

## VARELA AND THE UROBOROS: THE PSYCHOLOGICAL SIGNIFICANCE OF REENTRY

*Terry Marks-Tarlow, Robin Robertson, & Allan Combs*

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Abstract: The Uroboros, or snake that swallows its own tail, symbolizes regeneration and renewal the world over. It was adopted by Francisco Varela as an icon for his re-entry term in "A Calculus for Self-Reference." The present paper examines how the notion of re-entry can be applied psychologically, to issues of autonomy and identity. According to Varela, all autonomous systems are structurally open and functionally closed, which leads to paradoxical qualities particularly evident in higher order cybernetics. First Varela's early work is placed within a philosophical and historical context. Next, notions about biological autonomy are examined from the perspective of nonlinear dynamics. Then, the recursive dynamics of consciousness are explored through social mirror theories of identity formation. Finally, Varela's ideas are applied self-referentially to descriptions of his own experience as he neared death.

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*We are led to consider in all seriousness the traditional image of the snake eating its own tail as the guiding image for autonomy as self-law and self-regulation.*

Francisco Varela, 1979

This paper was written in tribute to the work of Francisco Varela. In the spirit of the Uroboros it explores Varela's concept of reentry in a number of different contexts, all of which make possible fluid but stable self-identity in systems that are structurally open yet functionally closed.

In myth the world over, the Uroboros, the snake that swallows its own tail, symbolizes self-generation and renewal. In ancient Egypt, the Uroboros is depicted on tombs as guardian of the Underworld. There it represents the liminal moment when death encounters resurrection. In the West African vodun religion of Benin, the Uroboros appears as an icon for the god of order, Dan. Dan mediates between the world of the gods and our world, in order to create order in the wind, water and other cyclic, often chaotic, rhythms of nature. In old European maps the Uroboros swims in distant seas to symbolize the fearsome edges of the known.

Over time the symbol of the Uroboros has evolved from the realm of matter to that of spirit. This symbol follows a similar trajectory to the mathematical and scientific research of the late Francisco Varela, as it evolved over the course of his lifetime. Recognizing the deep significance of the Uroboros to processes of self-generation, Varela chose an icon of the snake swallowing its own tail as a symbol for reentry in his calculus of self-reference. It depicts what Varela describes as the "ceaseless circular process which is, in fact, the symbol which tradition has chosen to represent the creation of everything since time *immemorial*" (Varela, 1975, p. 23, i).

### **Abstract Origins: A Calculus for Self-Reference**

Spencer-Brown's vision, then, amounts to a subversion of the traditional understanding on the basis of descriptions. It views descriptions as based on a primitive act (rather than a logical value or form), and it views this act as being the most simple yet inevitable one that can be performed. Thus it is a non-dualistic attempt to set foundations for mathematics and descriptions in general, in the sense that subject and object are interlocked. From this basic intuition, he builds an explicit representation and a calculus for distinctions. (Varela, 1979, p. 110).

In a seminal early paper, "A Calculus For Self-Reference," (1975), Francisco Varela extended G. Spencer Brown's *Laws of Form* (1969); he further extended this work in *Principles of Biological Autonomy* (1979). In the former, Varela said that: "By succeeding in going deeper than truth, to indication and the laws of its form, he [Spencer-Brown] has provided an account of the common ground in which both logic and the structure of any universe are cradled (Varela, 1975, p. 6)."

Spencer-Brown's work was critical for Varela in two significant ways. First, *Laws of Form* begins with the realization that *indication* and *distinction* are inextricably entwined: when any indication is made, any mark, it automatically creates a distinction between two states: that which is marked and that which is not. This is central in Varela's concept of autopoiesis. Varela (Varela, 1979) expresses the unity of distinction and indication this way:

A *distinction* splits the world into two parts, 'that' and 'this,' or 'environment' and 'system,' or 'us' and 'them,' etc. One of the most fundamental of all human activities is the making of distinctions. (p. 84)

But,

A distinction cannot exist without its concomitant value. The distinction thus becomes an *indication*, i.e., an indication is a distinction that is of value. (p. 84, 107).

Taking these two states - the marked and not-marked - together with two seemingly unarguable "laws" (i.e., primitive axioms), Spencer-Brown developed a *calculus of indications* which he then extended into an algebra. If that algebra, which is fully general for any 2-valued system, is assumed to deal with logic, it is identical to Boolean algebra. But his calculus is more basic than logic.

