The Triune Brain in Semiosis:

Paul MacLean's Neuroethology and the Doctrine of Signs

by

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ABSTRACT

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This work has the primary aim of clarifying the semiotic understanding of zoo- and anthroposemiosis, the study of the action of signs in animals, and of the action of signs specific to humans, language, respectively. This clarification is based on the neuroethological studies of Paul MacLean (1990), who, as a result of a long series of experiments on the brains of mammals and reptiles, described a triune model of the human brain.

Secondarily, an attempt is made to respond to MacLean's dilemma which resulted from his triune brain research: How do we come to terms with the fact that much of what motivates us in our decision making and estimation of what is important and true is not rational thought, but reflects much older systems of emotional mentation and protomentation, prototypical of mammals and reptiles? The response presented here has been developed by the application of semio-evolutionary principles.

Chapter 1 introduces the primary players, namely MacLean, Uexküll, Peirce, Sebeok, Deely, and Hoffmeyer. A picture is furthermore painted of the ongoing relationship between semiotics and science.

Chapter 2 discusses several pertinent domains of study within semiotics, specifically physiosemiotics (the study of signs in non-living systems), biosemiotics (signs in all living systems), as well as the above-mentioned zoosemiotics and anthroposemiotics. There is a strong emphasis on the question of the definition of language, and what makes human language as a primary modeling system unique.

Chapter 3 is a presentation of MacLean's triune brain research, discussing his understanding of the neuroanatomical and behavioral particularities of reptiles, birds, mammals, and humans.

Chapter 4 proposes a new triadic breakdown of the semiotic studies of animals and humans, based on the material in chapters 2 and 3, into "saurosemiotics", "theriosemiotics", and "anthroposemiotics". Chapter 4 concludes with a further discussion of language in the light of this model.

Chapter 5 brings to bear the biosemiotic vision of evolution (e.g., Hoffmeyer's "degrees of semiotic freedom") on the dilemma uncovered by MacLean's research mentioned above, and offers a theory of the next evolutionary emergence in humans.

For Susan

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Chapter 1
Introduction: Semiotics and Science

[T]he possibility of science depends upon the fact that human thought necessarily partakes of whatever character is diffused through the whole universe, and that its natural modes have some tendency to be the modes of action of the universe.

Charles Sanders Peirce, c. 1905: CP 1.351.

Comprised of closely packed elastic cells held together chiefly by colloidal forces, the brain has a density slightly greater than that of water and a viscosity comparable to glycerin. The surging blood flow through the brain imparts to it a firmness that helps to resist deformation. Placed lifeless in a container, the brain tends to spread because of its own weight, and if rotated under these conditions, it will "be distorted like a soft gel." . . . Given these properties of the ultimate receiver and analyzer, it is curious that scientists and people generally place so much confidence in their metallic instruments of precision while at the same time so constantly calling into question the workings of the subjective brain.

Paul D. MacLean, 1990: 570.

1.1 Setting the Scene

In 1990, as the culmination of a long career of neurological research at the National Institute of Mental Health, Paul D. MacLean published *The Triune Brain in Evolution: Role in Paleocerebral Functions*, his *magnum opus*. This comprehensive distillation of MacLean's lifework was received by his peers with some ambivalence. On the one hand it was warmly welcomed and defended by researchers with an appreciation for the ethological ideals of uncovering the

biological foundations of behavior and for the centrality of affective or subjective states to our understanding of animal (and human) behavior. On the other, for the perhaps more mainstream neuroanatomical researchers, MacLean's continued emphasis on the necessity of addressing non-measurable considerations such as the "sense of individuality" (MacLean 1990: 575) and epistemological difficulties raised by his rather macro-behavioral triune model, could be seen as outside the proper purview of neuroscience.[1]

Ethology, however, has always addressed epistemological questions, as shown by the adumbrative work of the Estonian born biologist Jakob von Uexküll (1864–1944). Uexküll's early theories resulting from his work with animals were an influence on the thinking of Konrad Lorenz (1903–1989) in the realm of ethology as well as Martin Heidegger (1889–1976) and Ernst Cassirer (1874–1945) in the realm of philosophy, but was largely neglected in the late 20th century.

It was linguist and semiotist Thomas A. Sebeok who introduced Uexküll's work to the community of semiotic inquirers at the *III Wiener Symposium über Semiotik* in 1977 (Sebeok 1979a: 187). Sebeok hoped to show that Uexküll's writings included an independently developed theory of the action of signs in the animal world which, with some adjustment of perspective, resonates deeply with Charles Sanders Peirce's foundational studies for a reintroduction of a *semeiotic*, or doctrine of signs, into the milieu of modern philosophy.

[1] For an example of these disparate points of view, see the critical review of *The Triune Brain in Evolution* by Reiner (1990) and response in defense thereof in Cory (2002).

Uexküll's "cryptosemiotic" (Sebeok 1976a: 187–207) system, the theory of the *Umwelt*[2] presented in his 1920 *Theoretische Biologie*, has been translated into English (1926), clarified in articles by Thure von Uexküll (1981) as well as Sebeok (1979), and was brought into the context of semiotics proper to help explicate the scope of zoosemiosis as well as anthroposemiosis—the action of signs particular to animals in general and humans in particular, respectively.[3] Contemporary thinkers such as evolutionary biologist Jesper Hoffmeyer (1993, 1998) and philosopher John Deely (1990, 2001, 2002, 2003) continue the effort to examine the consequences of Uexküll's *Umwelt* theory in bio- and anthroposemiotic works.

Published seventy years after Jakob von Uexküll's *Theoretische Biologie* broke ground for ethology, MacLean's neuroethological study of the behavior and brain systems of reptiles, birds, mammals, and *humans* affords us the possibility to examine the zoo- and anthroposemiotics of today with a new transdisciplinary eye. I will argue that Paul MacLean's model of the physiology and phylogeny of the human triune brain is, in fact, crucial for a more precise understanding of the semiotic study of animal and human life, and therefore to the fundamental philosophical dictum "Know Thyself." How well indeed can we know ourselves without an accurate understanding of the categories

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[2] 'Umwelttheorie' as used in philosophy today might best—though controversially—be translated as 'theory of objective self-worlds' (Deely 2002: 126–143; cf. section 2.2.1 below).

[3] Semiosis, the action of signs is properly speaking the subject matter of semiotics, thus we speak of *zoosemiotics, anthroposemiotics*, and so on for each domain of semiosis.

of self-experience and the continuing impact of our phylogenetic inheritance on our behavior—our life in semiosis—from day to day?

Following an introduction in sections 1.2 and 1.3 to semiotics and its relationship with empirical science, with special emphasis on Peirce, Sebeok, and Uexküll, chapter 2 will consider the current state of zoo- and anthroposemiotics, as they relate to the studies of physio- and biosemiosis. Chapter 3 presents MacLean's model of the brain systems of animals and in section 4.1 I discuss the implications of MacLean's work for our understanding of the role of semiosis in animal behavior and evolution, formulating a new outline of the divisions of semiosis in the animal kingdom. I am arguing in particular for a new triune model of the anthroposemiosic *Lebenswelt*, the unique objective self-world or *Umwelt* of humans (Deely 2001: 645). Finally, I will discuss in chapter 5 the relationship of this model with the work on evolutionary systems theory (that is, biological evolution from the semiotic perspective), and present a proposal of how the semiotic understanding of human language as a primary modeling system can aid in resolving MacLean's dilemma concerning the disparateness of the human triune brain.

1.2 Grounds for a Stimulating Relationship between Neuroethology and Semiotics

On what basis could a comparative study of semiotics and neuroethology be supported? Paul MacLean's neuroethology follows quite naturally from readings into the semiotics of the late 20th and early 21st centuries. This process invariably leads one to the source materials of a variety of scientific disciplines which are generally not in contact with each other, let alone with philosophy. One discipline in particular which is found to have strong affinities with semiotics is neuroethology, although the connection has hardly been dealt with in semiotics (in contrast to ethology proper). The affinity is due to the fact, at least in the case of MacLean, that questions of the practice of empirical science in light of epistemological issues are in the foreground. The subject matter of his neuroethological studies itself—the divisions and range of intelligences in animals of different classes, and therefore the sign-using capabilities of each—is also quite pertinent to semiotics.

It is not so strange that such accord would be apparent. In spite of the tendency for specialization, the relationship between science and semiotics is not coincidental, but rather fundamental: Semiotics itself had its modern origins in an attempt by Charles Sanders Peirce to reconcile his philosophical proclivities with his scientific training. Indeed, twenty years ago, as a kind of invitation to both philosophers and scientists, a small group carrying on Peirce's interest in this area of convergence wrote "A Semiotic Perspective on the Sciences" (Anderson, et al. 1986). They proposed a model for the role

of semiotics in supporting an "interdisciplinary[4] union" of the "expanding intellectual universe of contemporary science" (17). Many of the scientists discussed by Anderson, et al. are studying in a way which might be termed 'communicative' or 'synthetic,' or more in line with what is traditionally called process science—in this case characterized by the importance of the role of symbiosis (and not just Darwinian natural selection) in the evolution of biological life (e.g. Margulis and Sagan 1986), by the study of the co-evolution of the biosphere (e.g. Lovelock 1979), and the role of self-organization in the cosmos (e.g. Jantsch 1980).

1.2.1 Process Science

The influential paradigm of process science flowers on the outskirts of the hard sciences, forming within the various distinct schools of thought through the efforts of often revolutionary thinkers. Process science (and process philos-

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4 The term "transdisciplinarity" offers a perhaps more appropriate aim than interdisciplinarity: From the 'Moral Project' (CIRET 1987): "Transdisciplinarity is not concerned with the simple transfer of a model from one branch of knowledge to another, but rather with the study of isomorphisms between the different domains of knowledge. To put it another way, transdisciplinarity takes into account the consequences of a flow of information circulating between the various branches of knowledge, permitting the emergence of unity amidst the diversity and diversity through the unity." Nicolescu (1996) provides an axiomatic picture of transdisciplinarity.

ophy) is a line of thought winding through the Western intellectual tradition, from the ostensible founder Heraclitus "the obscure" of Ehpesus (c. 535–475BC) to American Pragmatists such as Peirce and James as well as scientists, most famously the physicist Alfred North Whitehead (1861–1947) (Rescher 2002). The emphasis in process science is always on *process*, naturally enough, rather than objects; on verbs rather than nouns; on the constant development or change in all processes. One of the few fragments remaining from Heraclitus demonstrates this vision: "Upon those who step into the same rivers, different and again different waters flow." (c. 500BC) As noted above, this line of thought could be called a science based on continuity, or in Peirce's usage, on a synechistic world view (1898A: CP 6.202). Communicativity, self-organization, far-from-equilibrium dynamics, and autopoeisis; all of these are areas of study oriented to process, and have a special affinity with semiotics.

1.2.2 A Meeting of the Minds

For a philosopher interested in semiotics, given the central impulse within semiotics to understand the relationship between empiricism and rationalism, it is poignantly compelling to read Paul MacLean's *opus*. MacLean, spending a career studying hands-on the cortexes of various animals, considered the epistemological consequences of his research to be of primary importance. In his *Triune Brain in Evolution*, the 600-odd pages surveying his 50 years of neuroethological research are book-ended by an introduction and conclusion

specifically dealing with epistemology and the human condition.

As evidenced by his address at the second Clarence M. Hincks Memorial Lectures given in 1969, MacLean clearly feels that his triune brain model and its implications have a great significance for mankind. He stated that in informing people as to the biological basis for their situation (that is, of being an extremely complex creature with brain systems having motivations often at odds with one another), it "would do much to help man live in greater contentment with himself and his society." (Maclean 1969: 7)

While supporting this hopeful idea, I specifically aim to help clarify on the one hand MacLean's research by means of the epistemology afforded by semiotics, and on the other the understanding of zoosemiotics by means of the same triune brain research. In particular, MacLean's philosophical stance is closely tied, as was Uexküll's, to a Kantian phenomenology: "There always exists the barrier of the nervous system between us and the so-called first-order facts. In other words, the brain always stands between us and what we observe." (MacLean 1990: 576) In the minds of at least some semiotists, this world-view tells an incomplete story. Nevertheless, MacLean's line of thought is in accord with process science, with the emphasis on continuity in the evolution of the human brain from its ancestors. As we shall see in chapter 3, MacLean demonstrates a particular natural parsimony in the development of the brains of animals and humans.

In his concluding chapter, in which MacLean brings out the paradox that given our complexity, it happens that very many "decisions" are made by brain-

systems which cannot understand language. As there is no evidence that the limbic system (let alone the striatal complex) is "capable of comprehending speech, nor is there any basis for inferring a capacity to communicate in verbal terms" (ibid: 578) MacLean wonders how any communication between the parts of the brain is possible:

> It is one thing to have the anciently derived limbic system to assure us in the authenticity of such things as food or a mate, but where do we stand if we must depend on the mental emanations of this same system for belief in our ideas, concepts, and theories? In the intellectual sphere, it would be as though we were continually tried by a jury that cannot read or write. (ibid: 453)

There is strong evidence that the triune model of the human brain could be a clarifying influence on the philosophy of semiotics. In particular it can give us a physical basis for the delineations of zoo- and anthroposemiotics, or in other words, for the ongoing discussion of the evolution of animals with greater or lesser degrees of "semiotic freedom" (Hoffmeyer 1993).

1.2.3 Biology and Semiotics

The science vs. philosophy or empiricism vs. rationalism dichotomy often spoken of is naturally somewhat of an oversimplification. While perhaps

'technologists' do not care about epistemology, many creative scientists of the modern and post-modern eras were—and are—deeply interested in questions concerning the ground of knowledge, as well as the impact of the available scientific models on human understanding. The time was apparently ripe in the 20th century for many such creative and holistic scientists, significant examples including physicists Erwin Schrödinger (e.g. 1944) and David Bohm (e.g. 1980), and biologists Stuart Kauffman (e.g. 1995) and Harold Morowitz (e.g. 2002). With a little hindsight we see that Peirce's thought is deeply resonant with these later thinkers. Peirce was himself a scientist by training as well as a logician, being both a biologist and geodesist.

Perhaps most centrally to the present work, it is the school of semiotic thought resulting from Thomas Sebeok's biosemiotic impulse that remains a particularly vital arena for the study of the relationship between philosophy and the scientific method. Sebeok's semiotic exploration of the capacities for sign usage in animals of all stripes—and with an invaluable clarification of the proper meaning of the term "language" as opposed to "communication," syntactic or otherwise—have supported discourse on new paradigms for the study of evolutionary processes. Sebeok considered biosemiotics and zoosemiotics to be quite central to the study of sign systems in general (1986a), and it appears to me to follow that an examination of the results of neurological science from the biosemiotic perspective could be clarifying to both. Lastly, the strong ties to ethology of both Sebeok's zoosemiotics (Sebeok: 1963) and MacLean's neuroscience (1990: 168) betoken a fruitful partnership.

