Relations: The true substrate for evolution

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Abstract

The strange ''forgetfulness of the notion of the sign'' that John Deely puts as an emblem for the third of the Four ages of understanding *(2001: xxx) may also be seen as an emblem for the so-called modern science that grew to unprecedented victories in that same historical period. This was the period where the Newtonian idealization of nature was, somewhat paradoxically, taken as a prime model for good materialistic science. One important consequence of this idealization was that the spectrum of acceptable causalities operative in nature was reduced to just one, the efficient causality of Aristotle. As a consequence the concept of relation disappeared from nature as autonomously existent. Departing from the bioanthropological critique of modern biology launched by Gregory Bateson, the paper reinstates ''relative being'' — and thus the notion of the sign — as a ''unique, suprasubjective mode of being'' (Deely 2001: xxxi). The scientific vision of a nature governed by natural laws is thus replaced by a vision of nature as an incessant semiotic emergence brought out by the ever increasing capacity of life for inventing new and more efficient kinds of ''interpretance'' or, in Peircean terms, a tendency to take habits.*

Keywords: *relative being; Gregory Bateson; evolution; semiotic emergence; bioanthropology; natural law.*

1. Newtonian idealism

Scientists that innocently take the Newtonian revolution to be a fundamental building block for modern rational science may not be aware of the strange metaphysical claim at its base. Thomas Hobbes' bold conjecture, that the social atoms, human individuals, posses *essential properties* from which the appearance of social order among human beings can be

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explained, was transferred by Newton to the natural world which he saw as constituted, at the micro level, of particles with *essential properties*: hardness, impenetrability, indivisibility and inertia. But Newton also claimed that these essential properties could not by themselves explain natural phenomena in the absence of a causative agent, or force, the force of gravity. Gravity differs from the essential properties of particles in that gravity is not a property of any single particle but an enigmatic *universal property*, unlike anything else known to human experience. Thus, according to Newton's postulate, right now every atom in your little finger is pulling in every atom on Venus and *vice versa* (although, unknown to Newton, gravity cannot exert its distant effects faster than the speed of light). Simply by postulating the existence of this one force Newton was able to bring the movements of celestial bodies into harmony with movement of bodies at the Earth, both kinds of movements being calculable by the same set of simple equations. While Newton himself did not think he had explained the phenomena, that he so accurately had described, and spent the last thirty years of his life searching in vain for a true explanation of gravity, most scientist since Newton have conceived of the Newtonian laws as the ideal way to scientifically model nature. The invisible hand of Adam Smith and the Darwinists conception of natural selection as a source of otherwise mysterious purposeful activity in animate nature are both deeply indebted to the Newtonian idea of gravity as an unexplained (divine?) yet — as the proponents believe — trustworthy force of lawful universal intervention in the senseless machinery of economy or evolution respectively.

The huge explanatory potential of the Newtonian achievement combined with the immateriality of gravitation itself served to strengthen the Platonic intuitions of scientists that came to see mathematical formalizations as expressing the deepest reality of our world.

The belief that mathematically formalized nature may in principle explain the unruly material processes and entities of natural systems, as we humans experience them, has been one of the major tenets of modern science. Only recently has this metaphysical supposition started to crack due to a growing understanding of the role of emergent processes in evolutionary systems. Findings in the study of complex systems have shown that the formation of ordered structures in our universe may be a more promising area of research than the much-heeded attempts to formalize natural systems into predictable patterns. Maybe complex natural systems simply are not predictable after all? Maybe, in other words, the seeming order of this world is not preordained by natural law but is, instead, simply the result of communicative interaction inside, or between, complex systems, semiosis.

A century has now nearly passed since Einstein's relativity theory undermined the belief in Newtonian conceptions such as absolute space and time. But neither relativity theory nor quantum mechanics abolished the fundamental belief in mathematical formalizations as *real* reality. Quantum mechanics may be interpreted to preclude ultimate predictions, but the implied indeterminacy is normally understood as an epistemological indeterminacy, i.e., the problem that observed entities are unavoidably influenced by the observation, whereas the quantum mechanical equations themselves describe a perfectly deterministic world. The Platonic-idealistic aspect of Newtonianism thus remained untouched for nearly another century.

Only in the final decade of the twentieth century did new approaches to the analysis of dynamical systems gradually permit a retreat from the Newtonian ideal. The capacity of computers to simulate the dynamics of complex systems has produced what might be called a "reality-influx" into the theoretical worlds of science. Most interesting systems in this world, living systems in particular, find themselves in a kind of state that thermodynamicists call *far-from-equilibrium* states and systems belonging to this class cannot be described by the classical equations. Thanks to developments in a range of advanced fields inside physics, biology, cognition science, and others a relative consensus have been reached in viewing such complex systems as having dynamic properties that opens for self-organization to occur (Haken 1984; Yates 1987; Kauffman 1993, 2000; Kelso 1995; Port and Van Gelder 1995). Self-organization is seen here as a process by which energetically open systems of many components "tend to reach a particular state, a set of cycling states, or a small volume of their state space (attractor basins), with no external interference. This attractor behavior is often recognized at a different level of observation as the spontaneous formation of well organized structures, patterns, or behaviors, from random initial conditions (emergent behavior, order, etc)" (Rocha 2001: 96). In complex adaptive systems kinds of positive feedback occur where the products are themselves necessary for the process, producing a "circular cause" or a "self-cause" (Juarrero 1999: 5). Unknown to most scientists already, Kant, of course, dealt with the "self-organizing" properties of life forms that for him implied the impossibility of ever including biology among the (Newtonian) sciences. Self-organizing systems, as scientifically conceived today, form dynamic wholes that are not just, as science so often assume, epiphenomena, but are capable, as systems, to exert causal power over their own components and exhibiting formal and final kinds of causalities.