The second significance of *Laws of Form* for Varela was that, beginning with the simplest possible system of mathematics, which depended only on an act of indication and distinction, Spencer-Brown eventually arrived at self-reference. In solving actual problems involved with the routing of trains, Spencer-Brown found that he was forced to develop algebraic equations within his calculus in which the

function referred to itself. This sometimes led to equations whose resolution was first the marked state, then the unmarked state, ad infinitum.

After much thought, he came to realize that this situation was equivalent to imaginary numbers in normal mathematics; that is, numbers which arose out of normal equations, but were something other than numbers as we normally know them. In mathematics, imaginary numbers eventually came to be interpreted graphically as numbers that existed at a right angle to the normal number line; hence not on the number line itself. Similarly, Spencer-Brown came to interpret his strange re-entrant numbers as oscillations in and out of the space created by the marked state and the unmarked state. Thus he felt that this marked the creation of *time* within the space created by his calculus. Varela called this insight "one of his most outstanding contributions" (1979, p. 138).

As a mathematician and logician, "Spencer-Brown wisely finished his work at the point when self-reference entered the picture, satisfied with the deep insight that self-reference introduces time" (Robertson, 1999, p. 53). Varela, a biologist and cybernetician, decided to begin where Spencer-Brown ended by adding self-reference as a third primitive value in a 3-valued calculus. He was proposing that, in the world we actually live in, there is not only the act of indication, which distinguishes between two states, there is also an act that endlessly reaffirms identity. By proposing that form re-enters itself at the most basic level, Varela identified a deep principle he believed went beneath logic itself to the very creation of structure in the universe.

### **From Duality to Trinity, then Re-Entry**

Consider the following two statements:

When Robert Frost was asked about the organization of a collection of poems, he is supposed to have replied that if a book consisted of 29 poems, then the book itself had to be the 30th poem. A collection, in other words, must transmit artistic integrity as eloquently as the individual works within it. No grab bag of hits will do (Hampl, 1999).

For every (Hegelian) pair of the form A/not-S there exists a star where the apparent opposites are components of the right-hand side (Varela, 1979, p. 101).

It might not be obvious that both quotations are saying the same thing, but Varela realized that supposed opposites are all created through a Spencer-Brown distinction and thus are inextricably joined through a third, the indicative act that creates them. There is always a whole on a meta-level above the opposites which binds them into a greater whole. It matters little whether we are talking about dividing a whole into two parts or into 29 parts, like Frost's collection of poems, because once you have this realization,

you inevitably have the possibility of self-reference. Any one of Frost's poems, for example, can also refer to the collection in which it is contained.

The importance of the third, the act that creates and binds the components, is also familiar to the readers of these pages in the work of the American logician Charles Peirce (e.g., 1998), who built a three-factor logic surprisingly compatible with Spence-Brown's two-value system. Peirce's logic was also the basis of major theory of semiosis, and will be useful later for discussing self-reflective consciousness. For these reasons we will briefly introduce it here for those who are not already familiar with its basic structure. Peirce's logic involves three parts, in his terms a *first*, a *second*, and a *third*. In general, for any argument the beginning is the first, the end is the second, and the middle term that expresses the relationship of the first to the second is the third. For instance, the possibility of seeing a bluebird while walking in the park is first, the bluebirds actually seen are second, and the probability functions that relate the first to the second are third. In logic as in language the third expresses a general or abstract relation of the first to the second. It is the medium or connection that binds them. In semiotics, the third is the concept that carries the meaning of this relationship. For example, the warm and slightly bitter, yet pleasing taste in my mouth (first), turns out to be tea (second), and I reflect on the fact that it is a black Indian variety (third). The meaning in the third is also termed a *sign*. On reflection it is apparent that each sign can itself be the first for other signs. One might consider the whole range of black teas that are available in a good café, or the all poems in a book, as in the above example. In these instances we see that signs convey *meaning* and the role that meaning plays in language, logic, and consciousness. It is easy to imagine networks of signs that reflect back onto themselves in complex re-entrant loops, an idea closely related to self-reflection in language and consciousness, and to which we will return below.

Varela was interested in the notion of re-entry at many levels of living systems, ranging from cell metabolism, to cognitive processes in thoughts, words, and self-aware consciousness. In all of these self-reference is central to the deepest levels of organization. Despite the awkwardness of "the brain writing its own theory, a cell computing its own computer, the observer in the observed" (Varela, 1975, p. 5), re-entry of any such system back into itself is what allows each to operate autonomously. By being self-indicative within a given domain, whether at biological, cognitive, or experiential levels, these systems become capable of maintaining their identity separate and distinct from their environment without outside intervention. In Varela's words: ". . . closure and the system's identity are interlocked, in such a way that it is a necessary consequence for an organizationally closed system to subordinate all changes to the maintenance of its identity" (1979, p. 58). And it can only do that through self-referential feedback of its identity to itself. Cybernetics thus evolves naturally into second-order cybernetics.