Indeed, the relationship between the successes of empirical science and the epistemological problems posed by rationalism are at the heart of Paul MacLean's writings. As we shall see, he struggled with these very issues in trying to come to terms with the ramifications of his own neuroethological studies. Before moving on to his studies, however, in order to properly place the connection between neuroethology and semiotics put forward here, we must have a view of what semiotics is. First, then, we will touch base with the (post-)modern motivator for semiotics, Charles Sanders Peirce.

1.3 Charles Sanders Peirce and Semiotics

Like a dissonant chord, Charles Sanders Peirce (1839–1914) reverberates in the milieu of the turn of the 20TH century as a man out of place. Now well-known within academia as the American father of semiotics, Peirce was an academic outsider for the greater part of his career. While being a remarkably prolific writer and polymathic thinker, and although from the beginning acknowledged by William James (1907: 46–47), Josiah Royce (Parker 2005) and others as an important American philosopher—being one of the founders of the philosophical movement by the name of Pragmatism—the vast majority of Peirce's work remained unpublished in his lifetime.[5] It is indicative of the breadth of his thinking that while his ideas are of growing interest to many

5 Some thirty volumes are planned for the Peirce Edition Project's chronological collection.

working both in the sciences and the humanities a century later, there is current investigation as well into the unexpected depth of influence of his logic and mathematics on his contemporaries (e.g. Brady 2000).

Peirce's view of the universe is synechistic, wherein matter is not separate from mind: "The one intelligible theory of the universe is that of objective idealism, that matter is effete mind, inveterate habits becoming physical laws" (c. 1903–4: CP 6.25). This vision has resonated with many both in the 'hard' and 'soft' sciences, invoking us to search within the physical sciences, the arts, philosophy and religion for expressions which help place the human, living within biological life and with its particular faculties, within the evidently functioning universe. The development of this line of thought by Sebeok, Deely, Hoffmeyer, and others may help provide a scientifically verifiable model of an undivided though hierarchically differentiated universe, with the human function playing a pivotal role (p.c. Lindahl 2007).

1.3.1 The Doctrine of Signs

In any case, it is without a doubt the discipline of *semiotics* that is the most familiar result today of Peirce's labors: a philosophical system which does not rest contentedly with its modern philosophical bedfellows. Indeed, some feel (see Deely 2001, 2003) that Peirce's reintroduction of a doctrine of signs is the very bridge between rationalism, spearheaded by René Descartes (1596–1650), and empiricism, around the same time by John Locke (1632–1704), the

absence of which resulted in the several-century-long dichotomy between philosophy and science, and therefore, that it must be considered the first truly postmodern philosophical system.

Semiotics is the philosophy or doctrine of signs. Its subject matter is semiosis, the action of signs or the process of signification. Unwinding like a clew through the labyrinth of western thought is the thread of this study: from Hippocrates' (460–c.377BCE) medical practice—symptoms being signs (Sebeok 1976A: 181); to Augustine's (354–430CE) *signum*—the appearance in the 4TH century, for the first time in philosophy, of the *general* notion of sign (as opposed to the natural sign) (Deely 2001: 215–16); to John Poinsot (1589–1644), at the dusk of the Latin age, and Locke at the dawn of modernity—both writing in the 17TH century (ibid.); to the semiology of the linguist Saussure (1857–1913) and the semiotics of Charles Sanders Peirce in the late 19TH/early 20TH centuries (Sebeok 1976A: 181). Sebeok (ibid.) portrays a tripod of sources for the foundation of semiotics, with the medical, linguistic, and philosophical feet resting on Hippocrates, Saussure, and Peirce, furthermore quoting Morris 1971: 337, who held that Peirce was "the heir of the whole historical philosophical analysis of signs."

What exactly is a sign? In the words of Peirce, "A sign, or representamen, is something which stands to somebody for something in some respect or capacity." (c. 1897: CP 2.228). A signification process is made up of three distinct parts, that is, it is irreducibly triadic. It is this relationship—"something which stands to somebody for something"—which makes the sign function.

Peirce calls these three aspects *representamen* (or *sign*), *interpretant*, and *object*, respectively, however in general their order given is: *sign*, *object*, *interpretant* (1903: 290). This order of the distribution of the three aspects of a triad is fundamental to Peirce's logic, and he gives the positions themselves the names *Firstness*, *Secondness*, and *Thirdness* (ibid.). To each position are imputed certain qualities, which are evident at whatever level the triad takes place. For example, as Rauch (1999) charts, *Firstness* has the qualities of "freedom/life/freshness, possibility", *Secondness* of "otherness/cause–effect/brute force, existence", *Thirdness* of "generality/continuity/habit, law". In Peirce's own words (c. 1890: CP 1.356):

> The First is that whose being is simply in itself, not referring to anything nor lying behind anything. The Second is that which is what it is by force of something to which it is second. The Third is that which is what it is owing to things between which it mediates and which it brings into relation to each other.

Recent work has adapted the names of the triadic aspects to *sign-vehicle* (to clarify the sign as a triadic relationship and the sign-vehicle as one aspect of the triad), *object signified* (to differentiate the object signified from any notion of a 'thing in itself'), and *interpretant*, being "that to which the significate is presented through the sign-vehicle" (Deely 2001: 434). By the means of sign processes, or semiosis, is all signification and all communication achieved.

Furthermore, the experience of the inner and outer worlds by animals is afforded by semiosis as attenuated by natural species-typical sensory and cognitive capacities, thus generating the experience bubble, or *Umwelt*, of the animal. It is clear by this line of thought that the relationship between ethology and semiotics is a natural one.

Having thus addressed the justification for a transdisciplinary study of semiotics and neuroethology, albeit briefly, we will now turn to exploring in more detail the landscape of each. In the following chapter, the range of semiotic study is arrayed, ranging from physiosemiosis through zoosemiosis and finally to anthroposemiosis.

Chapter 2
Language: Semiosis in Action

All dynamical action, or action of brute force, physical or psychical, either takes place between two subjects [whether they react equally upon each other, or one is agent and the other patient, entirely or partially] or at any rate is a resultant of such actions between pairs. But by "semiosis" I mean, on the contrary, an action, or influence, which is, or involves, a coöperation of three subjects, such as a sign, its object, and its interpretant, this tri-relative influence not being in any way resolvable into actions between pairs.

Charles Sanders Peirce, c. 1906: CP 5.484

The outlines of a semiotics that eschews anthropocentrism, coupled with an ethology that shuns parochialism, can already be envisaged. It seems likely that a full-fledged synthesis will be achieved before long, offering both a new paradigm and a methodology for the comparative analysis of semiosis in its full diversity, ranging from the two vast linked polymer languages at one end of the scale to the thousands of natural languages at the other, with a host of singular information coding and transmission devices, inside and outside the body of every organism, in between. Semiosis, independent of form or substance, is thus seen as a universal, criterial property of animate existence.

Thomas A. Sebeok, 1976B: 93

2.1 Biosemiosis out of Physiosemiosis

To understand anthroposemiosis, the semiosic capacities of human beings (and in particular, the species-specific faculty of human language) in its relation to zoosemiosis, the semiosic capacities of other animals, we must first come to an understanding of semiosis in the broadest sense. Peirce's semiotic

model is founded upon a particular world view, a synechistic[6] conception of a universe that is "perfused with signs, if it is not composed exclusively of signs" (1905: CP 5.448). This scientific metaphysics, it is argued by Reynolds (2002), was directed at undermining the deterministic view of the universe and its laws popular at the time, emphasizing rather the role of chance and evolution at all levels of universal process. As all processes are from this point of view necessarily connected as on a continuum, we must keep always in mind a picture of the layer upon layer of hierarchically ordered systems upon which biological life depends—itself a highly complex system, maintaining itself far from equilibrium (Kauffman 1995). These physio- and biosemiosic systems form the ground for the possibility of the existence of a creature complex enough to be a conduit for anthroposemiosis, a creature in our case which gives itself many names, such as "*Homo sapiens*".

Deely's exploratory approaches to physiosemiosis (e.g. 1990, 2001), the action of signs "[a]t the broadest physical level of atoms, molecules, interstellar gases, galaxies, stars, planets, and geological development" (2001: 629), attend to the question as to how the interaction of 'non-living' matter and energy might be considered sign processes, thus beginning to fill out a neglected area of Peirce's vision. In any case, Peirce himself would hardly have been surprised by the discoveries and hypotheses of some modern physicists and biologists.

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6 ***synechism***: A philosophy emphasizing the continuity of process and a non-dualistic view of the universe, wherein matter and mind are not discontinuous. (cf. Peirce 1902: 6.169 Fn 1 p. 117)

For example, in *Life of the Cosmos* (1997), Lee Smolin argues for a universe that evolved by processes akin to Darwinian natural selection, while James Lovelock (1979) proposes a theory in which the homeostasis of the biosphere is the result of regulatory processes existing between biological life and the physical world, and which are analogous to those processes involved in the homeostasis of organisms. Peirce himself stated that the laws of nature must have evolved by way of habit formation (1901, CP 6.101 *g*).

Scientific models of self-organization appear to apply at very large as well as at very small scales, both within the realm of 'life' and within the realm of 'non-life'. We must therefore make a careful examination of Sebeok's statement (1976A: 69) that "a mutual appreciation of genetics, animal communication studies, and linguistics may lead to full understanding of the dynamics of semiosis, and this may, in the last analysis, turn out to be no less than the definition of life." To call the self-organization and semiosis proper to the life within the biosphere the exclusive domain of semiosis may be a very useful distinction—as the description of a threshold or an emergence—but it cannot be taken out of the context of everything that has gone before to generate the conditions required for such life, or the continued interaction between 'life' and 'non-life' for the sustenance of this life, both physically (sources of food and air) and mentally (sensory stimulation, or semiosis) (cf. Deely 1990: 85–86).

Even at this point of the discussion—not speaking now of the semiosis of animals, let alone humans, we are drawn to ponder the question of the

meaning of the term 'language,' especially in relation to the related concepts of 'reference,' 'signification,' and 'communication.' The concept of language and its scope is perhaps the central issue in semiotics. While all must agree that humans use language to communicate, is it so clear whether or not animals do something comparable? As we are currently discussing biosemiosis, can we speak of a language used by cells or plants, which are clearly involved in semiotic processes (e.g. Witzany 1994 and Krampen 1986, respectively)? Furthermore, can self-organization processes in the physical realm, if they are indeed to some degree semiosic, be called communicative, or even language? This is indeed a possible outcome of an "exceptionally broad definition" of language (Rauch 1999: 55), e.g., "Language is signifying through an illative-type process" (ibid.), that is, any referential process, or all semiosis. Rauch notes in this context (ibid.) Peirce's clarification, "the illative relation is the primary and paramount semiotic relation" (c. 1893b: CP 2.444 Fn P1 Para 1/2).

It is no easy task to decide on a final definition for language, and there are serious implications for our understanding of the different qualities of semiosis resulting from our analysis. The discussion of the term will continue in sections 2.2 and especially 2.3 below, when anthroposemiosis will be contrasted with zoosemiosis, and for now the cover term 'semiosis' will continue to be used for this broadest sense of illative relation. In doing so, however, we must bear in mind that there is a viable argument for calling all semiosis language, as even the narrowest definition of language shares a fundamentally significative function with semiosis broadly speaking.

The study of the relationship between the semiosis in the area of life and that in the area of non-life, that is between biosemiosis and physiosemiosis, is truly in its semiotic infancy—taken up only recently in spite of Peirce's early indications. Scientifically, the idea is also somewhat immature. Biophysicist Harold Morowitz, an exception to the rule of specialization, describes in his study of complex processes twenty-eight emergences of order in the universe (2002: 26–38) ('semiosis' labels mine):

physiosemiosis	The Primordium
	Large scale structure
	Stars
	The elements
	Solar systems
	Planets
	The Geospheres
biosemiosis	The Biosphere
cytosemiosis	The prokaryotes
	Cells with organelles: eukaryotes
	Multicellularity
	Neurons
zoösemiosis	The emergence of two subkingdoms of animals
	Chordates to vertebrates
	Fish
	Amphibians
	Reptiles
	Mammals
	Arboreal mammals
	Primates
	The great apes
anthroposemiosis	Hominids
	Toolmakers
	Language
	Agriculture
	Technology and unbanization
	Philosophy
	The spiritual

Figure 2.1 Twenty-eight emergences

2.1.1 Biosemiotics

Biosemiotics, then, studies the semiosis of living systems within biospheres. Given such processes as the complementary, co-evolving nature of the living and non-living aspects of the biosphere, the constant influence of the sun, and the use of minerals to sustain life, the argument for a real break between life and non-life must be subtle and inclusive: As independent scholar Terry Lindahl inquired in a conversation (2006), "what part of a mineral is used to fuel thought?" The transition from non-life to life is itself not so clear cut, e.g. the case of viruses. While viruses are generally considered non-living, as they are acellular, being "little more than a stretch of DNA or RNA coated with protein" (Margulis and Sagan 1986: 50), and cannot reproduce on their own, they do have many characteristics of life when interacting with a host organism. If the interaction of DNA and RNA in living organisms is considered semiosic, these interactions which occur between viruses and the organism must very likely be considered semiosic in nature as well.

As we approach organisms which exhibit all of the classical (and prototypically semiosic) traits of life, namely reproduction, reaction to the environment, metabolism, and growth, the differences between biosemiosis and physiosemiosis become much more distinct. In particular is the complete semiosis proper to living organisms—that is, the fully triadic action of signs, as opposed to the virtual semiosis of physiosemiosis (Deely 1990: 87). When we include the cognitive experience of existence proper to all animals, and especially the generation and maintenance of an *Umwelt*—a communica-

tive self-world of sensations and perceived objects—Sebeok's notion of the purview of semiotics comes to life: that the genetic code and human language are the two great sign systems (Sebeok 1976A: 69, cf. Baer 1981: 183) encompassing biosemiosis properly speaking.

2.2 Zoosemiosis within Biosemiosis

Within the still rather broad scope of biosemiotics, which has as its subject matter the sign processes between and within all of the variety of life on earth (or, to be precise, in biospheres in general should the probable be confirmed), the study of the world of animals makes up a large part. In speaking of the world of animals here it is intended to be understood as both the world of communication between animals as well as those sign processes which permit an individual animal to sense and perceive its environment and thereby find its way for a lifetime of activity.

At the center of this study are two ideas around which many semiotic strands are wound. Both have a close connection to the career of the semiotist and "biologist manqué" Thomas A. Sebeok. Sebeok was perhaps the central figure in the sustenance and development of semiotics after Peirce (Baer 1981, Petrilli and Ponzio 2001, Deely 2004B). His many achievements—and the first of the two ideas mentioned—include the clear discrimination of semiotics as a general study of signs in which anthroposemiosis is but one field, as contrasted to sign theories which emphasize human language and

culture above other sign systems (Sebeok 1976B: 83–93). The latter approach is perhaps typified by the sign system of semiology ostensibly in the tradition of the Swiss linguist Ferdinand de Saussure (1857–1913), although Roland Barthes' (1915–1980) glottocentric semiology and structuralism may be closer to the actual contrasting pole (ibid.). Sebeok's writings on semiotics included a strong emphasis on zoosemiotics[7], although he did not avoid writing on linguistics, biology, and culture. On the contrary, Sebeok seemed interested in demonstrating the permeation by signs of all aspects of biological life. It was furthermore Sebeok who introduced to the community of semiotic inquirers the "cryptosemiotician" and early ethologist Jakob von Uexküll (Sebeok 1979A: 187–207). Uexküll's concept of the *Umwelt* of animals, that is a model or self-world composed perhaps entirely of signs—the second idea hinted at—has become very useful to semiotic studies.

