate the life stories and teachings of avatars and sages). The extent to which these ideas influenced Bateson’s thinking is not well-known. Bandy described him as open and accepting of Sathya Sai Baba’s message, while trying to bring it firmly into rational explanation. However, deep mysticism has always defied such attempts. Bateson expressed some frustration in trying to pin it down scientifically. Nora Bateson quotes him as saying after one of these meetings, “You just can’t talk to these Holy men.” Nevertheless, it is clear that information was exchanged. Bateson occasionally referred to the Vedas and Upanishads in his writings and it is clear that the very idea of mind and meaning in nature is a Vedic concept.

The Vedas speak of a single interconnected reality, which we see through the veil of Maya, but which emerges from a single creative principle that exists in all parts of the universe and the whole itself. The 5th Chapter of the Brihad Aranyaka Upanishad, called the Madhu Vidya, or Honey Doctrine, refers to one animating principle that is universal and reflected in every natural system of the universe. The same principle in each part is in the whole and vice versa. This was translated by the theological scholar, Muller (1884) as a “bright, immortal person,” and more recently by a Hindu guru, Swami Krishnananda (2006), who is perhaps more familiar with the cultural meaning, as an “immortal luminous being”. Muller translates “Madhu” literally as “honey” and figuratively as “the effect.” It would again be closer to the cultural meaning to translate it in more essential terms, such as “sweet product.”

The Madhu Vidya states (combining the first 14 verses, which give exhaustive examples of what we will call for the sake of expedience, “all existence”):

This [and all existence][9] is the honey (madhu, the [sweet product]) of all beings, and all beings are the honey of this [and all existence]. Likewise, this bright, immortal person [Luminous Being] in this [and all existence], and that bright immortal person [Luminous Being] incorporated in the body (both are madhu); He indeed is the same as that Self [Atman] that Immortal, that Brahman [universal source], that All[10].

In verse 15 it states:

And verily this Self is the lord of all beings, the king of all beings. And as all spokes are contained in the axle and in the felly of a wheel, all beings, and all those selves [existences, referred to above] are contained in that Self.

After referencing similar statements from the Rig Veda (the Upanishads are based on the Vedas and are to explain them), it states in the 19th verse:

...This is the Brahman, without cause and without effect, without anything inside or outside; this Self is Brahman, omnipresent and omniscient. This is the teaching (of the Vedas) (Muller, 1884).

We see in these writings a philosophy where the whole is immanent in the part and the part is constituted in the whole. This is analogous to functional interrelations, for example in the human body. A limb is a part of the whole body – it functions in harmony. The limb supports the existence of the body and the body supports the existence of the limb. We do not think this way of machines because they are “constructed” from external functions and require an external creator. The relational systemic view, like Vedanta, places ontology inside the system, and in this sense, nature is pregnant with life and divinity.
The ancient message from the Vedas and Upanishads can also be seen in what David Bohm called the “implicate order,” based on his study of “non-locality” in physics[11]. Non-local phenomena were confirmed by the famous experiments of Alain Aspect and others testing Bell’s theorem. Present science interprets these results as meaning that, at some level, everything in the Universe is indeed connected with everything else. Madhu Vidya, considered a central statement of the Upanishads, tells us that everything is intimately related to everything and imbued with an internal divine luminosity (meaning the source of creation). Hence, when we touch anything, we are touching everything – we are touching it not just from the outside as a thing but also from the inside as an essence. If we touch a table, we are touching the sun at once. This is considered a mystical view; however the Vedas’ meaning is that everything is vitally and ontologically connected. It is the very existence that is related, not just resulting dynamics, so that when we see anything, that seeing involves everything and in a sense is everything. This idea shares the depth of interconnection that Bateson was writing of and Rosen modeled, which also became known in the West through Deep Ecology (Kineman, 2005). In this way, Vedanta is about the moral and ethical relations that Bateson was so concerned about. It can also be said that, in Vedanta, the concept of communication is at the core of every interaction. When we speak to anyone, we are in some way communicating to everybody, and when we interact with others, we are in some way interacting with ourselves.

Modern Hinduism tends to anthropomorphize the Vedic idea of a “Luminous Being,” giving rise to the many Gods of modern Hindu culture that have quite human characteristics. Most popular religions find this necessary. But some derivatives of this philosophy, such as Mahayana Buddhism, insist that one must see beyond the more familiar concepts of physical form, which are limited tools, and recognize this vital essence as a subtle principle of the universe and all that exists in nature or mind. Even modern teachers of Vedanta in the Hindu culture, such as Sathya Sai Baba, emphasize this as the ultimate understanding, while nevertheless recognizing the human need for images.

In science we also attempt to formalize our concepts of reality and make them more tangible to human perception. Just as the spiritual imagery must point to something beyond it – a shared essence – the scientific imagery, or description, must also point to something beyond it. In the case of relational theory it can be the same shared essence. In the limit of relational theory (its unbounded extension), the holarchy of contexts contains the source of all existence and a pervasive principle of abstraction and actualization. It is an implicit creative reality at the root of all systems and especially magnified in life. Except for the limits of language, and taken in an active sense, is this not an “immortal luminous being?”