Varela originally joined forces with his mentor Humberto Maturana (Varela, Maturana & Uribe, 1974), to develop Maturana's concept of autopoiesis, "in cybernetics, a term coined by Humberto Maturana for a special case of homeostasis in which the critical variable of the system that is held constant is that

system's own organization (sic)" (Bullock, Stallybrass & Trombley, 1999). Varela further articulated these initial concepts in his *Principles of Biological Autonomy* (1979). Its major thesis is that biological systems become autonomous, capable of self-generation, by remaining *structurally open yet functionally closed*. The central idea that makes this possible is that a system can re-enter itself endlessly, i.e., create repetitive loops in which end products are fed back into the system as new starting points.

Here Varela is presenting a new answer to the age-old question of how form emerges in a formless world. This is one of the great issues in the history of Western philosophy, and worth a brief regression.

### **How does Form Emerge? A Digression into the History of Ideas**

*You cannot step twice into the same river, for fresh waters are ever flowing in upon you.*

- Heraclitus (Copleston, 1962, p. 55).

From time immemorial, men and women have noticed that the world is in flux, constantly changing. The most famous expression of that verity was Heraclitus' observation. Yet it is also true that, despite the river constantly flowing, it remains a river, separate from the land through which it flows. How can these two be reconciled? How can form exist in an ever-changing world?

The two classic answers to the question of how form emerges in nature are those of Plato and Aristotle. This shortest summary of their positions (which, of course, oversimplifies both) is that Plato was concerned with an eternal world of *being*, which undergirds our changeable physical reality, Aristotle with the world of becoming, in which we live. For Plato, all that exists in physical reality is a pale imitation of eternal forms, ideas, which are unchanging. For Aristotle, what we see in nature is matter in the process of developing into its predestined form. If that sounds too much like Plato's position, it's because Aristotle's position is, in fact, less clear than Plato's and is informed largely by his studies of biology. There he saw oaks growing from acorns, chickens from eggs, and so on. It seemed clear to him that the ultimate form of the oak had to already be contained within the acorn, and the chicken within the egg. In essence, his was a teleological position, Plato's a causal one.

Later Christian philosophers struggled to achieve a satisfactory resolution of these two positions. During much of this period there was little or no interest in looking at the world itself to see what was actually there. With the dawn of the Renaissance, however, the focus of art and literature shifted to the real world, and the type of detailed observation that would lead to the birth of modern science came into existence. As the latter emerged in the seventeenth century, careful observations of nature and detailed records of these observations slowly began to erode the faith in the old assumptions about nature espoused by Plato and Aristotle. Meanwhile, a growing emphasis on objective observation began to separate the observer from the observed, while at the same time an increasing number of individuals began to engage in or less

objective self-observation as well (Combs, 2001). This ability for reflection already reached a high point in René Descartes, who practically invented the notion of consciousness in his mid 17<sup>th</sup> century *Meditations*. In the early 18<sup>th</sup> century Bishop George Berkeley carried Descartes' introspective orientation to the limit, arguing for the *idealist* view that all sensory experiences are presentations of the mind. This line of thinking was not Platonic by any means, but do not contradict it either. On the other hand, the more successful stream of British empiricism represented by John Lock's notion of *tabula rasa* had a distinct Aristotelian flavor, with its emphasis on the primacy of the material world. Later in the century Immanuel Kant made a real advance on the ideas of Plato and Aristotle.

Kant argued that Locke was right, there is a physical world and it is composed of physical entities, *das ding an sich* (the thing in itself). But he also agreed with Berkeley that all we can experience are the ideas in our mind. But Kant saw that this was a psychological issue. We don't accumulate a direct portrait of reality from our sensory experiences as Locke thought, we construct reality using in-born categories of mind. Those categories, like Plato's ideas, might (or might not) be eternal, but reality isn't simply a poor mirror of those eternal forms. Those ideas (*categories* for Kant) are in the mind, and are what we use to structure our experience of reality. With the considerable success of this notion Kant instigated a kind of Copernican Revolution in philosophy according to which what we can know is never the thing in itself, but always the thing as represented. Never a perfect copy, it is always the outcome of our engagement with the external world and the active power of the mind. Our knowledge of the world bears the stamp of our own conceptual activity (Putnam, 1990, p. 261).