2.2.1 Uexküll's *Umwelt* Research

It is an interesting coincidence that the same man who so influenced Lorenz (Sebeok 1987: 21–23), and thus ethology proper, is today a figure of significant impact on zoo- and anthroposemiotics. Jakob von Uexküll, born 1864 (and thus coeval with the likes of Freud, Husserl, and the American Pragmatists), had an abiding interest in Kant's philosophy and questions pertaining to the

7 Indeed, Sebeok and Rulon Wells coined the term 'zoosemiotics' in 1963 (Sebeok 1963: 74).

minds and experience of animals. These interests guided his studies in the direction of *Umwelt* research (*Umweltforschung*)—the study of species-typical objective self-worlds. With some adjustment, i.e. moving towards semiotics from Uexküll's Kantian tendencies, this theory of the *Umwelt* of animals is used today to help clarify zoo- and anthroposemiotics.

Uexküll's model (1920) states that each animal according to its species-typical[8] inheritance has sensory organs capable of receiving a certain range of sensory impressions—some a greater range, some a lesser. In addition, each object perceived is of a certain value to an animal—positive, negative, or (relatively) neutral. It may be said that truly neutral objects are in fact not perceived by animals. Naturally enough, the "same" object may have very different meanings to different animals: what significance has a daisy to a human and a bee, when in a daisy chain around the head of a child? Thus each animal lives in a kind of sign-soaked bubble, its objective self-world or *Umwelt*, the extension of which is governed by the animal's intrinsic capacities and needs. This self-world is mediated entirely by sign processes—the reception of information by the sensory organs, the construction of an objective mental model of the environment from these sensations, the information coursing

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8 Following MacLean (1990: 11): "Since the patterns of behavior involved in self-preservation and survival of the species are generally similar in most terrestrial vertebrates, the customary designation of 'species-specific' for such patterns in a given species is hardly suitable. But since various species perform these behaviors in their own typical ways, it is both correct and useful to characterize the distinctive patterns as 'species-typical.'"

within the animal regarding its needs and drives; all these are signifying processes.

Although this is not the place for an exhaustive discussion on the topic, I must spend a little time here clarifying the term "objective self-world," which is likely perplexing to some readers. Uexküll's special usage of the term *Umwelt* has been translated into English as "subjective self-world," (T. v. Uexküll 1981: 148). Deely argues on the other hand, that we need to return the terms 'objective' and 'subjective' to their historically accurate meanings. Deely proposes including the line of thought from the scholastics, in particular, from Aquinas' commentaries on Aristotle culminating in the the sign theory of John Poinsot (1598–1644) (Deely 2004a). From this point of view it is indeed the world of objects to which Uexküll's *Umwelten* refer. In short, Deely points out (2002: 140) that *objectivity* refers to the world of *objects*, which by definition are objects as such only when they are in relation to a subject. A thing which is not within the *Umwelt* of a subject is *not (yet) an object*, not objectified. A world of objects is the world of what is perceived, the world of objects for a given subject, not a projected world of what is not perceivable, mind-independent and unknowable.

By studying the behavioral repertoire of animals it is possible to understand to a certain extent the *Umwelt* typical of a species: what objects make up its life-world, how much it overlaps with that of other species, and what qualities of semiosis in which it participates. The contents (though not the genetically determined depth) of each animal's species-typical *Umwelt* can

naturally be modified by experience. The degree to which the contents of the experience-bubble can be modified, the means for which might well be called 'education,' is a central issue in understanding the aspects of anthroposemiosis which contrast with the semiosis of other animals. Furthermore, we need to inquire into whether there are distinct strata of *Umwelt* qualities or depth, or whether the gradation of depth is smooth. As we will see in the next section, humans are considered to have a unique or emergent *Umwelt*—called the "*Lebenswelt*" by Deely (2002: 143)—differing from other animals qualitatively as well as quantitatively. If this is the case, are there other strata of similar significance within zoosemiosis?

A primary inspiration for the pursuit of this line of thought is the work of biologist Jesper Hoffmeyer, whose proposal for a study of the "degrees of semiotic freedom" of animal cognition (1993, 1998) will be considered in chapter 4. Hoffmeyer's concept revolves around the development through evolutionary processes of the depth and richness of an animal's *Umwelt*. It is in this regard that neuroethology, and in particular that of Paul MacLean, can aid us in clarifying our study of these issues by delineating distinguishable modes of animal and human intelligence, based on experience—that is, on ethological observation—as well as neurological fact. The neurological basis for these modes of intelligence is at the heart of MacLean's work, and may serve as well as an indication of the deep naturalness of the Peircian triadic logic. The triune brain model shows that there are, indeed, quite distinct levels of semiotic freedom: The 'continuum' of the degrees of semiotic freedom is

in fact not a smooth curve, as there are points of bifurcation demarcating 'kingdoms' of semiosis.

2.3 Anthroposemiosis: the Language of *Homo sapiens*

In discussing the species-specific *Umwelt* of humans in its similarities to and differences from the *Umwelten* typical of other species, the topic of language is clearly the central issue. As adumbrated in section 2.1, formulating a coherent definition for language is rather complicated. In common terms, the word language refers to the spoken, written, signed, or purely mental communication (e.g. inner dialogue) which humans are participating in much of the time, sometimes even when asleep. Language in this everyday sense is made up of words, which are themselves made up of sounds (in spoken language). Words, which as signs always refer to something, make up phrases of various types which, when articulated, are more or less accurately received and interpreted by the recipient (which is often enough the same person as the speaker). This common sense understanding of language becomes complex very quickly when the finer points are considered.

Thomas Sebeok stated that Bacon "did not commit the vulgar error of identifying language with communication" (1991: 145). This is a reminder of the complexity of the issue, and that this is an assumption begging to be reexamined—how indeed can we define language, if it is not simply a matter of communication as Sebeok appears to be saying? Sebeok himself took

up the topic at some length, informed as he was by biology, semiotics, and linguistics proper. Concerned with making a precise differentiation between the communication in which all animals participate (zoosemiosis) and the species-specific human language (anthroposemiosis), Sebeok wrote on the "Clever Hans"[9] phenomenon, including essays on purported high level communication between humans and a variety of animals such as horses, dogs, and simians (e.g. 1981: 109–209).

2.3.1 Language as a modeling system

From the results of these zoosemiotic studies as well as studies of linguistics, Sebeok concluded, following from Gould and Vrba (1982), that 'language,' as it appeared uniquely in hominids through evolutionary processes, was not most fundamentally the syntactic communicative system humans use, i.e. 'natural language'. It is rather the modeling system that *underlies* human language, "a mute primary modeling system lodged in the brain" (1986B: 14–16), itself non-syntactic and nonverbal (1987: 23–24), which is the unique mental ability

[9] ***Clever Hans effect***: the tendency to find what one expects to find, referring to the study by Stumpf and then Pfungst (1907), who demonstrated that von Osten's famous horse *der Kluge Hans* was 'only' intelligent enough to respond to unconscious physical cues from his trainer, who before this (and even afterwards) was convinced that Hans was capable of understanding and responding to instructions made in human language (cf. Sebeok 1981: 260–265).

of humans: anthroposemiosis. This modeling system, exapted[10] as syntactic communication in varying modes, is what affords humans the capacity of syntactic communication (e.g. the myriad of natural languages), as well as the sciences, the arts, religion, culture and criticism.

Sebeok's use of the descriptive term *modeling system* for the human-specific capacity of language refers to the modeling systems theory of the Moscow-Tartu school of semiotics and linguistics (Sebeok 1987, cf. Sebeok and Danesi 2000). The Moscow-Tartu semiotists proposed that language (i.e., human syntactic language), could be understood as a primary modeling system, in contrast to secondary modeling systems, namely the variety of cultural institutions built upon the primary (ibid.). Sebeok, however, realized that due to its very syntactic nature, language in this sense could not be considered primary, citing as an example the visual (non-linguistic) thinking of Einstein (ibid.: 23–24). He therefore proposed a trio of modeling systems: The primary being the nonverbal, non-syntactic capacity for symbolic modeling; the secondary being natural syntactic language in the common sense; the tertiary, the cultural institutions based on the secondary modeling system.

It is clear, therefore, that the range of arguable definitions for the term language is not small. From a terminological point of view, the word 'language' is well suited for denoting vocal communication, given the root of the

[10] ***exaption***: A word now fairly common within evolutionary biology, refers to an adaptation which serves a function for the organism that was not the original function selected for. Coined by Stephen J. Gould and Elizabeth Vrba (1982: 4-15)

word (Latin *lingua*, 'tongue') as well as common usage. Sebeok himself noted in passing that a more precise term was "grammar" (1986: 14), in, roughly speaking, the Chomskyan sense of an inborn syntactic modeling faculty, undifferentiated at birth. Figure 2.2 below shows a range of possible definitions.

> The physiosemiotic reading of "… signifying through an illative-type process" (Rauch 1999: 55), i.e., semiosis within all processes of the universe.
>
> The biosemiotic reading of the above, or the action of signs within all kingdoms of biological life.
>
> The zoösemiotic reading, or the communication between animals of the same or different species.
>
> The everyday usage: Natural language, spoken or otherwise signed by humans.
>
> Structuralist or Saussurian: A system (*langue*) of arbitrary and conventional signs (*parole*) used by a human society for communication purposes. (e.g. Saussure 1916)
>
> Universal Grammar or Chomskyan: An innate function of the human mind, namely a syntactic "grammar", which may be used for communication. (e.g. Cook & Newson 1996)
>
> Primary modeling system: A non-syntactic, nonverbal innate modeling system which has been exapted for communication as syntactic natural language in humans.

Figure 2.2 A range of possible definitions for language

In considering the last example as the root of human language, i.e. language defined as the human primary modeling system,[11] it is clear that animals can-

not be considered as having the said faculty, while they do communicate, as do all beings engaged in semiosis. According to Deely (2002: 141), this difference can be made quite precise: Language is the primary modeling system that "is first of all a way of modeling the world according to possibilities envisioned as alternative to what is given in sensation *or* experienced in perception." Animals, as opposed to humans, cannot envision such an alternative, but rather take the world as what *is* "given in sensation or experienced in perception." This is by no means a simple affair in itself, as Sebeok notes in reference to the ethogram[12] of animals: ". . . despite the fact that the literature of animal behavior is now enormous, and still rapidly ramifying, none of the several millions of codes still in use is entirely understood by man."

It should be clear from this that although syntactic language is undoubtedly the most thoroughly studied sign system, from the richness of diachronic (historical) linguistics to the incisiveness of synchronic (generative) linguistics, it is but one of a great variety of relatively independent sign systems used by humans and other life forms. This variety, full to overflowing from life, must be seen as a necessary ground for the unique potential within humans for a conscious awareness of the experience of existence—one aspect of that which makes up anthroposemiosis. Indeed, each subsequent level of semiosic

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[11] It is interesting to note that Sebeok offers 'model' as an appropriate translation of Uexküll's *Umwelt*, and felt there was strong (though unverifiable) evidence that the use of the term by the Moscow-Tartu school was the direct result of reading Uexküll (1987).

[12] ***ethogram***: The behavioral repertoire of an animal insofar as it is recorded by an ethologist.

activity relies upon the continued existence of the more fundamental level. The degree of richness and depth of a species' experience of existence is captured in the description of their degree of semiotic freedom (Hoffmeyer 1993). As it will furthermore be argued in chapter 4, the ground for anthroposemiosis is zoosemiosis, that is to say, anthroposemiosis cannot exist separated by some abstraction from zoosemiosis, as might be claimed by proponents of 'artificial intelligence.'

2.3.2 Two Models of Human Understanding

As a note to spark the transition from a discussion of semiotics to an examination of MacLean's neuroethological researches, there follows here a teaser comparison of two parallel models of the mental capacities of animals and humans to be explored in chapter 4. The first model has been drawn up by John Deely through the study of the logic of signs, both Peircian and that of the scholastics (primarily of John Poinsot), the other by Paul MacLean, culled from long study of the anatomy and physiology of the brains of reptiles, mammals, and humans, as they relate to the ethogram of each species.

In the realm of human understanding, Deely (2002) clarifies the terms 'sensation,' 'perception,' and 'understanding' in the following way: 'Sensation' is the direct reception of sensory information, whether from the external or internal world, undifferentiated, according to the receptive capacities of the animal. 'Perception' is the differentiation of the content of the said sen-

sory information, according to the needs of the animal (thus generating its *Umwelt*). These two capacities are inherent to all animals, and the model world or *Umwelt* constructed by the animal must resemble the environment closely enough for it to procure sustenance, find shelter, and—for the species—reproduce. Together, they make up the object of study for zoosemiotics. 'Understanding', the object of study for anthroposemiotics, and which is the key that opens the floodgates of the uniquely human *Umwelt* or *Lebenswelt*, is the species-specific capacity of *Homo sapiens* to differentiate between what is objectified (what is in the *Umwelt*) and what may be otherwise than what is sensed or perceived. This capacity permits linguistic communication, as well as "the study of the possibility of being mistaken," a definition for semiotics (Deely 2001: 733). The ramifications of this capacity are seen in the astounding variety of sign systems in human lives and societies.

MacLean, who apparently is not familiar with the Peircian study of signs, has developed the following plan of animal mentation: Under the rubric 'paleomentation,' two forms of mentation are evident, 'protomentation' and 'emotional mentation.' Paleomentation is non-linguistic in nature. In humans, uniquely, there is a third form of mentation, 'rational mentation' or 'ratiocination' (MacLean 1990: 12)—the province of language, or as we would now say (cf. section 2.3.1 above) of the human primary modeling system. Most importantly for this study, and contrasting with a great deal of philosophical and scientific thought, both semiotics via Deely and neuroethology via MacLean recognize the necessity of including the processes of the more ancient

forms of mentation inherent to non-human animals when regarding the more recent forms—understanding or ratiocination—in human beings. MacLean's own words will serve very well to conclude (423–24):

> Sensations represent 'raw' feelings associated with activation of 'intero-ceptive and extero-ceptive fields.' . . . They are distinguished in terms of quality (modality) and intensity. Individually or in combination, sensations become more informative as they are appreciated in terms of time and space. In such cerebral transformation they are introspectively recognized as perceptions. It may be presumed that sensations and perception are basic to the original generation of compulsions, affects, and conceptions, which, paralleling the triune development of the brain, would appear evolutionarily to represent a hierarchic order of information.