Conclusion
It is perhaps easier to achieve eloquence in anything systemic or introspective than it is to get a precise map of it, and in many ways the arts do a better job than science. But for the purposes of an integral science, the entailment structure presented here in Rosennean and Batesonian terms, can be a rigorous means for knowing about complex and living systems, including ourselves. Bateson believed that such an expanded perspective is absolutely essential for human progress, for, if we cannot gain a better picture of who and what we are, we will damage ourselves and much of nature.
Bateson applied his relational perspective not only to an external nature, but also to how we live and interact as a culture. He wrote:

If we continue to operate in terms of a Cartesian dualism of mind versus matter, we shall probably also come to see the world in terms of God versus man; élite versus people; chosen race versus others; nation versus nation and man versus environment. It is doubtful whether a species having both an advanced technology and this strange way of looking at the world can endure... If you put God outside and set him vis-à-vis his creation and if you have the idea that you are created in his image, you will logically and naturally see yourself as outside and against the things around you. And as you arrogate all mind to yourself, you will see the world around you as mindless and therefore not entitled to moral or ethical consideration (Bateson, 1972).

He minced no words in criticizing the Western contemporary education system for encouraging this myopia. He cites, especially in American students, a “lack of knowledge of the presuppositions not only of science but also of everyday life.” By this he meant that we have cultivated a “deafness” to the assumptions we are making in our views of nature, and thus a “child-like resistance” to discussing them or considering improvements in them. He found our entire education system, including “students of both sexes” and “humanists as well as scientists,” suspect for not recognizing alternative modes of explanation that are more appropriate for questions about life.

The Western derived view of nature may be referred to as “instrumental,” that is, nature as merely an instrument for human use and values (Kineman, 2005). In this view our connectedness is de-emphasized and our individual existence emphasized. Allan Watts traced the roots of this idea to Judeo, Christian, and Islamic beliefs that emerged in the Middle East, altering the ancient concepts to interpret man as separate from nature (Watts, 1960). They began to view the world, including man, as artifacts manufactured by an external God. Prior to this, the philosophies of the Far East, from Vedanta in India to Buddhism and Taoism in China, retained various forms of intrinsic divinity and holism. In later and more contemplative Christianity, interconnectedness with nature returned, for example in the theology of St Francis and Tielhard de Chardin.

Western science in an industrial age, however, seized upon this duality to establish what Watts called the “fully automatic myth,” that nature is a machine, and once created, it runs itself. It was this reification of extreme dualism and external law that has been credited with scientific advance, but also blamed for producing a destructive philosophy and culture based on domination[12].

We began with an implicit question from Bateson on how we might think differently about whom and what we are. We can end with a tentative answer. We saw, through the medium of relational theory, a single active principle inherent to the organization of nature, which, in agreement with ancient wisdom, can be said to animate us, our origin, and everything we know of. It is thus possible to achieve an integral world view in which we are indeed the “star stuff” that Carl Sagan said we are; but also in which we and the ‘star stuff’ are much more than we have imagined that to be. These views suggest that we are part of an eternal creative Beingness that produces stars and life.

Notes
1. Indeed, they once met (Rosen, 2006).
2. Rosen focused especially on mappings involved in Metabolism-Repair (M-R) systems.
3. Complementarity was defined in early quantum physics. It means a relationship between two irreducible aspects of nature that depend on each other; both of which are required for a
complete description. Physical dualities have been described as such complementarities. Complementarity is sometimes explained by analogy to the weave and artistry of a Persian rug, i.e. considering all possible weaves that could achieve a given pattern and all possible patterns that could be produced by a given weave.

4. Rosen makes the distinction between true complexity and “complicated” systems composed of many mechanisms. The later seem complex, but can only simulate naturally complex systems.

5. Rosen explains that to “abstract” is to “take out of” a system. It is not something more than is there, but something less. Measurements are abstractions as are models built on them.

6. Rosen used the term “realized” but since all components of the modeling relation are real in some sense, we prefer to say actualized. The meaning here is that a model is imputed to the world of action. The word act also corresponds with the sense of a play or Maya as we discuss later.

7. In other work we develop this aspect of the theory to recommend new informatics based on state and function databases (Kineman and Kumar, 2006).

8. This is quite distinct from vitalism, which proposed physical metaphors for the cause of life that were generally discredited (Mayr, 2002). It is also distinct from Creation Theory and Intelligent Design Theory in that the ideas are based on an external God that is more characteristic of the mechanistic view (Kineman, 2002).

9. Verses 1-14 are the same, substituting earth, water, fire, air, sun, space, moon, lightning, thunder, ether, law of action, truth, mankind, and Self; in other words, everything that exists in form or principle.

10. Authors’ explanations in brackets [ ].

11. Bell’s Theorem that no theory of local variables can explain the strange quantum phenomena known as entanglement, which is an instantaneous relation at a distance.

12. One should note, however, that the seeds of this duality also arose in the local descendents of Vedic tradition, in an extreme form of worldly renunciation. Buddhism, especially Mahayana, generally rejects this interpretation, as do followers of the original Vedic teaching.

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