While influential among philosophers, especially on the Continent, eighteenth century science took little notice of Kant. It was too early for science to worry about issues like the relationship between mind and world. Indeed, it is only recently that science has had to address such issues through detailed study of the brain and its relationship to the world.

All the above issues come to focus in the work of brain scientist and philosopher Walter Freeman, whose research on the brain provides exquisite support for Varela's model of biological systems as structurally open and functionally closed, reentering themselves endlessly to preserve identity. Freeman and his students studied the olfactory system in rabbits, attempting to trace every step of neural activity from the initial sensory receptors through all the paths this activity took until it reached the cerebral cortex. At that point, suddenly the original neural activity vanished! In Freeman's words: "just like the rabbit down the rabbit hole in *Alice in Wonderland*." Instead, they found a totally "new pattern of cortical activity that was created by the rabbit brain." They were able to replicate this finding, not only in the olfactory system, but in all the other major senses as well. No matter which sense they studied, when the neural activity reached the cortex, suddenly something new appeared, and that new pattern of activity varied each time they repeated the experiments. Freeman concluded that "the only knowledge that the rabbit

could have of the world outside itself was what it had made in its own brain" (all quotes from Freeman, 1995, p. 2).

For a rabbit brain, and by extension, the human brain, the most complex biological structure on the planet, Freeman appears to have amply demonstrated Varela's conjecture that biological systems become autonomous, capable of self-generation, by remaining *structurally open yet functionally closed*. How else to describe Freeman's rabbit, whose brain receives sensory input from the world outside, yet responds with a creative response from within? Freeman explains this in terms of intentionality. He views the brain as an intentional structure that reaches out into the world through the senses, rather than merely passively accepting sensory input. "I explain the lack of invariance [of our experience of the world] as based on the unity of intentionality, such that every perception is influenced by all that has gone before" (Freeman, 1995, p. 2). Curiously, Freeman himself is critical of Varela's position, which he interprets as "metaphysical solipsism, according to which everything that exists is the projection of a brain" (Freeman, 1995, p. 2). But though he disagrees with Varela's view, it is difficult not to see them both, each in their own way, as in agreement with Kant that all we can know is "a joint product of our interaction with the external world and the active power of the mind" (Putnam, 1990, p. 261).

### **The Soft Boundaries of the Self**

The boundaries of my body are invisible, a floating shield of self-production, unaware of space, concerned only with permanent bonding and unbonding. The self is also an ongoing process every time new feed is ingested, new air is breathed in, or the tissues change with growth and age (Varela, 2001, p. 263)

Varela's concept of biological identity contains paradoxical elements, implying that a system is open precisely because it is closed and closed because it is open. That is, biological systems retain cohesive identity because, as Prigogine and Stengers (1992) might say: they exist in far from equilibrium conditions with an exchange of matter, energy and information across open boundaries. At the same time, this identity can evolve dynamically precisely because of the system's autonomous functioning. Hardly the metaphysical solipsism of which Freeman accuses him.

As his career progressed, Varela extended his work from biological into psychological realms. During the past two decades, Varela helped to spearhead a shift within cognitive science away from the classical view, resembling Locke's position, of an inner mind representing an outer world using symbols in a computational language of thought. Instead, Varela embraced what he and colleagues called an *enactive* view of cognition (see Varela, Thompson & Rosch, 1991). This approach blends concepts from phenomenology and non-linear dynamics. As most recently conceptualized by Thompson and Varela in a forthcoming book, enactive cognition involves the following three elements:

1. *Embodiment*: The human mind is not confined within the head, but extends throughout and even beyond the living body to encompass the world outside of the organism's physiological boundaries.
2. *Emergence*: Human cognition emerges through self-organized processes that span and interconnect the brain, body and environment in reciprocal loops of causation. In addition to the 'upwards' causation of personal consciousness by neural and somatic activity, there is the 'downwards' causation of neural and somatic activity by the person as an active, conscious agent.
3. *Self-Other Co-Determination*: Because open boundaries exist at all levels, which include the social, the individual human mind does not emerge in isolation, but instead is embedded within an interpersonal context. Through ongoing, dynamic interaction, self and other create one another at the most fundamental levels.