Chapter 3
Neuroethology: Paul MacLean's Model of the Triune Brain

A comparison of the brains of existing vertebrates, together with an examination of the fossil record, indicates that the human forebrain has evolved and expanded to its great size while retaining the features of three basic evolutionary formations that reflect an ancestral relationship to reptiles, early mammals, and recent mammals. Radically different in chemistry and structure and in an evolutionary sense countless generations apart, the three neural assemblies constitute a hierarchy of three-brains-in-one, a triune brain. Based on these features alone, it might be surmised that psychological and behavioral functions depend on the interplay of three quite different mentalities . . . each having its own special intelligence, its own subjectivity, its own sense of time and space, and its own memory, motor, and other functions.

Paul D. MacLean, 1990: 8

Classical Philosophy had much to say about Aristotle's definition of the human being as a "rational animal". The problem was that, in this definition, the term "animal" was somehow never quite taken seriously, and most of the discussion centered on showing how "being rational" contrasted with "being animal" in such a way as to render animality unimportant.

John Deely, 1990: 50

3.1 Introduction to the Triune Brain Research

Over the course of his research career, starting in 1947 at the Massachusetts General Hospital and continuing for many years in the Laboratory of Neurophysiology at the National Institute for Mental Health (Boag and Campbell 1973: 2), MacLean studied the impact on the species-typical behavior

exhibited by animals—their ethogram—of the stimulation or destruction of areas of the brain, contained as much as possible to very specific regions of the forebrain.[13] These major structures, which are found to be relatively distinct, historically (phylogenetically) as well as anatomically and chemically, are called by MacLean the protoreptilian formation or *R-complex*, the paleomammalian formation or *limbic cortex*, and the neomammalian formation or *neocortex* (1990: 15–18). As a result, a model of the forebrain as a complex intercommunicating unity of three 'brains' appeared, a triune brain (9).

As a simplified working outline to be further elaborated over the course of this chapter, it can be said that the R-complex functions as the locus for the cognition required for signature, challenge, courtship, and submission displays prototypical of reptiles; a strongly developed limbic system (the limbic cortex and related brainstem structures) appears as the influential center of

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13 Throughout *The Triune Brain in Evolution*, MacLean describes (with an appropriately clinical distance) the methods of animal testing used for his research, which are commonplace in his field. In regard to work with humans—in this case with humans who are ill or have suffered some trauma which brings them to the point of being a source of information for his studies—MacLean writes (1990: 243): "Unlike other disciplines, the field of medicine is in the unfortunate position that advances in knowledge usually depend on an analysis of conditions resulting in human illness and suffering. All the more for that reason, there is the obligation to wrest from human misery information that will contribute to the relief of suffering and prevention of disease." Indeed, the value of the results from these experiments on animals is extremely important and the same sympathies should extend to them as well.

emotional activities including parenting, play, and (non-linguistic) audiovocal communication in mammals (and in certain respects in birds), while the neocortex, in the case of the uniquely developed neocortex of humans, is concerned chiefly with language in the sense of a primary modeling system described in section 2.3.1 above, e.g. planning for the future and syntactically organized discourse—all pertaining to the capacity for symbolic thought.

Each species exhibits an ethogram consisting of behaviors corresponding to each of the cortical complexes with which they are endowed. Humans, therefore, with the most richly developed neocortex also experience and exhibit the characteristic behaviors centered in the limbic/emotional cortex, and further display the compulsions centered in the R-complex. Non-human mammals and birds do not have a sufficiently developed neocortex for language, but live their lives with both the promptings of the limbic system and R-complex. Reptiles live only with the compulsive drives of fight or flight, prey or predator, shelter, status, and so on, epitomized by the intelligences of the R-complex.

It has been a popular oversimplification by commentators on the triune brain model to call these divisions the *lizard*, *mammalian*, and *primate* brains (e.g. Franklin 1987: 222–23), as well as to consider it a model of three quite autonomous brains (MacLean 1990: 9). These kinds of simplification, perhaps in some cases a concession for the 'average reader,' do not do the model justice: The R-complex does not refer to the brain of modern reptiles, but rather part of the hypothesized brain of the ancient mammal-like reptiles

called Therapsids, the "presumed antecedents of mammals" (MacLean 1990: 16). Furthermore, the limbic brain cannot rightly be understood simply as the brain of mammals as, for example, both reptiles and birds have corresponding, though "rudimentary and poorly developed" limbic structures (MacLean 1990: 247). The following sections continue this discussion in much more detail, but here it needs to be emphasized that in spite of the shallowness of much of the popularization of the triune brain model (and while the model may lend itself to oversimplification), MacLean's own research is far from reductionist.

3.1.1 Note on Terminology

We are faced from the first by the difficulty of describing the diverse construction of the brains of differing animals, as well as the great range of their behavioral repertoires. How can we address the range of complexity of these animals? Is a reptile less complex, less evolved, less developed than a rabbit? Is a human the most evolved animal on earth, or even the most intelligent? Is a baboon less perfect than a human? Questions along these lines hound discussions of animal and human intelligence, and it is important to tread sensitively. It is nowadays recognized that each existing animal is technically speaking equally evolved, equally successful, but wherein lie the differences of intelligence—or modes of intelligence—we as anthroposemiosic beings clearly understand as existing between different species of animals? For the

present, Hoffmeyer's terminology surrounding his notion of *semiosic freedom* (1993, 1998) will be used as a shorthand for discussing this set of differences in cognitive capacity. This scale describes the depth and richness of the species-typical *Umwelt* of an animal—the degree of freedom with which it participates in sign activity, from the most concrete to the most abstract. The term development in terms of physiology will be used in relation to this scale, such that species with more developed neurophysiology exhibit deeper and richer *Umwelten*.

3.2 The R-Complex

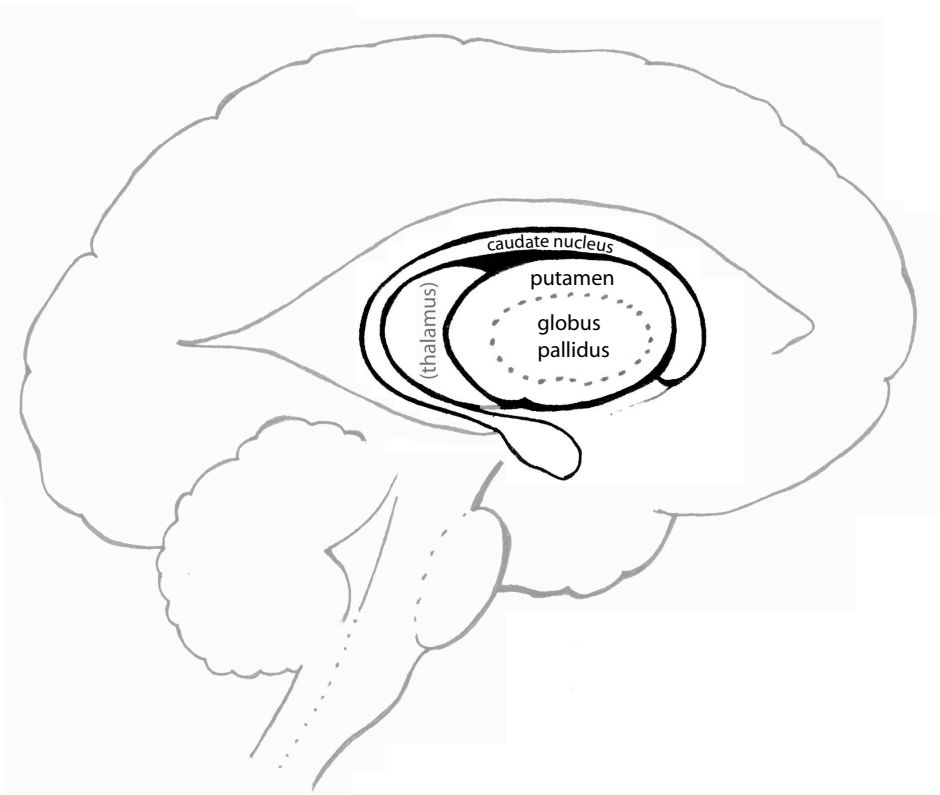

Figure 3.1 The R-complex

The R-complex in higher primates is described as being composed of the corpus striatum (itself the largest part of the R-complex, being composed of the caudate nucleus and putamen), the globus pallidus, as well as the olfactostriatum and some satellite grey matter. The R-complex is a set of forebrain structures which make up more than three quarters of the grey matter in the human cerebrum, largely telencephalic with associated diencephalic struc-

tures, together belonging to the basal ganglia, which is comprised also of structures not considered to be part of the R-complex: the amygdala and claustrum (MacLean 1990: 35). This set of forebrain ganglia MacLean calls "the striatal complex" as well as the R-complex in comparative circumstances (ibid.). It appears that the term "R-complex" is the more common term today (e.g. Hoffmeyer 1993: 118, Margulis and Sagan 1991: 19), when authors do not choose to use the more colorful but inaccurate terms 'lizard' or 'reptilian brain.'

Strictly speaking, the R-complex as delimited by experiment is not the forebrain of modern reptiles, which have as well some minimal limbic development corresponding[14] to the mammalian limbic lobe (1990: 16). Because of this confusion, MacLean prefers the term 'R-complex' over 'reptilian' and clarifies that it is more accurately a representation of the forebrain of an ancient group of now extinct reptiles, the therapsids, or mammal-like reptiles. The therapsids are considered to be the forerunners of all mammals, while there are no modern reptilian species descended from the same line (ibid.). MacLean reports that it was also widely accepted that the role of the R-complex

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[14] MacLean prefers the term 'corresponding' to the common term 'homologous,' due to the fact that "[t]hrough long and various usage, the meaning of *homologous* has become unclear, being interpreted by some authors to signify 'the same' or 'identical.' In dealing with different taxa of animals one can say 'corresponding' with respect to structures identified by a particular set of attributes, without implying that they are developed to the *same* extent or have the *same* degree of complexity in their organization" (1990: 37).

had diminished greatly in animals in whom the phylogenetically newer cortical structures were more fully developed, even to the point of predicting its complete disappearance in the future. On the contrary, MacLean found that the R-complex grew in size proportionately to the growth of these more recent structures—hardly the expected behavior for a "relic" or "vestigial" organ (1990: 243–4)!

It is important to note here that all three cortical areas of the triune brain as delimited by MacLean are constituents of the forebrain. It has been a common error to equate the R-complex, limbic cortex, and neocortex with the unrelated triadic division of the whole brain into hindbrain, midbrain, and forebrain. The designations *hindbrain* and *midbrain* refer to the lower (including the cerebellum, medulla, and pons) and central parts of the brainstem, respectively. This error must simply be a case of loose reading, as MacLean makes it abundantly clear that he considers that "the remaining brainstem and spinal cord [that which is not the forebrain –DW] constitute a neural chassis that provides most of the neural machinery required for self-preservation and the preservation of the species" (1990: 23), even drawing a comparison between the brainstem and a "vehicle without a driver" (ibid.). The driver, according to this model, is the forebrain—and in the case of more complex vertebrates, the neural chassis is equipped "not with a single guiding operator, but rather a combination of three, each markedly different in its evolutionary age and development, and each radically different in structure, chemistry, and organization" (ibid.).

A more comprehensible misunderstanding, though strangely almost ubiquitous, is to conflate the R-complex with the whole of the brain of a reptile. This error is seen on the NIH's own website (2004): "The R-complex, comprised of the brain stem and cerebellum. . . ." More correctly, the brain of a reptile is comprised of the brainstem, cerebellum, and the forebrain structures designated by the term R-complex.

3.2.1 Behavior and the R-Complex

MacLean's studies of the R-complex in modern reptiles and mammals resulted in an analysis of its functioning that was rather at odds with the thinking of the time concerning this phylogenetically most ancient set of forebrain structures. According to MacLean, the accepted view was that the R-complex served as a nexus for motor functions "under the control of the cerebral cortex, having 'no mind of its own'" (1990: 218). MacLean's experiments demonstrated that this view is at the very least incomplete, as the destruction of large areas of the R-complex did not have a destructive effect on motor functioning, causing "no apparent paralysis or other motor disability," an unexpected result for damage to an area of motor control (151). This disparity between the prevailing theory and results of clinical research encouraged MacLean and his group to pursue neurobehavioral studies of reptiles in order to disclose actual functions of the R-complex (ibid.).

The cause of this experimental disparity was that it was typical for pre-

vious experimentation on the striatal or R-complex to hold the animals in an environmental or physical state which would not permit normal species-typical behavioral patterns to emerge, as well as the tendency to believe that the R-complex was sufficiently understood. MacLean's advance was to set up his laboratory in such a way that the animals lived in an environment as close as possible to their natural surroundings—a concept from ethology—and thereby make it possible to observe their interactions with their surroundings, food sources, and fellow animals (99).

The result of these experiments was the recording of a wide array of behavioral patterns that have a locus of management in the region of the R-complex. These behavioral patterns have all the flavor of compulsion, oriented almost exclusively towards the state of the organism itself, its survival and comfort, and its place in the social hierarchy. These include the drives toward a stable daily routine and subroutines such as alimentary duties, sunning, and sleeping, each of which are carried out in order, and in general in precisely the same location and at the same time as the day before, and the 'ritual' social displays, such as signature or greeting, challenge or domination, submission, and courtship. All of these activities are carried out prototypically by all reptiles and typically by mammals.

These behaviors are also familiar to us, and on a little introspection can be seen as compulsive drives. Some are reminiscent of the potency of superstitious beliefs, which reason declares are baseless, but which cannot but be experienced as important. MacLean suggests the common practice of school

children taking the same route each day, with the same little diversions, out of fear of some 'bad luck' as being a possible example of the influence of the compulsion of the R-complex in humans (237). The picture becomes rather more complex when it is considered that many of these drives which we regularly experience we commonly call emotions, alongside other affective states similarly classified which are, in fact, found to be within the domain of the functioning of the limbic system.

It is of interest to note that certain familiar 'compulsive' behavioral disorders are considered by some scientists to be rooted in physiological disorders of the R-complex. Tourette syndrome (MacLean 1990: 221) and Obsessive-Compulsive Disorder (OCF 2006) are included on this list, which some consider to be caused by faulty communication between the basal ganglia and prefrontal cortex.

3.2.2 Protomentation

The range of behavior considered by MacLean to be in the class of protomentation—the mentation proper to the R-complex, as typified by the behavior of reptiles—is quite broad. Protomentation refers specifically to "rudimentary cerebration involved in regulating the everyday master routines and subroutines, as well as the expression of four main behavioral patterns (displays) used in prosematic communication" (MacLean 1990: 12). Protomentation is also understood to include the functions of memory and learning necessary

for the maintenance of such behaviors in practice (150). Of particular significance is the remarkable range of behavior displayed by animals with an *Umwelt* shaped by the capacities of protomentation, i.e. primarily the mentation of the R-complex. MacLean found at least twenty-five such behaviors which are exhibited prototypically by reptiles, and typically by other animals as well (MacLean 1990: 100):

Selection and preparation of homesite
Establishment of territory
Use of home range
Showing place preferences
Trail making
Marking of territory
Patrolling territory
Ritualistic display in defense of territory, commonly involving the use of coloration and adornments
Formalized intraspecific fighting in defense of territory
Triumphal display in successful defense
Assumption of distinctive postures and coloration in signaling surrender
Use of defecation posts
Foraging
Hunting
Homing
Hoarding
Formation of social groups
Establishment of social hierarchy by ritualistic display and other means
Greeting
Grooming
Courtship, with displays using coloration and adornments
Mating
Breeding and, in isolated instances, attending offspring
Flocking
Migration

Figure 3.2 R-Complex: Behaviors of Protomentation

Prosematic communication is MacLean's term for the communication of paleomental (protomental or emotional) information by any animal (including humans), whether bodily, chemical, or vocal (though not linguistic). This term was constructed from the Greek *sema* 'a sign, mark, or token' and *pro* 'rudimentary', to obviate the inappropriate (i.e. actually non-contrastive) term "nonverbal" for the communication of animals without the capacity for language (11). MacLean emphasizes that humans are constantly conveying information prosematically as well as linguistically (437), an idea certainly familiar to semiotics: Zoosemiosis is a major communicative player alongside anthroposemiosis in humans (Sebeok 1979c, cf. Deely 1990: 50–51).