The breakdown of the Newtonian idealization of nature thus reinstates a more broad-minded conception of causality and potentially lifts the

taboo against final causations in science that have for centuries prevented a semiotic understanding of nature. Even the simplest life forms take cues from their environment and generate interpretants in the form of actions that are future-oriented, inasmuch as living beings always seek signs that may help them survive and reproduce. Semiosis, the action of signs, says Lucia Santaella, is a synonym of final or intelligent causation and also a synonym of life: "Peirce's definition of the sign as the ordered form of a logical process including the effective action of the existent and subjected to chance function is a subtle, logical, general, and abstract description of all transformational processes such as life, mind thought, intelligence, time and evolution" (Santaella-Braga 1999: 499).

This, then, clearly shows us Charles Peirce as the first explicitly postmodern philosopher in the sense John Deely gives to this somewhat overused term, namely, the understanding that "the highest grade of reality is only reached by signs" (*CP* 2.327; Deely 2001: 211), or in Deely's own words: "If there is one notion that is central to the emergent postmodern consciousness, that notion is the notion of sign." (2001: xxx). The gradual overruling of Newtonian idealism in science lets us finally understand the full range of Peirce's semiotic realism, and we must be grateful to Deely for his visionary rewriting in this great volume of the history of philosophy in the light of a rarely enlightened postmodern understanding.

2. A deep symmetry

The subordination of the scientific worldview under Newtonian idealism left us with an unsurpassable bridge between nature and mind. On the one hand we have a scientific approach to the study of life that takes for granted that natural laws exhaustively explain all of reality. On the other hand we have a humanistic approach to which human intentionality, conscience or "first person experiences" remain central and which maintains that the core of these phenomena evades description in terms of natural laws. Thinkers of the latter opinion often take the poverty of the scientific world view *vis a vis* these aspects of the world to imply that a religious or spiritual position is necessary. Conversely, and symmetrically, adherents of the scientific world view routinely suspects religious or spiritual motives behind any criticism of the scientific world view.

None of these mainstream views seems much inclined to consider that a third possibility exists, a position that sees human mind as a particular instantiation of a nature that is in a deep sense itself *minded*. A view, in other words, which holds that neither human mind nor nature at large is reducible to deterministic natural laws. This, as we saw, was the position

taken by Charles S. Peirce, and in more recent times by Gregory Bateson — let us in this context term it *the bioanthropological position* — nature is not the mindless kind of thing the natural sciences have stubbornly tried to reduce it to and there is therefore no reason why human mind should not be seen as a naturalistic phenomenon in no particular need of religious or spiritual explanation.

One of the most remarkable aspects of the scientific outlook is exactly that it considers itself to be *materialistic* in spite of its obvious debt to Newtonian idealism. As Bateson saw this so-called materialism is strangely symmetrical to so-called superstition: ''Miracles are dreams or imagenings whereby materialists hope to escape from their materialism. They are narratives that precisely — too precisely — confront the premise of lineal causality'' (Bateson and Bateson 1987: 51).

Materialism and supernaturalism are in Bateson's view logically opposite ways of responding to the same central misconceptions deeply buried in our Cartesian heritage. First and foremost is the idea that there are two distinct explanatory principles in our world, ''mind'' and ''matter,'' forcing us to chose beetween the causality of mind (supernaturalism) or the causality of matter (materialism) in our explanations:

> [We can] think of the mind/matter dualism as a device for removing one half of the problem for explanation from that other half which could more easily be explained. Once separated, mental phenomena could be ignored. This act of subtraction, of course, left the half that could be explained as excessively materialistic, while the other half became totally supernatural. Raw edges have been left on both sides and materalistic science has concealed this wound by generating its own set of superstitions. The materialist superstition is the belief (not usually stated) that *quantity* (a purely material notion) *can determine pattern.* On the other side, the antimaterialist claims *the power of mind over matter.* That quantity can determine pattern is the precise complement for the power of mind over matter, and both are nonsense. (Bateson and Bateson 1987: 59)

To illustrate this claim Bateson asks the reader to consider the relation between classes and things. Take, for instance, chlorine, which is a name for a *class* of molecules but is not itself *a* molecule or a thing. Now, if you mix chlorine and sodium a chemical reaction will take place leading to the formation of common salt. Nobody denies the truthfulness of this statement. The problem is that the statement is not directly about the material world but only about *classes* of molecules. So, the question is: Are there such things as *classes* in the material world?

Bateson's answer to this question is surprising, and may not be understandable at all inside the Newtonian framework where causative agents are always positive events or conditions: impacts, forces, and so on. As

Bateson notes, this is not so in the creatural world (on the *pleroma-creatura* distinction, see next paragraph), where effects are caused by *differences* in some parameter sensed by the organism. A telling example is that of the frog, which will not see an insect sitting right in front of it as long as the bug does not move. The moment it moves, however, the frog immediately sees it and probably catches it too (Lettvin et al. 1959). "Every effective difference" says Bateson "denotes a demarcation, a line of classification" (Bateson 1972: 457). Classifications then are indeed natural phenomena, but only in *creatua* not in *pleroma*.[1] This answer does in a way lay out much of the epistemological fundament for what should later become biosemiotics (a term Bateson never used himself of course):

> In the world of living things, the Creatura of Jung and the Gnostics, there are really classes. Insofar as living things contain communication, and insofar as they are, as we say, "organized," they must contain something of the nature of *message*, events that travel within the living thing or between one living thing and others. And in the world of communication, there must necessarily be categories and classes and similar devices. But these devices do not correspond to the physical causes by which the materialist accounts for events. There are no messages or classes in the prebiological universe.
>
> Materialism is a set of descriptive propositions referring to a universe in which there are no descriptive propositions. (Bateson and Bateson 1987*:* 61–62)

Thus the life sphere is characterized by proccesses of communication, or semiosis as we would say today, and this is where patterns belong. But the causative universe of materialistic science does not possess the apropriate tools for describing such processes.