This view of cognitive autonomous functioning places the body, physical environs and even the interpersonal environment all within the purview of a kind of extended subjectivity. Now we can see how Varela extends the notion of "structural openness" from biology into psychology. At the psychological level, autopoiesis involves the evolution and dynamics of a psyche that employs structural openness, i.e., growth, change, movement in time, plus social and environmental coupling, in order to achieve functional closedness, i.e., stable, cohesive integrity and identity across time. The arc of consciousness moves outside and away from the body into the world and then back inside again, in the form of perceptual-motor loops and an extended phenomenal presence. Freeman, in a lovely expression of this social embeddedness of mind likens the interchange between two brain/minds to a dance. "Dancing with others is the quintessential means to bridge the solipsistic gulf" (Freeman, 1995, p. 5). We see this throughout the normal experiences of life. When two strangers interact, it's easy to view them as "functionally closed," with communication limited to the content of the words they speak. Contrast that with lovers whose whole world is the other person. Looked at from without, it's easy to see the "dance of love" they go through.

This mutual dance is more than anecdotal. In his *Beyond Culture* (1977), linguistic anthropologist Edward T. Hall presented research on *synchrony* by experimental psychologists William Condon and Ray Birdwhistell. They filmed couples and larger groups in a wide variety of generalized behavioral settings. When, afterwards, they slowed down the films, what looked in normal time like spontaneous behavior, was actually a dance in which each gave and responded to tiny behavioral cues. According to Hall, "Viewing movies in very slow motion, looking for synchrony, one realizes that what we know as dance is really a slowed-down, stylized version of what human beings do whenever they interact" (Hall, 1977, p. 72). He concludes further that this ability to respond to tiny behavioral cues is innate and well established by the second day of life, if not in fact present from birth.



More recent infant research suggests that this synchrony is involved in the development of self by the infant, and in the mother's development as well (Beebe & Lachmann, 1988; Beebe, Jaffe, & Lachmann, 1992). Here, the expanding selves of child and mother are integrally linked. How the child comes to view him- or herself depends critically upon mother's emotional responsiveness. How the mother views herself depends critically on that of the baby. (Marks-Tarlow, 1999). One is reminded of what Freeman calls a "Society of Brains." In this dance of synchrony the infant and mother become a society of two, in which fundamental perceptual and motor choices represent the elemental distinctions, or signs, that in developmental time will lead to the higher order and more abstract signs we associate with meaning and consciousness. This escalating web of signs will eventually lead to the ability to become an objective observer, as we will see below.

Returning momentarily to infancy, however, let us note that as conscious, its hallmark will be the capacity to draw distinctions between one thing and the next. And., in order to draw distinctions, opposites must separate in consciousness, allowing the child to experience each case independently in time. Unlike the realm of the unconscious, opposites do not necessarily co-exist comfortably in the conscious mind. For with the capacity to separate opposites in consciousness, also comes the possibility for contradiction. No longer do opposites simply merge and emerge from one another; now they may actually collide.

Yet as Varela (1975) intuited, self-reference enfolds and sometimes incorporates opposite states. That is, the recursive enfolding of opposite states leads to a system that is functionally closed, but not necessarily internally contradictory, even at the cognitive level. Contradiction can be avoided when opposite states continue to be expressed sequentially in time as oscillating emotional and/or experiential states, or when they are separated by barriers between conscious and unconscious levels of awareness. Isn't this reminiscent of Spencer-Brown's oscillation in and out of the form?

At the cognitive level, recursive dynamics lead us ineluctably to second order cybernetics. Consciousness operates continually upon objects and aspects of both internal and external worlds. Reentry occurs through feedback processes whereby products of one state of consciousness become the content for the next state. Each sign becomes the *object* of another sign, and these contain each other like a reflection captured between the surface of a pond and a mirror held above it. As one of the authors has previously noted, in this moment consciousness crosses a threshold of complexification and self-awareness is born (Marks-Tarlow, 1999). In poet John Donne's words: "The beast does but know, but the man knows that he knows."

### **Self and Recursion in Social Theory**

There exist a number of social theories that contain recursive dynamics and identity information at their

cores. In each, consciousness arcs away from the self towards the other, only to return again through social interaction. Out of these recursive loops of social interaction a global sense of self is shaped and held in a coherent self-identity. Object relations ego theorist Jane Loevinger (1976) calls such processes "circular reactions." Similar notions were expressed a century ago by Cooley (1902/1968), who used the phrase "looking-glass self" to describe how a sense of oneself is integrally connected to a correlate sense of others. I see you looking at me, and observing you I begin to sense the me with whom you are interacting.

At about the same time in history the American psychologist James Mark Baldwin proposed the similar idea that infants first learn to discriminate people from other objects in the environment before recognizing themselves as people. Only later, however, does the child finally distinguish in others the same feelings experienced in his or herself, to arrive at full social awareness and empathy. Baldwin's model is similar to Cooley's, but in it the self forms the mirror in which one knows the other, rather than *visa versa*. The two models appear to be reverse images of each other.