3.3 The Limbic System

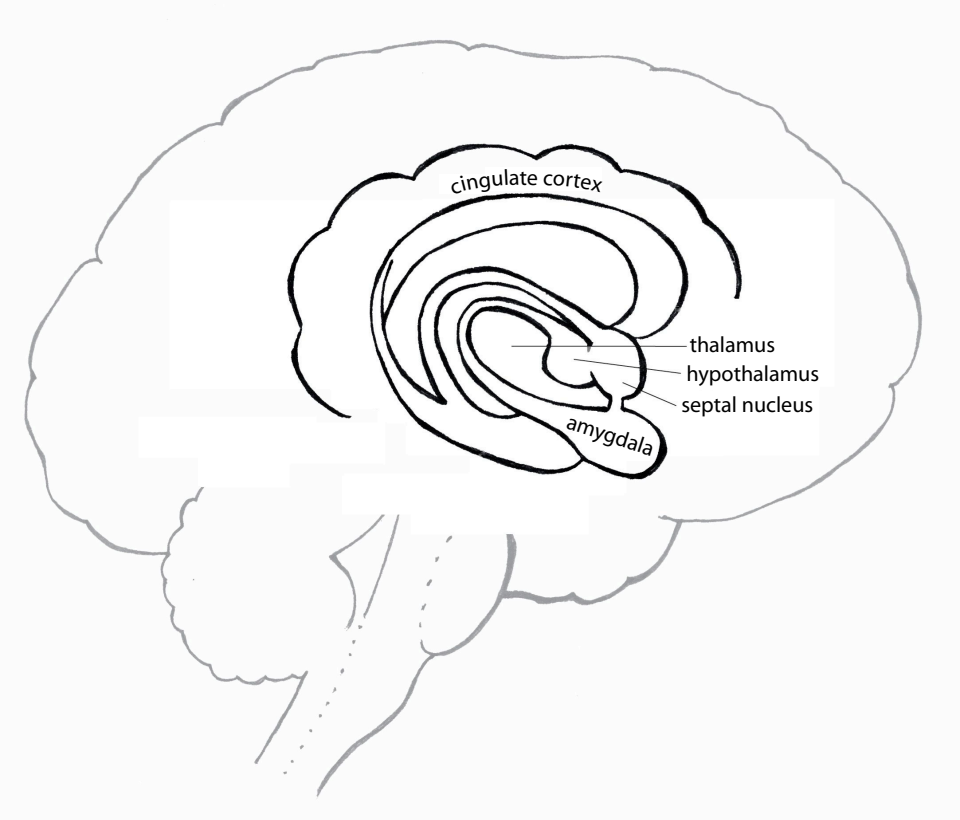

Figure 3.3 The Limbic Brain

The limbic system, deeply involved with the chemistry of emotion in the body, is made up of the limbic cortex and its primary connective structures in the brainstem. The limbic cortex is itself, when viewed in relation to communication nodes, divisible into three main subsections: the amygdalar, the septal, and the thalamocingulate (MacLean 1990: 272). The latter, the most recently developed part of the limbic cortex of mammals, has no evident correspond-

ing structure in the reptilian brain (388), and MacLean's researches provide evidence that the thalamocingulate structures are the locus of the intelligences required for the prototypically mammalian behaviors listed below—not found in the ethogram of reptiles. Mammals display all of the behavioral patterns found in the reptilian ethogram (cf. figure 3.2 above), and in addition they exhibit the small number of novel limbic-specific behaviors specified below (MacLean 1990: 388):

Nursing and maternal care
Audiovocal communication between mother and offspring
Play

Figure 3.4 Limbic System: Behaviors of Emotional Mentation

3.3.1 Talking Emotion

As the discussion turns to the realm of the mammalian and avian *Umwelten* and takes into consideration the limbic system and emotional life of animals as well as humans, we are entering an area of discussion which has traditionally been considered very difficult or even inappropriate for science to properly address.[15] This has held true even for the study of human emotions, but especially so for the emotional experience of other species who cannot

[15] Charles Darwin, however, addressed the topic directly (1872).

communicate their 'subjective' experiences verbally. It seems to be a fairly recent development in neuroscience to consider the individual experience of emotions or affects to be something which can and indeed must be understood in order to understand a variety of other mental and physical processes in humans and animals.[16] MacLean's response to criticism concerning the viability of such discussion will serve very well for the current line of thought (1990: 228):

> When ethologists draw parallels between animal and human behavior, they may be criticized for equating animals and human beings. Comparative neurologists are subject to the same kind of criticism when they give emphasis to anatomical and biochemical similarities of different parts of the brain in animals and human beings. In neither case is it the intention to equate animals and humans. Rather it is regarded as a reasonable assumption that if particular brain tissue from a variety of species conforms generally in its constituents, construction, and connections, it may have corresponding functions.

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16 The study of the chemical basis for emotion is a bridge between the experience of emotion and the scientific study of the same—including groundbreaking research by Candace Pert. A popular account of her own work can be found in Pert (1997).

3.3.2 The Limbic *Umwelt*

At first blush it may seem surprising that the ethogram of mammals is so minimally different than that of reptiles, adding only three behavior patterns to the existing twenty-five. This quantitative estimate is extremely misleading. The *Umwelt* of an animal with a more fully developed limbic system is a significant emergence, that is to say, it reveals an order of magnitude greater complexity, from one whose *Umwelt* is regulated primarily by the R-complex. The emotional life particular to birds and mammals is almost completely absent in reptiles. This remarkable new life includes the prototypical activities of parenting, play, and communication by means of vocalization. Birds share the first and last with mammals, but evidence for play among birds is scarce (MacLean 1990: 559)—probably related to the evidence that the neocortex, more developed in mammals than birds, has a likely role to play in playful activity by means of its close relationship to the thalamocingulate region of the limbic cortex (ibid.). Excepting some basic parenting seen in crocodilians (136), reptiles often cannibalize their young, do not play together, and do not communicate audiovocally.

The triune brain research helps us to recognize the dramatic shift in the *Umwelt* of mammals and birds as a result of the development of the limbic system. The compulsions typified by the reptile are nearly entirely self-centered, that is, the self as opposed to the outside world. This system of compulsory drives has served very well—for millions of years, animals have survived, procreated, and in the fastness of time, the waves of generations have filled

niches within the fitness landscape.

With birds and mammals, however, the self-survival compulsions are not the sole motivating factor. The prototypically mammalian behavioral repertoire including play, parenting, and audiovocal communication are all related to the extension of the self to include relatives and even the social group. MacLean notes that "it is to be kept in mind that emotional mentation represents the only form of psychological experience that, by itself, may induce pronounced autonomic activity" (1990: 326). A striking demonstration of this is that the emotional drives of the limbic system have the strength to overpower even the survival compulsions of an organism, e.g. a mother dying to protect her young or in humans even suicide, yet in less drastic situations we see a true interplay: How are parental protection, nest building, and territoriality—the latter a compulsion of the oldest kind—intermingled in experience and behavior?

3.3.3 Emotional Mentation

Why would such novel capacities, namely those called by MacLean "emotional mentation" (1990: 23), be an evolutionary advantage? It is quite clear that reptiles survive and reproduce excellently without play, parenting, and vocalizing (except, perhaps, in the warning hiss). The obvious advantage is that the newborn mammal or bird need not be completely self-sufficient at the time of emergence from the womb or egg. While a newborn Komodo's

first action—if it is to survive—is to hide itself from its parents so as not to be eaten by them (125), a newborn mammal can be shaped to a much greater degree by its environment as well; its gestation period is so to say continued *ex utero*. This permits the development of a much more flexible routine by the processes of education—learning from the complex interactions of the members of the given group.

While the set of three mammalian-prototypical behaviors is easy enough to identify, the picture of the extent of the limbic functioning is in actual practice rather more subtle. As mentioned above, these behaviors are emblematic of a qualitative change in *Umwelt*, expanding the range of the self to certain others—which involves much more than 'play, parenting, and vocalizing.' The human (and by uncertain extension, mammalian and bird) sense and experience of self and sense of what is true and important, are intimately tied to the functioning of the limbic system. Furthermore, how and what mammals and birds can learn—in differentiation with reptiles—depends on this same cortical region.

The reptile does learn and must remember important aspects of its environment. It is capable of a kind of procedural memory (Hoffmeyer 1993: 104–5, cf. MacLean 1990: 149) which permits a practical knowledge of the environment for survival purposes, or in other words "enables the animal to perform a learned sequence of actions" (ibid.). Once learned, the reptile then tends strongly to repeat this behavior without adjustment, regardless of its efficiency (MacLean 1990: 121). Mammals and birds, however, seem to be able

to remember "previously experienced episodes" or concrete situations, thus having what is called an "episodic memory," which is especially prominent in the lives of more developed mammals such as the anthropoid apes (ibid., cf. Donald 1991). Episodic memory, from this point of view, permits a memory of the relationships actually experienced between relatives or group members, thus permitting significantly more complex social structures. The ties between protomentation and procedural memory, and between emotional mentation and episodic memory should be clear already, and a third 'kingdom' of memory, the so-called semantic memory, will be discussed alongside ratiocination in the following section.

This capacity for episodic memory and cognition is reflected in MacLean's study of the limbic system, as in humans it has been shown that the limbic system and its affective information is closely linked to what MacLean calls the "memory of ongoing experience" as well as the "sense of self-identity" (1990: 500–16). Prior to 1950, the limbic area of the brain was considered to be primarily associated with the senses of smell and taste (467), but MacLean's studies showed that in fact there are neural connections from all sensory systems to the limbic lobe, as well as input from within the organism by way of the vagus nerve (467–499). MacLean offers a hypothesis that the capacities for the memory of ongoing experience and for a sense of self are tied to the reception of signals *from both the inner and outer worlds simultaneously*. The terms used by MacLean for these two worlds of sensation and perception are used in this text as well, namely *interoception* and *exteroception* (ibid.).

This pair of ideas, i.e. firstly, that the limbic system receives input from both exteroceptive and interoceptive sources, and secondly, that the memory of ongoing experience and the sense of self are possible due to the simultaneity of this registration in the limbic lobe, MacLean based on studies of amnesia and psychomotor epilepsy. Anterograde amnesia (or loss of short-term memory) is a predictable result of damage to certain areas of the limbic cortex, in which case, for example, a patient can appear fully aware and intelligent, reason well, play chess or cards, and hold a conversation, but cannot remember what is going on around her or him—he or she may read the same page for hours, or repeat the same conversation twenty times (501).

Furthermore, from the study of psychomotor epilepsy it has been found that in the "aura" experienced just before the seizures which take place within the limbic cortex, there often results an alteration in the sense of self of the individual in question: "some patients may have exaggerated feelings of self-awareness, or, on the contrary, there may be feelings of bodily detachment and depersonalization" (515). MacLean holds that "[t]hrough introspection it becomes evident that the condition that psychologically most clearly distinguishes us as individuals is our twofold source of information from the internal private world and the external public world" (513). If this connection is compromised, therefore, certain aspects of experience or behavior particular to the sense of self would be accordingly compromised—namely, the connection of self with ongoing experience (515).

While it can be for now little more than an aside, there is evidently a

strong correspondence between emotion, the limbic system, the sense of self, and respiration. Parts of the limbic system have been found to "show a phasic discharge correlated with either vagally entrained or spontaneous respiration" (MacLean 1990: 484). The vagus nerve itself is a large factor in certain experienceable (and measurable) emotional and physical symptoms related to nervousness, and is closely tied to the limbic areas of the brain. MacLean himself reminds us of the heritage of our word "psyche" in the Greek word for breath (422).

Finally, it is of serious interest to those involved in the study of epistemology that MacLean poses a question about the role of the limbic system in our sense of what is true. A common experience in the aura preceding a limbic seizure are the "free-floating, affective feelings of conviction of what is real, true, and important" (453)—free floating in the sense that they are not attached to a particular object—and MacLean acknowledges that it is quite possible that the sense of conviction we feel about the rationality of our thoughts has its roots in this ancient system of emotional intelligence: "In the intellectual sphere, it would be as though we were continually tried by a jury that cannot read or write" (ibid.). The sense of what is true applies quite subtly: "The study of the affective nature of the auras in psychomotor epilepsy suggests that there may be an essential precondition and that something does not exist unless it is imbued by an affective feeling, no matter how slight" (516), that is to say, perceptions are those sensations which are imbued with affective feeling, which are rendered significant by the emotions.

These last issues are of deep significance to MacLean, who himself leaves them largely unresolved, expect to say that it might be "premature" for humans to consider the possibly terrifying implications (579). In chapters 4 and especially 5 below I will begin to address these issues from the point of view offered by the confluence of language studies, semiotics, and neuroethology.