The misunderstanding that quantity determines pattern owes much of its credibility to the apparent naturalism of the Cartesian coordinates, which tended to conceal the constructed nature of any graphic or functional representation of natural processes. The laws of gravity, for instance, do persuasively describe certain aspects of our world, but this does not mean that the laws are natural in the sense that they are part of nature. The laws are patterns made up by scientists, they are mental phenomena. Patterns don't exist unless *somebody* draws them.

And here is the core of Bateson's (and Peirce's) idea, a far-reaching idea indeed: Living systems are communicative systems by themselves, and they must therefore deal with classes of some sort, or, in other words, they draw patterns and — I would add — in this sense they essentially are *someones*. Consequently someones — ourselves included — are natural beings, not supernatural observers describing the world "from nowhere" (to use Thomas Nagel's [1986] incisive expression).

3. Creatura and Pleroma

This brings us directly to what I think may be called the main focus of Bateson's whole work whether in biology or in anthropology, understanding the process of knowing, or epistemology: "the interaction of the capacity to respond to differences, on the one hand, with the material world in which those differences somehow originate, on the other" (Ruesch and Bateson 1987: 20). Or, expressed in the terminology Bateson chose for his discussion in *Angels fear*: the interfaces between *Pleroma* and *Creatura* (Bateson and Bateson 1987: 20).[2]

Pleroma is the world of nonliving matter. This is the world descibed by physics and chemistry in which there are no descriptions. A stone does not respond to information and makes no injunctions. The stone is affected by "forces" and "impacts," but not by difference:

> I can describe the stone, but it can describe nothing. I can use the stone as a signal — perhaps a landmark. But *it* is not the landmark. I can give the stone a name; I can distinguish it from other stones. But it is not its name and it cannot distinguish. It uses and contains no information. "It" is not even an *it*, except insofar as I distinguish it from the reminder of inanimate matter. (Bateson and Bateson 1987: 17)

Creatura on the other hand is "the world of explanation in which the very phenomena to be described are among themselves governed and determined by difference, distinction, and information" (Bateson and Bateson 1987: 18). *Angels fear* was published in 1987, seven years after Gregory Bateson's death, and his daughter, Mary Catherine Bateson, who had worked closely together with him in writing the book before his fatal disease would bring his life to an end, took care to point out in brackets that Creatura and Pleroma are not, like Descartes' "mind" and "matter," separate substances:

> On the one hand all of Creatura exists within and through Pleroma; The use of the term Creatura affirms the presence of certain organizational and communicational characteristics which are themselves not material. On the other hand knowledge of Pleroma exists only in Creatura. We can meet the two only in combination, never separately. The laws of physics and chemistry are by no means irrelevant to the Creatura — they continue to apply — but they are not sufficient for explanation. (Bateson and Bateson 1987: 18)

The Creatura-Pleroma distinction is indeed quite subtle, and from Bateson's unpublished manuscripts it appears that he had worked on it for quite some time (Harries-Jones 1995: 95–97). In *Angels fear*, Bateson

explicitly accepts the Kantian understanding of *Das Ding an Sich* as an inaccessible, and accordingly he also thought that we can only know the non-living material universe of *pleroma* through the communicative contexts we ourselves establish, the appearances of *pleroma* so to say, not *pleroma* itself. Harries-Jones explains: ''As *creatura*, we may assume that *pleroma* has its own regularities — inertia and change, cause and effect, connection and disconnection — but the regularities of *pleroma* remain, in the last resort, inaccessible directly'' (Harries-Jones 1995: 97).

The creatural theory is probably the nearest thing Bateson ever came to formulating the ontological assumptions underlying his scientific work. Reading it again so many years later, and this time with an eye to the Peircean perspectives of his thinking I found it hard not to equate *creatura* more or less directly with Peircean *thirdness*. *Creatura*, like *thirdness*, is an anlytical tool for ordering the world's phenomena into categories, and more concretely *creatura* and *thirdness* both encompasses the mediating, lawful, and evolutionary aspects of our world. To place *pleroma* in the Peircean categorial system is less obvious. Taken in its Jungian sense from *Septem Sermones ad Mortuos* as the totally unstructured realm, the ''nothingness'' or the ''fullness'' of the eternal or infinite, *pleroma* might perhaps be equalled to Peircean *firstness*, i.e., potentiality, indeterminacy or chance. *Firstness* necessarily is vague because it is pure quality and does not imply a referent and thus *firstness* — like *pleroma* — need to manifest itself in order to be grasped, but the moment it manifests itself it is already embraced by *secondness*, i.e., reaction, resistance, existence or quantity. *Pleroma* like *firstness* can only be cogitized through its appearences in our cognitive system, so *pleroma* might perhaps be said to correspond to *firstness* in its being in itself, but to *secondness* to the extent pleromatic phenomena are distinguished and described theoretically or practically.

Unlike Jung, however, Bateson did not see *creatura* and *pleroma* as ontological categories but rather as explanatory principles. This was a fortunate choice I suppose, but it must also be admitted that it leaves the Batesonian system a little naked. One would like to escape the implicit dualism of *pleroma* and *creature* not only by epistemizing the two terms. For this distinction does indeed seem to confer upon us a deep sense of understanding — and not just a tool for obtaining such understanding. Let me suggest that a solution to Bateson's dilemma at this point might be to give up the Kantian idea of the inaccessibility of the world's *pleromatic* existence.

Peirce did not accept the idea of the thing-in-itself as an unapproachable limit concept for our understanding. He rather, as John Deely explains in *Four ages*, saw

the realm of what exists "in itself" and what exists "phenomenally" or "in appearances" as "laced together," in fact, in experience and in cognition as such, by the action of signs in such a way that we can come to distinguish and know the one as part of the other by the critical control of objectivity that is the heart of science and philosophy alike beyond their differences of orientation. (Deely 2001: 613–614)

Peirce escapes the Kantian dead end of modern philosophy exactly because he does not follow modern philosophy in thinking that thought operates with concepts or ideas, claiming instead that thought operates on *signs*. This difference is radical: "Concepts refer, signs signify" (Deely 2001: 561). Signs are neither sensible things nor concepts, they are pure *relations*, i.e., irreducibly triadic relations connecting a sign vehicle to its object through the production of an interpretant; and this triadic relation is itself independent of the concrete physical status of the sign vehicles, the objects to which they might refer or the source from which they derive, be it nature or mind.