On reflection, the question of whether it is the self that forms a mirror for the other, or the other that forms a mirror for the self, acquires the aspect of a chicken and egg issue, merely demonstrating the reversibility and yet the ultimate equivalence of marked and unmarked states. Each sign is the object of another sign, itself the object of reflection.

Perhaps the most famous example of circular reactions is found in George Herbert Mead's (1934) theory of "social behaviorism." Like Cooley, Mead postulated that mind and consciousness arise as children learn to represent themselves to themselves through taking the views of others such as the mother or a teacher. Later, children acquire an awareness of a generalized or collective *other*.

According to Mead, the development of self-reflective awareness involves a sense of 'I' (as an active subject) and a sense of 'me' (as an object acted upon by others). We can see this theory in action by watching young children learning to speak self-referentially. First they refer to themselves by name, in the third person, as if they were objects seen through the eyes of others. Only later do they gain the ability to refer more directly to themselves, as subjects in the first person form of "I."

Similar ideas are found in the writings of psychoanalytic object relations theorists such as Melanie Klein or Margaret Mahler, who postulate that our extended system of early interpersonal relations becomes internalized as aspects or representations of self. Thus, the developing awareness of self and others go hand and hand. In a similar thought evolutionary vein, Francisco Happé (1998) speculates that during the process of human evolution, *homo sapiens* became conscious as a side effect of selection pressure to read the minds of others. This theory is passed in part on Happé's observations of autistic development, where social deficits are seen to accompany deficits in self-awareness. Social mirror theory is also receives

suggestive supported by current neurological research that identifies the presence of 'mirror neurons' in the ventral frontal pre-motor area of macaque monkeys (Rizzolatti, Fadiga, Gallese & Fogassi, 1996). These are neurons that fire in similar patterns when a monkey performs a simple action such as grasping and lifting a cup, or observes another monkey (or even robot arm!) doing so. Mirror neurons have also been recently identified in humans as well (Nishitani and Hari, 2000).

As suggested by the presence of mirror neurons, the development of functionally closed, autonomous identity out of structurally open cycles of interactions does not occur only in early childhood, but extends throughout life, we continually rely on the internalizations of our perspectives of others to retain stable, cohesive identities. As we do so a sense of the subjectivity of the others is co-created along with that of the self, leading to complex webs of intersubjectivity.

In all the above models of circular reactions, self-awareness and identity emerge in a functionally closed, autonomous, fashion from structurally open cycles of social interaction. Internal complexity builds as awareness of oneself develops hand-in-hand with our awareness of others. As cycles of interactions between self and other become recursively enfolded into self-self cycles, a fully symbolic experience of self emerges from more concrete levels of self-reflection. In Peirce's terms, increasingly complex networks of signs are created that reflect each other like the Net of Indra, and out of which arises the emergent phenomenal reality of the self. In the words of Søren Kierkegaard (1949), written in 1849, the self "is a relation which relates itself to itself" (p. 216), and that very relation is the self.

Social mirror theories help us to see how new, more complex and abstract levels emerge from infinite, recursive cycles of consciousness re-entering itself. This process peaks in our own capacity psychologically and linguistically for self-referentiality, the ability to use symbols like the "I" form of speech, to represent oneself as a symbol.

### **Recursive Loops in the Development of Intelligence and Self**

From the above themes it is perhaps not surprising that a growing sense of self-awareness and objectivity is essential to psychological growth, and indeed to the developmental unfolding of intelligence itself. A survey of the work of many developmental psychologists makes it clear that an essential feature of intelligence is the ability to reflexively stand back, as it were, from our own experience and see it objectively (e.g., Cook-Greuter & Miller, 1999; Fischer & Harter, 1999; Kegan, 1982, 1994; Kohlberg, 1981; Loevinger, 1976; Flavell, 1963; Wade, 1996). Much of development can be seen in this light, and the changing sense of self that comes with this increasing objectivity is tantamount to nothing less than a series of transformations of our identity as we mature. This motif can be carried into the realm of consciousness studies where it bears directly on the spiritual development as well (Combs, 2001; Gebser, 1949; Wilber, 1999).