3.4 The Neocortex

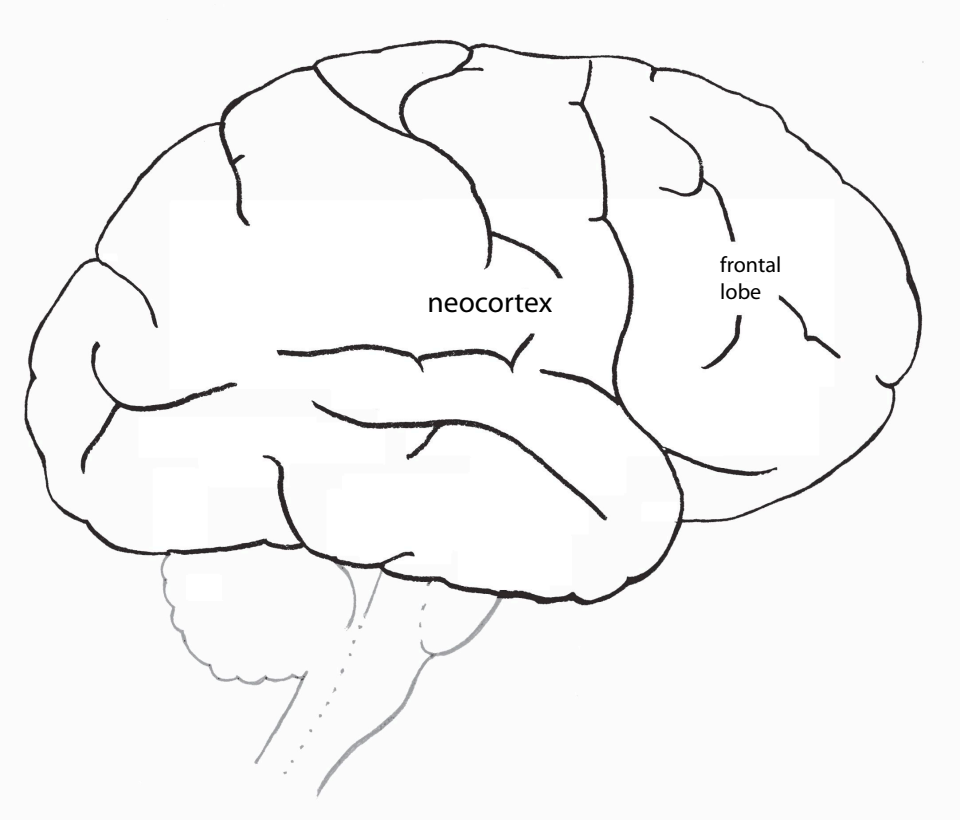

Figure 3.5 The Neocortex

A layer of 'grey' cortical structure forming the outermost division of the brain of humans, mammals, and to some degree other animals, the neocortex or isocortex is often supposed to be the most recent part of the brain to evolve (thus "neo-"), although there is not necessarily an abundance of evidence for this—it is the unique cognitive capacities attributed to the neocortex in mammals and especially humans that are more certainly evolutionarily recent. While many

animals may have what appears to be corresponding (or at least analogous, i.e. independently evolved) neocortical structure, including birds and reptiles, in mammals it takes shape as a hexalaminated structure not found in the other classes. In humans the neocortex accounts for close to eighty percent of the brain's volume (Dunbar 1993). The mammalian frontal neocortex has a close relationship to the thalamocingulate division of the limbic cortex as discussed in section 3.3 above (MacLean 1990: 533), and it is that part of the neocortex on which MacLean has focused his studies—otherwise known as the frontal lobes—being at the time "the only neocortex that appears to be definitively known to be involved in the interplay of intellection and affective feelings" and furthermore which has an influence on the protomental behavioral repertoire (520).

For MacLean, there is no doubt that a certain significant percentage of the contents of our human experience is the result of the functioning of the "primitive" and "illiterate" (MacLean 1990: 578)[17] R-complex and limbic system. If we feel it is consistent from MacLean's neuroethological researches

[17] MacLean's description of the R-complex and limbic system as "primitive, illiterate" is rather incongruous with other comments he has made. First of all, he notes that both the limbic system and the R-complex have developed *in parallel* with the neocortex. Can it be said that the emotions of a raccoon are as nuanced or fine as those of a human? MacLean is also interested in the feelings associated with *seeing* an altruistic act (1990: 534). This can hardly be called "primitive." As for "illiterate," it is clear that the neocortex is not "literate" by nature, and can function perfectly well without literacy. Perhaps MacLean means rather non-linguistic.

and Uexküll's semio-ethological investigations that the human being is born by no means a blank slate, in that we arrive in the world with fully functioning apparatuses proven effective in the crucible of millions of years of evolution directing much of our behavior, as well as the capacity for the reception of a definite range of sensory stimuli, it must appear a fruitful study to attempt to understand the functioning of the neocortex in contrast with that of the limbic system and the R-complex. What, then, is unique to the neocortex? While MacLean did not study the neocortex as extensively as he did the R-complex and limbic system—which were the matter of a career of effort—he does address in some detail certain capacities associated with the frontal cortex, discussed in the following section.

3.4.1 Ratiocination

If we take the tack of comparing the behavioral repertoire of humans with that of a highly developed mammal, we see a kind of explosion of complexity. Animals of all stripes, be it bees or tigers, have undeniably remarkable and complex means of communication, yet it is clear to most that this communication never bursts the bubble, so to speak, into what could be considered an *Umwelt* with symbolic richness equivalent to that of a human. The consideration of the order of magnitude of this difference lead Deely to propose a parallel term to signify the distinctive human *Umwelt*: the *Lebenswelt* (e.g. 1990: 60).

In endeavoring to understand anthroposemiosis, is crucial to consider what the contents of the human *Lebenswelt* are—for it is not as some idealized rational apparatus or computer that we can be understood in our complexity. The earlier brain systems are always at work in us, just as in other animals according to their inheritance. We are indeed incredibly complex—waging war and writing poetry both innerly and outerly, constantly gauging ourselves and others, protecting our territory and struggling to maintain our status—and yet with a very peculiar trait which other animals do not have: the primary modeling system at the root of our use of symbolic reasoning (cf. section 2.3 above). From this capacity emerges a faculty for both the conscious and unconscious use of symbols of a great variety: the *Lebenswelt* for which other animals have very little use. It is not sound that beavers cannot hear, but the music into which the sounds are organized. In considering a small sampling of the remarkably diverse behavioral systems in which humans are engaged, it is possible to see a common thread, i.e. the use of abstract symbols in potentially infinite proliferation:

Language
Science
Mathematics
Art
Philosophy
Religion
Culture

Figure 3.6 Neocortex: Rational Mind

In MacLean's triune model of the brain, he uses the term rational mentation or ratiocination for these symbolic cognitive systems closely tied to the functioning of the human neocortex, in contrast with protomentation and emotional mentation (1990: 228). Given the several consistent tendencies of accidentally or medically lobotomized humans (once considered a plausible therapy for certain afflictions), it is possible to hypothesize several faculties of cognition with their locus in the frontal lobes (the first three being closely related):

"Future memory"
Predictive capacity
Understanding of consequences
Certain language faculties (Broca's area)
Play/regulation of play (in contact with limbic system)

Figure 3.7 Frontal Cortex Capacities

MacLean's research indicates that the neocortex has a particularly strong role to play in the sense of the future ("future memory"), the sense of the possible consequences of one's actions, as well as one's relationship to ongoing emotion and physical pain: "Given impaired insight in conjunction with impaired foresight, there would exist a combination of factors contributing to the impression that frontal-deficient individuals are asocial, lack empathy, and have blunted anxiety about the outcome of events affecting themselves and others" (1990: 533). Indeed, it was one of the startling revelations about the use of frontal lobotomy to relieve pain—the pain remained, or even increased,

but the anxiety about the pain continuing into the future was completely diminished (531).

The tendency for mammals and humans to engage in playful behavior is seen by MacLean as tied to the frontal cortex in its relation to the thalamocingulate division of the limbic system (559). This physiological interrelation is clear in mammals and humans, while not so in birds or reptiles. While birds do show evidence for other limbic-specific behaviors, namely parenting and audiovocal communication, there is little evidence that they participate in prolonged playful activity like mammals (ibid.). A major factor making play possible is a greater capacity for symbolic reasoning—as much of play is the imitation of some other activity, such as fighting. Hoffmeyer reminds us (1993: 5–6) of Bateson's realization that the play (i.e., mock combative) "snap" of the monkeys contained a meta-message: "This is not a bite." Thus mammalian play is an early form of symbolic understanding, which adumbrates the world of arbitrary symbolic usage in humans.

The neocortical capacities for prediction, or the memory of the future, semantic memory, as well the relation of the frontal lobe to play, can be understood as being closely related to the semiotic discussion of the human primary modeling system. Semantic memory, or "the ability to remember meaningful relations without these being linked to any specific situations" (Hoffmeyer 1993: 105) is the 'neocortical' mode of memory, contrasting with procedural and episodic memory as discussed in section 3.3.4 above. These cognitive capacities, hinted at in mammals who, though in a much less devel-

oped way, nevertheless have sufficient neocortical structure for a degree of such cognition, permits the symbolic modeling of the *possible*, the *future*, or other than "what is given in sensation *or* experienced in perception" (Deely 2002: 141). In humans, these capacities support the infinite progression of signification of the *Lebenswelt* which affords us the great cultural sign systems. The participation in the richness and complexity of the human *Lebenswelt*, which is in fact made up of the interactions of three systems of cognition and behavior, requires a great deal of learning on the part of the infant. It is therefore no surprise that the human newborns are so utterly dependent on their parents, and for so long a time, not even being able to hold on to their mother, let alone move independently, for many months. This permits a great deal of the formation of the brain to be influenced by the interactions of the environment.

Chapter 4
The Triune Brain and Semiotics

It is the instincts, the sentiments, that make the substance of the soul. Cognition is only its surface, its locus of contact with what is external to it.

Charles Sanders Peirce, 1898B: CP 1.628

It is sometimes argued that subjectivity is an unessential epiphenomenon—that the brain could perform everything it does without the need of subjectivity. It is pointed out, for example, that the brain takes action to prevent the body from falling "before there has been time to think about it." Or it may be stated that some public speakers may be able to give a lecture "with their minds being some place else." Such "balloonous" arguments are pricked by the realization that the mere existence of subjectivity means that it is an additional source of information that may be drawn upon for adapting to the environment. In the case of human beings, language would hardly exist without the need for words to express subjective experience.

Paul MacLean, 1990: 423

4.1 Toward a Non-Anthropocentric Anthroposemiotics

It is perhaps the explanatory power of the triune brain model that has intrigued people[18]—what other model of brain evolution predicts so naturally the discord that colors the pages of every history book, every society, each individual? It is a terrifying fact that must not be ignored that humans are drawn in equal measure to creativity and justice, war and bigotry, generosity and jealousy—the list can be continued indefinitely. The contrast between the

[18] See, e.g., Sagan (1977) and Franklin (1985)

manifold of conflicting urges and our unique capacity to examine ourselves is a defining feature of human experience expressed throughout recorded history: We feel there is something to be understood about ourselves that is very elusive, and something for which we are responsible. While this sense of an unfulfilled purpose is addressed more directly in chapter 5 below, the present chapter aims to clarify the impact on zoo- and anthroposemiotics of the triune model, and by this means lay the groundwork for a renewed discussion of human purpose: the function of the semiosic capacities of humans in the biosphere and semiosphere.

Behind this description of semiotics and neuroethology is the motivation to participate in the development of a non-anthropocentric understanding of anthroposemiosis. That is to say, what would help us to understand ourselves not as 'people', but rather more directly as processes within process—and by extension all of biological life as a process within process? If we are to find meaning as individuals in our place in the universe, it is not as people, but as processes with particular qualities and functions participating in the way unique to us in a larger process. This, it can be posited, is a legitimate way to pursue an understanding of a synechistic world view as envisioned by Peirce, and to reflect the principle of the parsimony of nature: nothing in nature, including necessarily human consciousness, is "extra".

4.2 A Triune Zoosemiotics

To place anthroposemiosis in a natural context, we must first understand zoosemiosis as being divided into two distinct modes. Both modes are classifiable as pre-linguistic, or paleomental—in other words, pre-anthroposemiosic zoosemiosis. The first mode of zoosemiosis is that of animals whose cognition and behavior have their center of gravity in the R-complex. This group includes prototypically the reptiles. The behavioral capacities of these animals are imbued with the qualities of Peirceian *Firstness*: direct sensation, self-survival and maintenance of the status quo, or "that whose being is simply in itself, not referring to anything nor lying behind anything" (Peirce c. 1890: CP 1.356; cf. section 1.3.1 above). Although the traditional distinction is considered now more as a scale than a true dichotomy, it is interesting to note that these animals are generally regarded as cold-blooded. The first reptiles (cotylosaurs or stem reptiles) are considered to have appeared around 300 million years ago (MacLean 1990: 34).

The second mode of zoosemiosis is that of richly limbic-endowed animals: including prototypically mammals, and as an intriguing parallel, birds. These limbic animals (traditionally considered warm-blooded) are imbued with the qualities of *Secondness*: I and thou, the outer and the inner worlds, parenting, play, vocalization—that is, communication not limited to the regulation of procreation, dominance, and submission. In Peirce's terms, "The Second is that which is what it is by force of something to which it is second" (c. 1890: CP 1.356; cf. section 1.3.1 above). It is crucial to bear in mind the interplay

between the R-complex and limbic system in these animals, a mixture of the compulsions imposed by the R-complex with the desires super-imposed by the limbic system. These compulsions and passions intermingle, compete, and agree. If the R-complex is seen as being autocratic or compulsive, the picture becomes more nuanced when we realize the immense neurochemical power that the limbic brain has over the organism: A mother bear may loose her life to protect a cub, trumping the individual survival compulsion. The class Mammalia is considered to have appeared around 200 million years ago (Margulis and Sagan 1986: 198).

The third mode of zoosemiosis is that of animals with a richly developed neocortex—rich enough to exhibit the human primary modeling system in the Sebeokian sense (cf. section 2.3.1). Humans are, to the best of our knowledge, the only animal of this type on the planet. While this cortical region and its capacity is relatively distinct (both anatomically and cognitively), a human does not act only according to its reasoning: The limbic system and R-complex are always at work. In MacLean's terminology, the line crossed is between animals with only paleomentation (protomentation only or protomentation and emotional mentation together) and those which include also rational mentation (or ratiocination) (1990: 12). Humans are endowed with three relatively independent forebrain systems, inter-working and competing, each involved in semiosic activity according to its particular inherited qualities. This third cortical region—the rational, the language modeler—is clearly imbued with the qualities of *Thirdness*: abstraction, modeling, syntactical

communication, movement, the future, or "that which is what it is owing to things between which it mediates and which it brings into relation to each other" (Peirce c. 1890: CP 1.356; cf. section 1.3.1 above). This cortex permits semiotics, a study of the semiosis of each class (including within a single human), or a "study of the possibility of being mistaken" (Deely 2001: 733). The genus *Homo* appeared perhaps 500,000 years ago, while the species *sapiens*, perhaps 100,000 (Margulis and Sagan 1986) or even as little as 50,000 years ago (Donald 1991: 22).

Given the current state of semiotic terminology, with our *biosemiotics, cytosemiotics, zoosemiotics,* and *anthroposemiotics*—each term with a Greek provenance—the following terminology is accordingly proposed to clarify zoosemiotics:

saurosemiotics The study of the semiosis of the R-complex, *saurosemiosis*, including all protomental capacities. From Greek *sauros*, 'lizard'.

theriosemiotics The study of the semiosis of the limbic system, *theriosemiosis*, including the capacities of emotional mentation, as if taken apart from the functioning of the R-complex. From Greek *therion*, 'wild beast'.[19]

To be included with the already existing term anthroposemiotics:

anthroposemiotics The study of the semiosis of the neocortex, *anthroposemiosis*, including all capacities resulting from rational mentation, as if taken

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19 *therion* is the common term for mammal, e.g. the subclass Prototheria (monotremes).

apart from the functioning of the limbic system and R-complex. From Greek *anthropos*, 'man'.