Thus, according to Peirce, Bateson's *pleroma* would not be inaccessible, but would as the subject matter for physics and chemistry gradually become better and better known to mankind as that primary substratum of the universe out of which life and human mind had gradually emerged. How this could happen is exactly what science and philosophy should now work together to solve. Some beginnings in this direction can be found (Pattee 1977; Salthe 1993; Weber 1998; Hoffmeyer 1999, 2001; Kauffman 2000; Deacon in prep.). And in this sense the existence of *creatura* would not presuppose some mystical "third position" from which to distinguish it from mindless *pleroma*. Rather the distinction of *creatura* from *pleroma* should be seen as an in-built possibility inherent to our universe only to become fully realized through the unfolding of the sharpened evolutionary potential of *creatura.*

4. Relative being

The interface between *pleroma* and *creatura* cannot be dealt with in classical biology for the simple reason that *creatura* or *thirdness* refers to aspects of the natural world that fall beyond the accepted ontology of natural science, and all attempts at explaining these concepts are therefore likely to be met with suspicions of mysticism. Even though most biologists do probably recognize that communicative processes are part of natural systems, they instinctively figure these processes in terms of the involved biochemical and genetic processes supposed to result in the

communicative behaviors. To talk of messages or distinctions just blurs our minds. This is the reductionist credo ruling nearly every department of biology throughout the whole world. And the simple question asked from these quarters when confronted with Bateson's writings (or biosemiotics) normally is: What's all the mess about?

What it is all about, I think, is a quite simple thing, namely the reality of *relative being*. Relative being is a strangely obvious thing, which is nevertheless generally dismissed by science as not really "real." For example Jupiter has a number of moons circling around it; but the relations between the moons and the planet is not seen as anything real in itself, it does not add anything to a strict analysis of the properties of the individual celestial bodies themselves. The simple genitive case seems neatly to exhaust the whole relation: the moons are indeed Jupiter's. And it is of course true that in principle a relation could be drawn between any two physical objects in the world, and in all but a very few cases such relations would turn out to be absolutely uninteresting, whether seen from the point of view of science or from the point of view of ordinary people's everyday life. However, not all relations are of this kind; and to give an example of "relative being" that cannot easily be dismissed as ficticious let me (again following Deely) suggest "parenthood." For all we know, King Frederik the Ninth of Denmark was the father of Queen Margrethe the Second, though His Majesty passed away a long time ago, and we have no doubt that Margrethe will pass away too at some time in the future. Yet, due to royal destiny their relation will in all likelihood persist for a very long time as a relation of parenthood, father to daughter. This kind of "relative being" seems to have a reality of its own that cannot be reduced to the individual persons that substantiate the relation, and such relations have been called *ontological relations* (Deely 1990, 1994, 2001).

But are there ontological relations in nature? Bateson's work can be interpreted to answer this question in the affirmative. *Creatura* is exactly the domain of *pleroma* where relations are truly ontological, in the sense that these relations are not just descriptive devices but are in fact functional in an autonomous way. Relations in *pleroma* may also sometimes be thought of as functional, as for instance in astrology. Thus the multiple relations existing between the planets of our own solar system has indeed been intensely studied by scientists of the past, and they remain a matter of great concern to a lot of people believing in varieties of astrological theory. Since no likely mechanism whereby, say, a conjunction between Mars and Venus (as seen from Earth) could possibly influence the destiny of individuals or nations on Earth has been suggested, such a belief is generally rejected by scientists as superstition. We have absolutely no reason to believe that those relations have any distant causal effects on the

world qua relations. In this case — as in *pleroma* in general — it makes good sense to talk about related things rather than relations, and maybe the general unwillingness of science to accept relations as ontologically real owes much of its strength to the ancient — and now strangely revived — struggles science had to fight against dogmatic beliefs connected to mystical or religious persuasions.

When we turn to *creatura*, however, relations tend to become considerably more autonomous things. The shoulder, for instance, is a ball-and-socket joint that enables a person to raise, twist, bend, and move the arms forward, to the sides and behind. The head of the upper arm bone (humerus) is the ball and a circular depression (glenoid) in the shoulder bone (scapula) is the socket. A soft-tissue rim (labrum) surrounds and deepens the socket. The head of the upper arm bone is coated with a smooth, durable covering (articular cartilage) and the joint has a thin, inner lining (synovium) for smooth movement. The surrounding muscles and tendons provide stability and support. Here are a whole assembly of relations that are all remarkably adjusted to each other. The primary functional relation of course is that between the shape of the ball of the arm bone and the contour of the shoulder socket, and we can assume that this relation has indeed been functionally modulated by natural selection all along the way from the evolutionary origin as appendages or fins in fish. Clearly these relations are of quite another kind than the pleromatic relations pertaining to the planetary system. The relation in fact is so central to the function of the animal that one can hardly imagine the one bone change without a corresponding change occurring in the other bone. Or, if this should happen by an unfortunate mutation, the resulting individual would be crippled and leave little or no offspring. If on the other hand, a mutation should occur that affected both bones in a coordinated way, conserving their internal relation, the resulting individual might perhaps manage quite well in the competition. In this case, the relation as such does indeed seem more real than the individual bones making up the relation. And this state of affairs may well be the rule rather than the exception in the realm of *creatura.*

Quite generally, living systems have evolved a capacity for making anticipations: they must decide when to grow and when to withhold growth, when to move, when to hide, when to sing, and so on, and this way of adjusting the behavior depends on a capacity to predict the future at least to some limited extent. For instance, is it likely the sun will shine or not, is it likely that little flies will pass by if I make my web here, will the predator be fooled away from the nest if I pretend to have a broken wing, etc. Of course, in most cases it will be the instinctual system of the animal rather than the brain that makes this kind of prediction, but the logic is

the same: the animal profits from its ability (whether acquired through phylogeny or through ontogeny) to identify trustworthy regularities in the surroundings. And most — if not all — trustworthy regularities are indeed relations. For instance, the relation between length of daylight (more exactly degree days) and approaching summer that tells the beech when to burst into leafs; or the play of sun and shadows that tells the spider where to construct its web; or the relation between clumsy movements and an easy catch that tells the predator which individual prey animal to select, and thus tells the bird how to fool the predator away from its nest.