For instance, Piaget's concrete operations stage is associated with a period of magical thinking and identity with the physical body. The child at this stage *is* his or her body. During the next stage, concrete operations, identity shifts to become embedded in a social context. We *are* the role we play in the family and society. This is the level of Kohlberg's "good boy, nice girl" morality, and of conformity-oriented moral behavior. The transition to Piaget's formal operations period is linked with a shift of identity to an inner self, and an absolutist morality. These changes go hand in glove with changes in the ability of the individual to stand back and observe his or her own process. While the magical child is identified with his or her own body, the slightly older conformity-oriented child stands back from the body, seeing it objectively as an articulated aspect of his or her experience, and identifies with the group. Further into the formal operations period he or she will see the group objectively and come to identify with an inner self. Theorists of the history of consciousness (Barnes, 2000; Beck & Cowan, 1996; Gebser, 1949; Wilber, 1999) observe that this sequential disentanglement with body, the group, and finally the mental process itself, as seen at the highest level of formal operations and in post-formal-operations intelligence, characterizes the history of human consciousness itself as it moved from hunting and gathering (magical) societies to agricultural one (mythical or role oriented societies), and on to the ancient civilizations such as Greece, Rome, and the Hebrews (formal operations), and after a regression during the Middle Ages, to the modern and post-modern worlds (post-formal operations).

This ability to stand back from the body, from the mind, from increasingly large fields of thought, thereby appraising concepts and attitudes as objects of reflection, and finally from emotions and even our very sense of identity, marks a trajectory that ties together the fields of psychological development, historical evolution, and spiritual unfolding. The religious scholar Frithjof Schuon (1981) observes that,

There is no knowledge without objectivity of the intelligence; there is no freedom without objectivity of the will; and there is no nobility without objectivity of the soul. (p. 15)

Objectivity is the fruit of self-awareness, and surprisingly enough, self-awareness is the gift of complexity. Reflecting at length on this matter, psychoanalyst Stanley Palombo (1999) concludes that it is through complex networks of interactions, within the psyche and within the brain, that our sense of self comes to have access to the many thoughts, feelings, and motivations that otherwise drift about as disconnected attractors, controlling us like puppets without our knowledge or understanding. In other words, objectivity requires wholeness while the usual human condition involves significant fragmentation. Motivational aspects of the mind are only loosely connected to cognitive belief systems, rational process, perceptions, and even emotions. The idea could also be stated in terms of the interconnections of neural networks in the brain and the attractors that their activities trace. Palombo points out that it is the goal of psychotherapy—and here we would add, the goal of psychological growth in general—to connect these fragments into a more complex, fully integrated, system of processes in

which few psychological events continue on their own outside of consciousness.

Years ago the pioneer of biofeedback, Elmer Green (Green & Green, 1977) observed that when a system is supplied with feedback it somehow tends to regulate itself to increasing degrees of balance and stability. For example, biofeedback for heart activity or blood pressure does not usually influence them in an immediately useful way, but over time they become stabilized with greater balance and health. There are many body therapies today, from progressive relaxation to Network Chiropractic, that seem to work on the same principle, namely increasing the patient's awareness of different parts of aspects of their bodies, and thus lending them a natural stability. The situation is not much different in the psychological realm. The 20<sup>th</sup> century sage and yogan Sri Aurobindo (1972) once observed,

All developed mental men, those who get beyond the average, have in one way or other, or at least at certain times and for certain purposes, to separate the two parts of the mind, the active part, which is a factory of thoughts and the quiet masterful part which is at once a Witness and a Will, observing them, judging, rejecting, eliminating, accepting, ordering corrections and changes, the Master in the House of Mind. (p. 83)

Modern development theorists tell us much the same thing in less poetic language. Growth comes with increasing complexity, which leads to increasing objectivity. Such objectivity comes with a growing ability to see larger and larger chunks of whatever it is that is us in objective ways via reflective consciousness. In doing so, our own sense of self becomes larger and less constrained. For mystics, this growing sense of self, shedding previous identities like the snake skins of Uroboros, leads to larger and larger vistas of experience.

### **Recursive Interpenetration: Varela's Final Inconclusion**

*One tries to get inside oneself  
that inside of the outside  
that one was once inside  
once one tries to get oneself inside what  
one is outside:*

*to eat and to be eaten  
to have the outside inside and to be  
inside the outside.*

R. D. Laing (1970, p. 83).

Varela was a Buddhist a student of the Tibetan master Chögyam Trungpa. This meant that he was very familiar with Buddhist insight meditation, perhaps the most highly developed technique ever devised for cultivation of self-observation. This in mind, it is perhaps not surprising that towards the end of his life he shifted his professional interests from cognition viewed as abstract entity toward the subjective essence of consciousness itself. He embraced the work of phenomenologists such as Edmond Husserl, who systematically studied the structure of experience. In the end, Varela wound up embodying his own ideas and applying the tools of his profession, that began as a biologist, to his own subjectivity.