Deely, while explicitly acknowledging the continuing role of zoosemiosis in humans (2002: 110, cf. Sebeok 1979c), emphasizes that the term anthroposemiosis refers precisely to the unique modeling capacity of a being such as a human. Perhaps it would be preferable to emphasize the notion that, as anthroposemiosis cannot function without a ground of zoosemiosis, it is irreducibly the a action of signs in a being engaged in the interactions of a triune brain which makes human semiosis unique. In any case, Deely's distinction is valuable if we are careful and consistent in our thinking, such that we may avoid the trap of leaving out (for our comfort) the unflagging influence of the zoosemiosic—the paleomental—cortexes.

4.2.1 What is Anthroposemiosis?

What is the make-up of the semiosis inherent and unique to humans? MacLean shows that in many ways we remain akin to our animal relatives, who we have carefully called "the brutes". We have the individual survival oriented compulsions epitomized by reptiles, the emotional mentation epitomized by mammals, and finally a mind capable of yet another degree of semiotic freedom. Recalling that Hoffmeyer's conception of semiotic freedom (cf. section 2.3.1 above) has to do with the depth and richness of the experiential and

conceptual life of the animal, it becomes apparent that each new degree of freedom includes the world of experiences—and behavioral repertoire—of the former.

From reptiles, almost entirely self-centered, to mammals who include particular others in their self-world and for whom much more life experience is required in order to become behaviorally mature, to humans, whose *Umwelt* expands in richness to an astounding degree. Consider a view of ancient Egypt and modern New York City, the civilizations, languages, mythologies, and aesthetics of the peoples of the earth, and who can include in their self-world potentially all of life. This awesome spectrum is the evidence for the new depth of the human *Lebenswelt*, an *Umwelt* with a remarkably rich degree of semiotic freedom.

Deely is careful to point out that we humans have, intractably, these zoosemiosic capacities underlying our anthroposemiosic capacities at all times (e.g. 2001: 721). Indeed, the glance at the human *Lebenswelt* above shows an *Umwelt* deeply woven with compulsion, emotion, and ratiocination on all levels. What could epitomize a human more truly than this triune *Umwelt*, the interaction of all aspects of our inheritance? Following from this, we can see that humans are uniquely signifying animals: for our degree of semiotic freedom affords us the ability to plan far into the future, develop codes, study signs, and quite fundamentally, to examine the validity of the imperatives of our compulsions, emotions, and even thoughts.

Other animals cannot doubt an emotion or compulsion—but humans are

different. We can detest a stranger we pass by on the street *and know better*, we can adore someone we know has it in for us, can feel fear and know that it is baseless; we can also examine our feelings or compulsions and agree with them, discern what is true in them. We *can*, but such greater inclusiveness is not necessarily easy. Our collective and personal histories show us directly to what degree our rational mind can influence our emotions and compulsions. More often than not our rational mind simply rationalizes what has already occurred in our emotions. Perhaps the influence of the neocortex is weak when brought into conflict with the anciently derived and deeply rooted limbic system and R-complex, both of which deal with the deep parasympathetic chemistries of the organism. These brain systems play a crucial role not only in sensory and perceptive cognition and behavior, but also in the maintenance of the physical equilibrium necessary for bodily health.[20] A definition of true maturity (or wisdom) in humans might be the ability for the rational mind to actually mediate, that is to say in fact and not only in thought, between our emotions and compulsions, and without suppression, to inform our actions.

As noted by MacLean, there is no thought, no conception, no object (that is to say, no perceived sign) which is not colored, to some degree, great or small, by the limbic system (1990: 516). It does not seem to be a stretch to hypothesize that every sign also receives an evaluation by the R-complex. The capacity in humans to model alternate or symbolic worlds, which are

[20] MacLean notes that a dominant male lizard can take on a state of torpor and even die due to losing its dominant status (234).

otherwise than what is sensed or perceived, can be applied equally to the astounding variety of systems of relatively arbitrary signs (language, music, codes), the study of nature (humans are the only animals that know that the sun is a star, although many animals can perceive both sun and stars), and to the possibility for self-examination (the study of the degree to which our triune evaluations are accurate). This capacity is called anthroposemiosis.

Chapter 5
Anthroposemiosis: Language as Mediator

> *If we dare think that semiosis, and thus in a sense humanness, was in fact present, at least in a proto-form, in the universe from the very beginning, then we can link ourselves into the universe. If we dare not, only miracle can explain our existence. Ironically, the traditional scientific understanding rests its existence (as human endeavour) on the truth of exactly that miraculous intervention which it was its whole ambition to explain away. While the semiotisation of nature, often looked upon with suspicion by scientists, makes it possible to think of the world as one unified process requiring only that one miracle of existence as such, which no thinking can surpass.*
>
> **Jesper Hoffmeyer,** 1998: 291

> *They do not understand how by being at variance with itself it agrees with itself. It is a backwards-turning attunement like that of the bow and lyre.*
>
> **Heraclitus,** c. 500BC

5.1 *Homo sapiens* in the 21st Century

Having read the description of humans contrasted with other animals in chapter 4, developed from the perspectives both of semiotics and neuroethology, how does the resulting picture compare to our common sense understanding of ourselves? History certainly tells a tale—both our own personal histories as well as the history of humankind. We are an astonishingly complex and evidently unstable species. Greed, familial love, poetry, war, religion, art, science, suicide, and philosophy. We truly run the behavioral gamut like no other

animal, as Shakespeare incomparably dramatized. All of our compulsions, emotions, and thoughts can apparently be "rationalized" (i.e. justified) in language, in a story which we are constantly telling ourselves and others. For a being with a triune brain, having three survival agendas with little intrinsic relation to each other, it is no surprise that we are so complex. It begins to make sense that Freud's postulations—some of which seem outright bizarre to us today—could be so convincing for so long (cf. Lewis, Amini and Lannon 2000). The forces at work within us are indeed huge, and we are rarely aware of their functioning in all their complexity. Perhaps the word *unconscious* is more appropriate than the word *subconscious* for these largely hidden worlds. The planet has seen roughly one hundred thousand years of the human triune brain, with the neocortex developed as it is in *Homo sapiens*—barely a flash in the millennia of evolutionary processes. We remain with an abundance of questions, the same questions that have haunted us throughout recorded history. Perhaps today, in the early years of the twenty-first century, it is possible for us to ask them with less superstition and more clarity.

We have been drawn from the earliest times to ask what our purpose is, but here again we are in danger of anthropocentrism (if not anthropomorphism). Perhaps it is better to make the question one of function: What function do we serve in nature, or in the universe? Are we, and all life, simply a chance event, an anomaly? Biologists might claim that nature permits nothing extra; mathematicians have a profound love for parsimony—it is order and not only chaos that we sense in the universe around us. Orderliness is apparent

from extremely large scales (galactic filaments and superclusters) to extremely small (subatomic particles). If the universe is a functioning whole, that is a self-maintaining whole, then we humans, as part of life, must play our small part, be it only within biological life, or on a larger scale. While small—and vanishingly small in the case of the individual—our intuitions from all time, which have repeatedly convinced us that we are *central* to the cosmos, may be a sign that our part to play is, rather, *pivotal* or transitional (p.c. Lindahl 2007).

There may indeed be a clue in how disparate we are, and yet how attuned to orderliness we are (even in rejecting the notion), as to what function our species-specific complexity might serve. Let us not forget the 'feeling of certainty' that inspires our 'rational minds' to dismiss emotions as irrational, or our dreams of uploading our minds into computers.[21] This disparateness, partnered with our innate sense of purpose—our most prominent features—must be the very keys to understanding any function that we might have in a functioning universe, as distinct from the function of other animals. Indeed, Hoffmeyer (1993: 119) wonders where our sense of individuality comes from, given that we are "running around with possible thousands of independent brain modules (or thought swarms) inside us. . . ." *Homo sapiens*, complex

[21] Thus gaining an immortality of a most peculiar kind: Without the limbic system there is no sense of self, without the R-complex and brainstem there is no survival instinct. Can an anthroposemiosic mind be elaborated without the sauro- and theriosemiosic minds supporting it?

enough to raise this question, might in doing so be fulfilling its pivotal function.

5.1.1 Degrees of Semiotic Freedom

Within the study of evolutionary biology there is a post-modern trend, that is to say a semiotic trend (cf. Deely 2001), amongst those who find the strict reading of the theory of Darwinian natural selection to be incapable of explaining certain important observable details of biological systems. Primary ideas in this subfield, called in general 'evolutionary systems' (i.e. Van de Vijver, Salthe and Delpos 1998) include evolutionary convergence, i.e. the development of morphological or other similarities in animals not considered to be closely related; the remarkably limited range of morphological actualities (rather than the great range of probabilities predicted by genetics), which points to the strong influence of non-genetic factors influencing the evolution of species such as interaction with the environment and with other species (e.g. symbiosis); and from Jesper Hoffmeyer in particular, the notion of "degrees of semiotic freedom" (e.g. 1993, 1998; cf. section 2.3.1 above). Natural selection (or adaptation), from this point of view, is considered to have a significant role in the "fine-tuning of systems to their local environment" (Salthe 1998), rather than being the engine for all evolutionary change.

Hoffmeyer proposes that a definite trend is observable within the processes of the evolution of species, such that alongside species which exhibit an

Umwelt (cf. section 2.2.1 above; Uexküll 1920) roughly similar to their ancient ancestors there arise others with progressively more complex *Umwelten* (Hoffmeyer 1993: 61):

> The most pronounced feature of organic evolution is not the creation of a multiplicity of amazing morphological structures, but the general expansion of "semiotic freedom," that is to say the increase in richness or "depth" of meaning that can be communicated[.]

Evidence for this concept is seen in the triune brain of human beings, the biune brain of mammals, and the unitary R-complex of reptiles (MacLean 1990: 533). MacLean himself could not help but consider this as "directional evolution" (ibid.). Directionality or teleology[22] in the process of evolution is often looked upon with less than high regard, e.g. Lewis, Amini and Lannon (2000: 30), sincere admirers of MacLean's work, who declare that "[w]e are free to label ourselves the end product of evolution not because it is so, but because we exist *now*. Expunge this temperocentrist bias, and the neocortical brain is not the most advanced of the three, but simply the most recent".

While it is indeed the case that all living animals are "the end product of evolution" it would be difficult to maintain that the human triune brain,

[22] Teleology cannot be addressed at length here, but it is important to note that the term can also refer to the functioning of an organ in an organism—a function (or purpose) which science does not deny.

while perhaps in some sense no more "advanced" or complex than the brains of other animals, does not play host to a significantly richer *Umwelt* than the brain of a mammal—even that of the great apes—which in turn is an order of magnitude richer or "semiosically freer" than the *Umwelt* of the reptile. The order in which these brain systems appeared is furthermore not due entirely to chance. In order for the limbic system to be able to appear (or more exactly, the functioning which is embodied by the limbic system), by which means the *Umwelt* of an animal includes a small but very specific range of others in its sense of self, and which relationships necessitate a much greater amount of learning after birth than in the life of a reptile, the family line must first be able to survive. This unflagging complusion is the cognitive domain of the R-complex in interaction with the brainstem.

Furthermore, in order for the order of magnitude greater amount of post-natal learning required for a language modeling anthroposemiosic brain such as that found in humans, it is not only the necessary survival drives which must be strong: A family system of support must be of sufficient stability that the infant organism can survive and learn for a long time, completely dependent upon its parents. Each subsequent emergence of a greater degree of semiotic freedom must be supported by a strongly maintained ground of the previous qualities of semiosis. If we are to consider the possibilities for the next evolutionary emergence, we could forecast the necessity for a ground of a richly maintained *Umwelt* critically combining sauro-, therio-, and anthroposemiosis.

Reptiles, insects, fishes, plants, in fact all living systems perform their "work cycles" now as they have, in various guises, over the great ages of the biosphere. Do mammals really have a survival advantage over reptiles, or reptiles over fish? What must be taken into account is that every biological niche can (or possibly even will) be filled in time. Thus it can be proposed as meaningful to suggest a semiosic fitness landscape in which species can find a niche (or "unroll"[23] into a niche) (cf. Hoffmeyer 1993: 59) according to the degree of semiosic freedom—a landscape of mind interpenetrating the physical landscapes of survival, food, environment. Only because there is a semiosic phase-space is there the potential for movement via evolutionary processes to inhabit areas of it, to live and interact within it, and to be nourished by semiosis.

A further aspect of this movement into adjacent landscapes of greater semiosic freedom is the tendency for the individual of the species to "matter" more. Given that environmental factors (in other words, "education") play a correspondingly greater role in the development of an animal with an inherited greater degree of semiotic freedom, it is as though processes of adaptation to the environment occur within the lifetime of the said animal, rather than in the lifetime of the species. Humans appear to have a rather peculiar certainty of their self-importance, even in the face of overwhelming

[23] It is apropos that early usage of the word 'evolution' includes descriptions of ship movements in naval warfare, and finds its source in the Latin *evolvere*, 'to roll out of.' This meaning has a useful lack of directionality in it, i.e., it does not imply "ascent".

evidence that we as individuals could not matter in the life of the biosphere, let alone the universe. There is deep irony in this, as we as anthroposemiosic beings are also the only animals that can perceive and understand the truth of our relative insignificance. Even those whose "spiritual emergencies" cause them to feel useless, meaningless, and disconnected from the rest of life are evincing a self-importance that no other animal can experience. Our unique function must be tied to this unique species-specific capacity.

5.1.2 Critically Poised Far from Equilibrium

Where then do we find ourselves? An extremely complex being, full to overflowing with compulsions, emotions, and thoughts, often completely at odds with one another—and intercommunicating chaotically if at all—and yet each with a great deal of its own native intelligence. When these contrasting, interwoven brain systems are undifferentiated, unseen, what is the source of our behavior and self-experience? MacLean truly brings to light the ancient question of "know thyself," for what good is knowing "what I like" if the source is hidden, or if at one moment part of me likes something while another part dislikes the same? We as humans seem to feel, and to have always felt, that we are unfinished—the aspiration to educate our children and ourselves is a clear sign of this. This sense of purpose pervades philosophy quite naturally, as well as religion, and it is evident that scientists as well are struggling with how to understand the next stages of human evolution. As Morowitz notes

(2002: 177), "I think that there is a feeling ranging from the theists to the existentialists that we have not fully evolved or have not worked our way to what we map become." What then comes next? Do humans participate in the next emergence by means of genetic engineering, or cybernetics? If we follow linearly, we would expect a fourth brain system that would overlay the neocortex. On the other hand, if we take the apparently deeply-rooted aspiration of humans to "better" themselves as a sign of potential change within a lifetime, perhaps a new *Umwelt* with an as yet unfathomable degree of semiosic freedom would not require a new cortical region. It will be suggested here that we are complex enough that the next emergence does not require a "new brain," or a novel human-computer hybrid, but rather a critical reorganization of our current capacities. Morowitz concludes that "[t]here will be a new emergence, and we will play a part in what that emergence is," which emergence "requires our efforts" and must "[go] beyond the mind" (2002: 178)

5.2 Language as a Means for Mediation

The response to the above world-view, to be presented in sections 5.2 and 5.2.1, is made possible by the results of an examination of the convergence of seemingly disparate schools of thought: the linguistic, the ethological, and the neurophysiological. They are brought into relationship transdisciplinarily (cf. section 1.2) by means of the discipline of semiotics, which itself has been strongly informed by the first two mentioned.