Now, in the first two of these examples (the beech and the spider) a certain organismic activity is released as a response to pure (non-semiotic) natural relations, so-called *categorical relations*, whereas in the third example the bird produces a fake categorical relation (clumsy behavior as expectedly related to easiness of catch) and then takes advantage of the semiotic or ontological relation established by the predator when it lets itself be fooled by a false sign. In this case, in other words, the bird fools the predator because it somehow (genetically or ontogenetically) "knows" how the predator is going to (mis)interpret the seeming categorical relation. Observe that, in this case, the predator may not always be fooled, we are not here dealing with normal (efficient) causality, but with semiotic causality: the predator may misinterpret the sign (the faked clumsy behavior), but it also may not.

Anticipation is of course a semiotic activity in which a sign is interpreted as a relation between something occurring now and something expected to occur later, like the dark cloud alarming us to an upcoming thunderstorm. From its very first beginnings in Augustine's writings in the fourth century the sign is conceived as something awakening us to infer something else: In Augustine a *signum* or "a sign is anything perceived which makes something besides itself come into awareness" (quoted from Deely 2001: 221). Deely suggests that Augustine happened on this definition as a "lucky fault" (2001: 216) due to his reluctance to learn the Greek language. The Greek term for sign, *semeion*, was taken by the Greeks to imply "natural signs," whereas "cultural signs" were termed symbols or names, and this categorization of signs of natural and human origin into distinct groups might well, had he mastered the Greek language, have hindered Augustine from abstracting the formal relational character of the sign from its embeddedness in different concrete realms of reality. Still Augustine's definition is too narrow in its focus on perception, since elements of awareness may well be signs also without being perceived. Augustine nevertheless pointed to the core of the matter when he defined a thing as "what has so far not been made use of to signify something" (Deely 2001: 221), implying that things may well be signs

but they need not be so, and also implying that the essence of the sign is its formal relational character of evoking an awareness of something which it is not itself, thereby implying the full triad of sign, object and interpretant (here the altered awareness). The evoking of such a triad is of course by no means exclusive for the workings of human awareness but is rather, as was later realized, a purely logical relation to be established in any system capable of autonomous anticipatory activity, i.e., by all systems belonging to *creatura*.

Just as predictability must precede prediction, a system of useful dyadic relations must first have been realized on planet Earth while it cooled down. Only then more sophisticated systems could survive based on a complicated capacity for anticipation that is, for bringing themselves in relation to the pre-established set of relations under the formation of true triadic or semiotic relations. And while the underlying system of dyadic relations may well be understood in terms of the things related, the emergence of true triadic semiosis in the shape of living beings and their activities established kinds of causality peculiar to this new form of *relative being*, causalities that are way too sophisticated to be decently grasped through the simple dynamics of dyadic relations between things. At this state of organic evolution *semiotic emergence* may increasingly have become an autonomous factor in the continued history of life (operating in a dynamic interplay with natural selection), and the general trend towards a realization of ever new forms of semiotic freedom was started.

Natural selection is itself ultimately dependent upon predictability if durable changes shall be produced. If niche conditions in generation-$(n + 1)$ were not to some extent like niche conditions in the generation-n, "selected" properties in one generation would induce no systematic advantage in the next. In natural selection, a relation between the composition of phenotypes in the population or lineage and the actual ecological and semiotic niche conditions framing the life of this population is acted upon by individuals in such a way that a collective quasi-rational "populational" interpretant is the outcome in the form of an altered pool of genomes brought forward to the next generation. Here the niche occupies the logical position of the sign vehicle, the changing composition of phenotypic properties in the population is the object to which those niche conditions refer the lineage, and the interpretant is the changed genome composition of the lineage in the next generation. Through hundreds of millions of years such a mechanism is thought to bring about coordinated adjustments, like the one pertaining to the upper human arm bone and the shoulder socket.

Describing natural selection as a semiotic process implies that the apparent finality (or teleology) of the process becomes non-contradictive.

Semiosis or sign action is always embedded in sensible material processes and for that reason has a dynamic side that allows the communicative process to run, as well as a complementary or mediating side. The first of these sides is governed by the compulsive force of efficient causation; the second expresses the controlling agency of semiotic causation. And *semiotic causation*, bringing about things under guidance of interpretation in a local context, may be seen as a modern way of conceptualizing the kind of causation Aristotle called final causation, i.e., that cause "for the sake of which" something exists or occurs (Short 2002). Anticipation through skilled interpretation of indicators for temporal relations in a context of a particular survival project (or life strategy) will necessarily guide organismic behavior towards a local end.