In his final paper of sole authorship, Varela (2001) explored the phenomenology of his own struggle with a shattered sense of self that accompanied his severe medical condition of a liver transplant and subsequent failure. The paper is entirely self-referential. Varela used his deteriorating physical condition to explore in himself the moving boundaries of an identity that paradoxically sometimes rejected the self as alien and embraced the alien as self. He implicitly highlighted the paradoxical aspect of his condition with the contradictory title, *Intimate Distances: Fragments for a Phenomenology of Organ Transplantation*. The paper emanates a paradoxical flavor of the presence of alterity, the alien or otherness, in the self.

Thus the foreignness of the grafted liver is less and less focused. The body itself has become a constant, ongoing source of foreignness altering itself as in echo, touching every sphere of my waking life... Transplantation is never in the past, ..it produces an inflexion in life that keeps an open reminder from the trace of the scar altering my settledness, bringing up death's trace. It is my horizon, an existential space where I adapt slowly, this time as the guest of that which I did not arrange, like a guest of nobody's creation (p. 270-271).

Along with the presence of the alien in the self and the inside in the outside, e.g., Varela's body captured on medical film as well as life and death decisions mediated externally by a team of medical experts, there is another level of paradox buried deep in Varela's paper. This level is implicit in any earnest effort by consciousness to seek its own truth, whether at the beginning, middle or end of life. It is the sobering recognition that all attempts to seek internal truths are fraught with lies.

In a 1975 paper, *Introductory Comments to Francisco Varela's Calculus For Self-Reference*, Howe and von Foerster note that Kant placed the autonomy of the observer at the center of his philosophy. This represented not so much a shift to subjectivity but instead to the ethics and responsibility that come with autonomy and self-creation. They state, "Lying and not objectivity is the problem and the force of the paradox of the Cretan liar. With his calculus of the paradoxical, the self-referential, the autonomous, Varela has opened for the first time the possibility of a Calculus of Responsibility" (p. 3).

In applying this calculus of responsibility to our selves, we can see how lies function in service of truth

telling, at least in the realm of self-reflection. Whitehead (2001) notes that the ability to attribute false beliefs to others underlies tactical deception, purposeful lying, games like hide-and-seek, and the capacity to understand children's tales such as why Little Red Riding Hood gets into bed with the wolf. He also observes that the capacity to solve false belief tasks, which usually develops around four years of age, is essential to normal social interaction and may never develop in autistic children. In the same vein he writes that for young children pretend play is critical for learning to infer the mental states of others. Such play, which usually begins by around 12 months, can be understood as harmless lies harnessed in service of the capacity to tell the truth about the inner life of others, and ultimately of oneself as well. Pretend play is also the obvious precursor to making art. No wonder Shakespeare said, "The truest poetry is the most feigning," while Picasso's declared art "a lie that tells the truth." And Umberto Eco argues for deception as the precursor to signification.

When it comes to everyday life we tend to think of ourselves as stable, bounded entities, both psychologically and physically. We believe, or at least operate as if we believe, that we can make clear distinctions what is between inside and outside, me and not me, self and other. Yet these are truths based on a lie, a failure to recognize the structural underpinnings of identity as open as a fluid, dynamical, ever-moving, ever-renewing, ever-elusive processes with shifting boundaries that are infinitely deep and impossible to resolve.

Sadly, Varela's final paper went to press just as he died. Here are his final words, written under the subtitle, *Inconclusion*:

I can see it: all of us in a near future being described as the early stages of a mankind where alterity and intimacy have been expanded to the point of recursive interpenetration. Where the body techné will and can redesign the boundaries ever more rapidly, for a human being which will be 'intrus dans le monde aussi bien que dans soi-meme' [extruded into the world as far as into himself] as the epigraph says. Even if my own window is narrow in time and fragmented in understanding. Somewhere we need to give death back its rights (p. 271).

Although Varela expressed this anomalous awareness in his twilight hours we all, whether in sickness or in health, must travel great distances away from ourselves in order to achieve intimacy within. Only as we gain the metaphorical capacity for objectivity, or distance from our selves, do we gain the capacity for intimacy. Yet paradoxically, no amount of distance allows us to perfectly achieve this goal. The paradoxical idea that intimacy with ourselves is a function of psychological distance, expressed with such anguish by Varela at the end of life, is beautifully captured in a more positive light by Theodore Roszak, who wrote, "the mind is gifted with the power of irrepressible self-transcendence. It is the greatest of all escape artists, constantly eluding its own efforts at self comprehension." Here we see the great paradoxical nature of psychological reentry at work. The very attempt to re-connect with our core is

intrinsic to the very failure of this enterprise. And this failure itself represents its own ultimate success, that of self-transcendence.

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