Inside "materialistic" biology, however, the apparent finality of selection remains strangely unaccounted for. Darwinists normally escape the finality-problem by pointing out that selection only exhibits an "as if" teleology, or *teleonomy*. In explaining the purposeful nature of adaptive traits, one does of course make reference to the consequences of those traits for fitness; but, as has often been remarked, the consequences that explain the existence of adaptive traits are the consequences those traits *have had*; they are not the consequences that they *will have* or *can have*. And since the consequences precede the effects, there is no violation of the general scheme of efficient causation implied. And yet, Darwinists all the time talk about properties or types of traits as having been selected for, but the fact that it is not particular "traits" but rather "types of traits" that are selected for does nothing to detract from the obviously teleological nature of the process. At least it must be asked why some *types* of traits are "preferred" by nature (or natural selection) and not other "types." Are not preferences inconsistent with a non-teleological nature? As Short has recently concluded in a sharp analysis of the finality of Darwinian selection:

> What I am suggesting is that we take seriously the currently popular talk of "selecting for" a property or type of trait (Sober 1984). Taking it seriously means accepting that talk at its face value: it describes evolutionary processes as shaped by types of outcome and it explains outcomes by citing the types those outcomes exemplify. But a type of outcome that explains its own exemplification is what translators of Aristotle have named a "final cause," as Darwin appears to have recognized. (Short 2002: 337)

Seen as a semiotic process, the finality of natural selection contains no mystery. Lineages are reproductively integrated systems of individual organisms and as such they certainly interact with the world in pursuing

their own supra-individual interests — in fact, to do so would seem to be the whole idea of being equipped with anticipatory capacity.

We conclude that not only is it absurd to deny the reality of *relative being*, because *relative being* rather than things (individual creatures or populations) is what evolution persistently optimizes, but by denying this reality one is prevented from developing a proper scientific understanding of biosemiosis and purposefulness. Instead, science has felt challenged to show that these phenomena are pseudo phenomena (epiphenomena), and that there is therefore no contradiction between our own existence as human first person beings and the purely material universe that created us. People whose intuitions contradict this understanding have had to go elsewhere to cope with their need for understanding how they could possibly belong in this universe. Increasingly natural science has come to look like an esoteric order of believers keeping the reality of non-believers at arms distance behind the walls of power based on a shared narrow ontology (reinforcing itself through the ever repeated memory of the preceding centuries of victorious revolt against the dogma of the Christian church), a consensus about what belongs and what does not belong to reality. How natural scientists manage to know so surely that they are part of a nature that in itself knows nothing is to me a complete mystery.

5. A minded nature

In Stuart Kauffman's recent book *Investigations* an important part of the analysis turns on the question of the non-ergodicity of the universe, meaning that the universe never had the time it would have needed should its present state of affairs in any way be representative of its in-built possibilities (Kauffman 2000). The persistent movement of the universe into the "adjacent possible" precludes its ever reaching a state that depends on statistical likelihood. Instead, the universe is historical, for "history enters when the space of the possible that might have been explored is larger, or vastly larger, than what has actually occurred" (2000: 152).

And Stuart Kauffman brings his analysis to the following far reaching claim: "our biosphere and any biosphere expands the dimensionality of its adjacent possible, on average, as rapidly as it can" (Kauffman 2000: 151). Kauffman is fully aware that this "burgeoning order of the universe" cannot be reduced to matter alone, to entropy (or the negation of entropy, for that matter), to information, or to anything that simple. The propagation of organization and the subsequent growing diversification of the world is taken care of in Kauffman's terminology by *autonomous agents*, and these agents are, as we shall see, semiotic creatures. An

autonomous agent may be defined quite rigorously as an "autocatalytic system able to reproduce and able to perform one or more thermodynamic work cycles"; and in earlier work Kauffman had shown how such agents will be expected to self-organize given the kind of world our Earth system belongs to (Kauffman 1993). In *Investigations*, Kauffman explicitly observes that this definition leads to more intractable questions of "measuring" or "recognition." For if work be defined as "the constrained release of energy," where will the constraints come from? At least it will take work to produce them, and this is not all: "autonomous agents also do often detect and measure and record displacements of external systems from equilibrium that can be used to extract work, then do extract work, propagating work and constraint construction, from their environment" (Kauffman 2000: 110).

And since a measurement is also always an act of interpretation, this immediately brings us to the core of biosemiotics and also poses the question of the origin of life in a new way which shall not, however, be further explored here (Von Neumann 1966; Pattee 1977; Hoffmeyer and Emmeche 1991; Hoffmeyer 1998, 2001; Ulanowicz 2002).

Kauffman's and Bateson's works stand in no contradictory relation to each other here, rather they reach into different aspects of that universal principle that Bateson called mind, and it will be one of the great tasks of biosemiotic analysis to bring these findings under a single consistent theoretical umbrella.

As a first and very preliminary approach to such analysis, let me suggest here that the systematic growth of *semiotic freedom* in our biosphere is a concrete expression of Kauffman's "expanding dimensionality" of "the adjacent possible" as this principle pertains to the Earthly biosphere. Semiotic freedom may in fact be singled out as the only parameter that beyond any doubt has exhibited an increasing tendency throughout the evolutionary process.

Semiotic freedom was introduced in *Signs of meaning in the universe* (Hoffmeyer 1996) as a measure for the depth of meaning or the degree of sophistication of communicatory or interpretative activity. Let us for illustration consider first a case of relatively low semiotic freedom: courtship display among water mites of the species *Neumannia papillator.* Here, the male exhibits a behavior called "courtship trembling," in which he will walk slowly around the female in the water vegetation while vibrating his legs. This behavior almost certainly has arisen as an icon for the vibrations produced by prey animals swimming in the surface water. The female will often respond to male leg-trembling as if to prey, orientating itself to the source of the vibration and clutching the male in her forelegs. Male leg-trembling frequencies are well within the range of vi-

brations produced by the prey (copepods), and starvation experiments have shown that hungry females are more likely to orientate to and clutch at courting males. "It thus appears that male mites are capitalizing on female sensory adaptations for the detection of prey," writes Johnstone (1997). Courtship trembling is an obvious case of what we elsewhere have termed *semethic interaction* (from *semeion* and *ethos* = Greek for, respectively, sign and habit; Hoffmeyer 1997), i.e., a behavioral interaction between two or more agents in which habits and signs reciprocally scaffold each other. Thus one agent evolves the habit of interpreting the habits of another agent as a sign for releasing a distinct activity or habit that may then, in turn, become signs for a third agent, etc. In *N. papillator*, the prey animal's involuntary vibrations have become incorporated into male courtship behavior as an icon "destined" to release a distinct behavioral pattern in the female, allowing reproduction to take place. Whereas the courtship ritual is thus nicely scaffolded through a semiotic relation, the distinction between the leg-trembling as an icon for prey-behavior and for prey itself is still uncomfortably weak, as witnessed by the fact that hungry females respond more enthusiastically to the icons than do less hungry females.

Biological evolution can only proceed from what is already there, and the creation of "leg-trembling" as a scaffolding device for mating in water mites is typical. The evolutionary process may of course continue to modify the semiotic scaffolding devices it inherits in multiple ways, as may, for instance, be observed in the evolutionary line of balloon fly species belonging to the family *Empididae.* In these species, Sebeok tells us: "the males gather in swarms, carrying captured insects as 'wedding presents.' The male offers his gift to a female, which sits peaceable sucking it out while the male inseminates her. As soon as copulation is completed, the female drops her present, but if the empidid bride is still hungry, she may consume her amorous groom next" (Sebeok 1979: 18).

It has been shown that the packaging of these gifts vary greatly from species to species, and in one of the species the male even risks to approach the female "empty-handed." In an early evolutionary stage the female is offered just the juicy insect as such as gift, while in later stages the insect is wrapped in increasingly more silken thread, until the gift has reached the state of a real balloon. In the succeeding stages, writes Sebeok, the prey steadily diminishes in size, hence in food value, while the balloon increases commensurably in complexity (1979: 19). Sebeok notes that in the last of these stages, where the balloon is in fact empty, the link between the sign vehicle and the object for which it stands has become "arbitrary," and that in this case the sign "meets every viable definition of a symbol" (1979: 19). It is interesting that balloon flies are

sometimes used to illustrate so-called *phylogenetic inertia*, i.e., the tendency for structures or behavioral features to be conserved within a certain evolutionary line even when there have been significant evolutionary divergences between species. Thus, in the balloon fly line even the most recently evolved forms that are nectivorous (eating nectar) still offer balloons as "wedding gifts." In other words the balloon, empty here of course, remains a tool for courtship, even though insects have no longer any concrete meaning to the flies as food objects. Seen from a semiotic point of view this could hardly be called inertia, however, since the passage from an iconic mating sign to a symbolic mating sign constitutes a radical jump in semiotic freedom. All traces of the original dyadic relation have now been erased, and a purely triadic relation has taken over.

In both cases discussed here, as in invertebrates quite generally, I assume,[3] semiotic freedom is still very limited and should not be seen as a property of single individuals but rather as a property of the species or the evolutionary lineage. The symbolic character of the balloon in nectivorous species of *Empididae* is only true when considered as a species-specific behavioral trait having developed in the lineage as a kind of historical convention. At the level of the single individual fly, on the other hand, there is almost no semiotic freedom at all, since its behavior is fully controlled by the rather deterministic instinctual reflex systems. It should be noticed, however that behavioral determinacy is not complete. Thus, the occasional mutant that, for some reason, has developed a less rigorous release mechanism for mating behavior may, under rare exceptional conditions, survive and thereby contribute to the establishment of a bifurcation of the lineage, a nascent speciation event.

At later stages of evolution semiotic freedom becomes increasingly individualized. One major step in this process is the much-celebrated transition from a reptilian world to a mammalian and avian world. Mammalian and avian species in general seem to master significantly more sophisticated ecosemiotic settings than do reptilian species. The Swedish ethologist Sverre Sjölander has pointed out that while, for instance, a dog need not have a full picture of the hare all the time for hunting it efficiently, a snake will stop hunting its prey whenever it disappears from view (Sjölander 1995). The snake may well go on searching for the prey at the spot where it disappeared, but it will not calculate the eventual path the prey may have taken. The dog, on the other hand, will proceed away guided by an anticipation of where the hare would be expected to turn up next. "Thus it seems as if the representation or construct of the hare is 'running' in the internal world in a way corresponding to the actual hare in the actual world" writes Sjölander, so that "the sense organs are just used to correct the representational happenings and not to

create them'' (1995: 3). In the snake, on the contrary, hunting appears to be guided by a succession of quite independent sense modalities. Thus, striking of prey is governed by sight (or temperature sense organs), location of the struck prey is detected by smell, and the swallowing procedure is governed by touch. This lack of true intermodality in the snake makes it ''hard to imagine that the snake can harbor some form of a concept of a mouse in its brain'' (1995: 5). The snake apparently cannot integrate its sense modalities to form a central construct.

A moving animal in a moving world is confronted with a perpetual need for making split second choices of behavior. Such choices evidently will serve survival the best if they are based on some kind of anticipatory calculation that integrates inner body parameters such as emotional states, fatigue, hunger, memory into a range of external parameters as registered by the sense organs. As long as the animal has a survival strategy based on simple activity schemes in a predictable space of challenges these behavioral decisions may well be accounted for in terms of instinctive patterns of sensomotoric reflex circles. Such a direct connection between a stimulus and a corresponding behavioral act is perhaps what takes place in the snake so that in its Umwelt there are indeed no mice, but only things to be searched for, things to be stroked, and things for swallowing. In animals dealing with more complex patterns of challenges, a direct coupling of stimulus and behavior is no longer sufficiently flexible. Instead, the brained body as a holistic intentional unity must now make decisions based on split-second evaluations of unforeseeable events. Judging from the efficiency of modern computer programming in producing virtual realities, there is probably no *a priori* reason why brains could not have solved this problem by a sophisticated elaboration of the reflex circuit principle. But while computers are designed to obey strategies decided by the programmer, organisms had to develop designs obeying their own interests; and this is where the computer analogy may mislead us. Organisms must integrate their life project into their calculatory potential. The body as flesh and blood, therefore, from the very beginning, has to be part of the anticipatory and inventive brain models. We shall suggest this is the reason why nature invented the trick of producing an experienced holistic virtual reality, an internal icon more or less isomorphic in its properties with those parts of the real world that the animal could not safely ignore.[4] The exciting (threatening, attractive, etc.) aspects of the outer world in this way became internalized as inner threats, attractions, etc., thereby assuring the necessary immediate emotional bias in all choices of action. The hard problem was not just to calculate the path of action but to make sure this path of action was the most relevant given the esoteric life project of the individual animal, and this is the point

where the emotional apparatus must be brought to play. The iconic inner experience works as a holistic marker focusing the enormous diversity of calculations upon a single path of action (further discussed in Hoffmeyer 2006, from which the preceding paragraph was taken).

The core of semiotic freedom lies in the gain of *interpretance* it conveys. Interpretance may be defined as *the capacity of a system for responding to signs through the formation of "meaningful" interpretants*. High interpretance allows a system to "read" many sorts of "cues" in the surroundings and act upon them in ways that, in the given context, must be assumed to serve the proliferation of the system. In general, the prosperity of systems with high interpretance derives from the advantages a system may obtain by scaffolding of its behaviors or its developmental and physiological processes by means of semiotic controls. Semiotic controls widen the space of scaffolding by introducing indirect mechanisms, omens so to say, in addition to ordinary causal effects, fleeing from smoke, for instance, rather than from the pain inflicted upon the organism by the fire itself (the risk of substituting semiotic causality for efficient causality, on the other hand, is that signs, e.g., smoke, may be faked, whereas burns are the real thing, danger). The emergence of higher-order interpretance means that the system or agent acquires the ability to respond suitably to complex cues that might not be noticed or even be noticeable by lower-level systems. Thus, as we saw, mammals, but not reptiles, are generally capable of interpreting the speed and direction of movement of the prey animal as a complex sign telling them where to search for it in case it disappears from view. Contrary to reptiles, mammals seem capable of making a central construct of the prey animal in their minds or Umwelts, and this is an activity of classification or digitalization. As Bateson told us, the alternation between digital and analog processing is the key to emergence of higher level organization: "to get from the *name* to the *name of the name* we must go through the *process* of naming the name" (Bateson 1979: 206). Or, in a biosemiotic terminology, the emergence of higher-order interpretance in mammals departs from situated iconic and indexical semiosis (analogical codings) as we find it in reptilian hunting.

6. Postmodern evolution thinking

The dramatic controversies surrounding evolutionary theory, in the past as in the present, are rooted in the belief that the natural history of our species is, after all, telling us an important story of whom we are. The so-called postmodern skepticism towards the "naïve" belief in scientific theories as privileged tools to an understanding of what nature really is

like, may have served to delegitimize the Darwinian story of humankind, but we all know that somehow we are indeed related to or even derived from the other creatures of this world. Modern kinds of natural theology such as creationism, or its recent new version as so-called *intelligent design* theory, may confuse the minds of many people but the inconsistencies of these "theories" *vis-à-vis* hard-won practical knowledge of the world — from medical to agricultural practices — cannot avoid leaving their track. The only reason why a theory like that of "intelligent design" can survive must be that the Darwinian story about who we are is itself lacking in credibility. People do generally not believe that their experiential worlds can be reduced to an aimless result of processes of natural selection among unconscious brutes (as claimed by neo-Darwinian orthodoxy), or that their pet animals are indeed unconscious creatures and that the experiential world even in humans is an epiphenomenon, a strange illusion produced by the brain (as claimed by Darwinian philosophers like Daniel Dennett [1991]).

Rather than dismissing this opposition to evolutionary theory as naive "folk-psychology," science should confront the undigested ontological (Newtonian) biases in its own deep structure that prevents it from producing less provocative and less absurd theories of how people arrived at this Earth. For, as we have seen, simply by admitting that our world cannot exhaustively be explained in terms of natural laws because it possesses an even deeper inherent interpretative agency, i.e., an associative potential for producing regularities by relating things to other things, and thus relating relations to other relations, it becomes possible to see how anticipatory processes and thus living entities could emerge in it. If, as Peirce suggested, instead of determinacy we allow indeterminacy to be a primary state of the universe, then natural laws becomes exceptions from the rule and as such in need of explanation. If so, natural laws may be seen as special derivations (habits) from an inherent interpretative agency of the universe rather than vice versa. Semiotic emergence, the ever increasing capacity of life for inventing new and more efficient kinds of interpretance may be seen thus as a sophisticated expression of this basic tendency to take habits as Peirce called it or, in Kauffman's wordings: the tendency of our biosphere to expand "the dimensionality of its adjacent possible, on the average, as rapidly as it can" (2000: 151).

We have finally arrived at the fourth of Deely's *Four ages*, the age where it dawns upon us that "the highest grade of reality is only reached by signs" (*CP* 2. 327). Newtonian science, and Darwinian theory in particular, were extremely important stepping stones on the route towards this fourth age, but stepping stones are dangerous things, because so many of us tend to think that the stones themselves are the important

thing, rather than the opportunity the stones offer to get us even further in the search for meaningful relations.

Notes

1. One should perhaps not exclude, that differences might have causal effects *qua* differences in complex chaotic systems, like vortices or typhoons, where shortlived lifelike properties might perhaps be said to arise.
2. Bateson explicitly remarks that he uses these two terms in the sense given to them in Carl Gustav Jung's (1967 [1916]) *Septem Sermones ad Mortuos*, rather than the sense given to them in Jung's later works where archetypes were included in Pleroma.
3. Octopuses may be an exception.
4. John Deely has pointed me to this very apt formulation of the Uexküllian position on neutral aspects of the Umwelt.

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