Thomas Sebeok, the semiotician who insisted on the importance of including the results of biology and ethology in the general study of signs (cf. section 2.2 above), was a former student of Charles W. Morris—a pragmatist, behaviorist, and semiotician—and was strongly influenced by linguist and semiotist Roman Jakobson (Petrilli and Ponzio 2001: 5), one of the founding members of the seminal Prague Linguistic Circle.[24] Sebeok also, as we have seen (cf. section 2.2), introduced the work of the protoethologist and cryptosemiotician Jakob von Uexküll and his theory of animal *Umwelten* to the semiotic community. In addition, linguist Noam Chomsky, whose theory of the innate "universal grammar" of humans is included by Sebeok in his semiotic discussion of language and modeling systems (Sebeok 1986: 14; cf. section 2.3.1 above), is himself an avowed Peirceian: "[T]he philosopher to whom I feel closest and whom I'm almost paraphrasing is Charles Sanders Peirce" (1979: 71, cf. Rauch 1980).

Turning now to the influence of neurophysiology, it is MacLean's interest in the consequences of the capacity of humans for ratiocination, which from his point of view cannot communicate with the intelligences of the limbic system and R-complex (1990: 578, cf. section 3.4), that is distinctly tied to the question of language—both in the sense of a primary modeling system (Sebeok 1987; cf. sections 2.3.1 and 4.2.1 above) and in the sense of natural

[24] The structuralist literary and semiotic work of the Prague Linguistic Circle, or Prague school, including founder Vilém Mathesius, Nikolai Trubetzkoy, Sergei Karcevskiy, as well as Jakobson, continues to be influential today, although disbanded in 1946 (Galen 1985).

human language. Furthermore, as we have seen (cf. chapter 3), the relationship of MacLean's work to ethology is fundamental, as the bases of his studies are the neurophysiological loci for the ethogram and cognitive capacities of different species and classes of animals.

Given this concordance, it appears possible to reassess and respond to MacLean's poignant conclusion (1990: 578–9):

> Given the previously described propagation of limbic seizures and the manifestations of psychomotor epilepsy, one is led to infer a dichotomy in function of neocortical and limbic systems that may account for a dissociation in intellectual and emotional mentation. Moreover (and this cannot be overemphasized), the phenomenology of psychomotor epilepsy suggests that without a co-functioning limbic system, the neocortex lacks not only the requisite neural substrate for a sense of self, of reality, and the memory of ongoing experience, but also a feeling of conviction as to what is true or false. This presents a problem of crucial epistemological significance because there is no evidence that the limbic structures of the temporal lobe are capable of comprehending speech, nor is there any basis for inferring a capacity to communicate in verbal terms. Hence, it would appear that the manufacture of belief in the reality, importance, and truth or falsity of what is conceived depends on a mentality incapable of verbal comprehension and communication. To revert to a comment in Chapter 24, it is one thing to

> have a primitive, illiterate mind for judging the authenticity of food or a mate, but where do we stand if we must depend on that same mind for belief in our ideas, concepts, and theories?

As MacLean recognized, there is an evident discontinuity between the intelligences of our triune brain. Although he does not specifically note in the above quote the further "dissociation" between the R-complex and the limbic and neocortical systems, it must certainly be included as part of the picture. The key to understanding the possible reconciliation of the dilemma described by MacLean is that simply equating "speech" with language and communication is, as we have seen in figure 2.2 above, a vast oversimplification. Perhaps the understanding of language afforded by semiotics can shed some light on how the functioning of these cortical regions can begin to be reconciled with each other.

For any change in the arrangement of our triune minds to be significant, the entire system must undergo an adjustment. The influence of the R-complex and limbic system on our whole organism is implacable—the chemistries speak the language of survival. These brain systems, which are in place and acting at all times, cannot be altered significantly by a thought or an inclination. Even in the realm of "emotional health," psychiatrists acknowledge the years of sustained effort required to alter the neurochemical and neuropeptidal homeostasis we experience as ourselves (cf. Pert 1997; Lewis, et al. 2000). What then is required if what is at issue is not an acceptable level

of physical, emotional, and mental health, but rather a further emergence, the result of a profound *metanoia*?

5.2.1 Change of Mind

There is very rich content to be found in the Greek word *metanoia*: 'change of mind' or 'beyond mind'. It is familiar in the English language context when translated as 'to repent,' a rather different connotation now than the Greek word seems to literally entail (cf. Nicoll 1954). Although we are now inured to or bedeviled by the present-day meaning of this word, as in "repenting for one's sins," it may be a source of help for placing our intuitions about the next evolutionary emergence. While the word in this case comes from a religious context, it does not seem wholly out of place: The sense of being unfinished or incomplete, or that there is some work to perform which is uniquely up to us—which all of mankind throughout history seems to share—has often been felt in relation to religious or spiritual conception. Although perhaps with less tendency towards religious expression, this sense of disparateness is more prominent than ever in today's technological age.

If the term is taken more literally, however, as a "going beyond the current thinking," or a "change of mind" or "change of heart," the notion of *metanoia* becomes an interesting prospect from the point of view of our situation as detailed above. Finding three contrasting loci of intelligence and motivation in our one brain, what in fact must change—chemically, psychologically, or

semiosically—for there to be a lasting *metanoia*, i.e. a lasting reconciliation of the disparate intelligences within the organism? From this point of view, *metanoia* carries with it the sense of an emergent order, potential within the triune cognitive capacities of a human being. It is thus possible to formulate a postulate:

> *The disparateness of the human self-experience on the one hand and the abiding sense of the need for self-completeness on the other hand form together a sign adumbrating the emergence of an* Umwelt *yet freer semiosically than the* Lebenswelt*, resulting from a particular kind of effort uniquely potential in humans.*

The role of language in the regulation (and self-regulation) of the *Lebenswelt* (cf. section 2.2.1, p. 27) is the key to psychiatry,[25] and may be the key to the next evolutionary emergence. The unique capacity of humans afforded by language, the primary modeling system or ratiocination, is "the study of the possibility of being mistaken," (Deely 2001: 733; cf. section 2.3.2 above). As noted before (cf. section 2.3.1 above), language "is first of all a way of modeling the world according to possibilities envisioned as alternative to what is given in sensation *or* experienced in perception" (Deely 2002: 141). In

25 The picture presented by MacLean complicates the approach of psychiatry as well, as "[he] suggested that when a man lies down on a psychiatrist's couch, a horse and a crocodile lie down beside him" (Morrow 1983).

MacLean's terminology, it could be said that *ratiocination is first of all a way of modeling the world according to possibilities envisioned as alternative to what is given in sensation or perceived in protomentation or emotional mentation* (cf. section 2.3.2 above). It is crucial to notice that although this is indeed a distinct capacity of human beings, it is not always taking place. In fact, although we are often imagining alternate worlds (e.g. daydreaming), when push comes to shove we almost unfailingly believe in the world as given in sensation and perceived in paleomentation.

The critical and sustained examination by the rational mind of the limbic emotional evaluations and protomental compulsive drives as well as its own rational activity, by means of the language faculty in its sense as a non-linguistic modeling system—as opposed to the attempt to rationalize with the emotions and compulsions by means of words—is a means for permitting the three nominally independent parts of the human frontal lobe to communicate with each other and the "vehicle" (MacLean 1990: 23; cf. section 3.2 above) of the rest of the brain and body. By this means can a human respond genuinely to the dictum "know thyself." The realized regulation of the disparate brain systems would lead to a reorganized human cognition and consciousness: a triunely reconciled human (p.c. Lindahl 2007).

The functioning of such a unified human, it could be hypothesized, would be the semiosic ground for the next evolutionary emergence: An animal with an *Umwelt* with a yet greater degree of semiosic freedom. It would serve well to recall here Peirce's definition of *Thirdness*, the quality imputed to the primary

modeling function of the neocortex (cf. section 4.2 above): "The Third is that which is what it is owing to things between which it mediates and which it brings into relation to each other" (c. 1890: CP 1.356).

Chapter 6
Conclusion

> *For, as the fact that every thought is a sign, taken in conjunction with the fact that life is a train of thought, proves that man is a sign; so, that every thought is an* external *sign, proves that man is an external sign. That is to say, the man and the external sign are identical, in the same sense in which the words* homo *and* man *are identical. Thus my language is the sum total of myself; for the man is the thought.*
>
> *It is hard for man to understand this, because he persists in identifying himself with his will, his power over the animal organism, with brute force. Now the organism is only an instrument of thought. But the identity of a man consists in the* consistency *of what he does and thinks, and consistency is the intellectual character of a thing; that is, is its expressing something.*
>
> **Charles Sanders Peirce,** 1868b: 54

This work charts a course through several domains of knowledge, with the primary aim of clarifying the semiotic understanding of zoo- and anthroposemiosis (cf. chapter 4 above)—the former being the study of the action of signs (i.e. the cognitive, behavioral, and communicative capacities) of animals (cf. section 2.2 above), and the latter being the action of signs specific to humans, (i.e. language as a primary modeling system, cf. section 2.3 above). This clarification has been based on the neuroethological studies of Paul MacLean, who, as a result of a long series of experiments on the brains of reptiles and mammals, developed a triune model of the human brain (cf. chapter 3 above).

Secondarily, an attempt has been made to respond to MacLean's dilemma which resulted from his triune brain research: How do we come to terms with the fact that much of what motivates us in our decision making and estimation of what is important and true is not rational thought, but much older systems of emotional mentation and protomentation, prototypical of mammals and reptiles? The response presented above has been developed by the application of semio-evolutionary principles to MacLean's neuroethological paradigm (cf. chapter 5 above).

In examining human neurophysiology from the perspective of MacLean's research, we find that the forebrain (or "driver", cf. MacLean 1990: 23) is comprised of three relatively independent cortical regions: The R-complex, the limbic cortex, and the neocortex. The R-complex (cf. section 3.2 above) is considered to be the locus of intelligences which are involved in semiosic activity prototypical of reptiles including territoriality, ritualistic courtship and combative displays, hunting and foraging (see figure 3.2 above). MacLean uses the term *protomentation* for the cognitive faculties which produce this ethogram, whether in reptiles or in mammals and humans (MacLean 1990: 12; cf. section 3.2.2 above), and in this work the semiotic term *saurosemiosis* is proposed for these capacities (cf. section 4.2 above).

The limbic system (cf. section 3.3 above) is understood to be the center of the emotional life of animals, prototypical of mammals and to a degree typical of birds. An animal participating in *emotional mentation* (MacLean 1990: 326) or *theriosemiosis* (cf. section 4.2 above) evinces such prototypical behaviors

as play, parenting, and audiovocal communication (cf. figure 3.4 above), but also subtler experiences based on the memory of ongoing experience, and a new sense of self (cf. sections 3.3.3 and 5.1.1 above).

Finally, the neocortex (cf. section 3.4 above), as developed in humans, is the locus for *ratiocination* (MacLean 1990: 228) or *anthroposemiosis* (cf. section 2.3 and chapter 4 above), that is, the cognitive center of language, both in the sense of human natural language as well as the more fundamental primary modeling system unique to humans (Sebeok 1986b and 1987; cf. section 2.3.1 above).

From the semiotic viewpoint it has been brought out above that the progression of intelligences described by MacLean, from saurosemiosis to theriosemiosis and finally to anthroposemiosis, is reflective of Hoffmeyer's vision of the emergence due to evolutionary processes of greater degrees of semiotic freedom (1993, 1998; cf. sections 2.3.1 and 5.1.1 above). The qualities of each cortical region furthermore resonate with the Peirceian triadic logic (cf. sections 1.3.1 and 4.2, and chapter 3 above): The R-complex evinces qualities of *Firstness* (self-survival, imitation, procedural memory, or "that whose being is simply in itself, not referring to anything nor lying behind anything" (Peirce c. 1890: CP 1.356)), the limbic system shows qualities of *Secondness* (I and thou, evaluation, connection between the outer and inner worlds, episodic memory, or "that which is what it is by force of something to which it is second" (ibid.)), the neocortex exhibits qualities of *Thirdness* (unlimited and intentional use of signs, potential extension of "self" to all life, semantic memory, or "that which

is what it is owing to things between which it mediates and which it brings into relation to each other" (ibid.)). This semiotic view owes a great deal to the ethological (or protoethological) work of Jakob von Uexküll (1920), whose theory of animal and human *Umwelten* (cf. sections 2.2 and 2.2.1 above) or objective self-worlds (Deely 2002: 140; cf. section 2.2.1 above), helps elucidate the interaction of an animal with its environment within a world of signs.

The necessity of understanding human cognitive functioning as consisting of three classes of intelligence, interacting in very complex ways, is an underlying theme of this work (cf. chapter 5 above). From the side of semiotics, Peirce (1898B: CP 1.628) and Deely (1990: 50) insist in a more general way (i.e. without the precision afforded by MacLean's research) on the import of the passions and animality to understanding humans not only as a "rational animal", but rather an animal with rational capacities (anthroposemiosis) as well as those proper to other animals (zoosemiosis) (ibid.). MacLean, from his neurophysiological and ethological viewpoint, is adamant that the R-complex and limbic system play a very great role in how we experience ourselves and what motivates us—even the feeling of certainty in regards to the "rationality" of our ideas—although he fears that we might not be ready to live with the consequences of this understanding (1990: 578–9; cf. chapter 5 above). MacLean's fears seem to be based on the assumption that language and speech are identical, that is to say, that the primary function of ratiocination is "verbal" language, and as the limbic system and R-complex cannot understand such a language, no communication is possible between the different systems

(ibid.)—a fear borne out by the apparent disparateness in the lives of human beings.

This distressing point of view is somewhat ameliorated by the semiotic understanding of language. This is because there appears to be a possibility, though elusive, for the reconciliation of the disparate complexes of intelligence within an individual human (cf. chapter 5 above). The term language, having an extremely wide range of possible definitions (cf. section 2.3.1 above), is, according to Sebeok's semiotic viewpoint, best understood as the primary modeling system or non-verbal system of symbolic reasoning (Sebeok 1987, cf. Sebeok and Danesi 2000). This modeling system can be understood as being primarily a capacity for conceiving of worlds consisting of that which is not received in sensation or perception (Deely 2002: 141). The natural language which MacLean refers to is rather one capacity among many permitted by the primary modeling system of humans. As anthroposemiosis, the semiosis inherent to the human neocortex, is able to conceive of such alternate worlds, it is possible for a human to be experiencing saurosemiosic compulsions, theriosemiosic emotions, and anthroposemiosic rational thought, and to critically examine the messages each are continually broadcasting. This critical examination is not an attempt by the rational mind to communicate with the emotions and compulsions in words (i.e. "rationalize"), but rather a rational embrace of all cognitive functions (including the rational mind itself). From a prolonged process of such an examination, for which the neocortex must develop an increasingly inclusive regulatory influence over the chemistry of

the limbic system and R-complex, it is hypothesized that a human could become a being with a triunely reconciled mind (p.c. Lindahl 2007)—a natural evolutionary emergence from the anthroposemiosic *Lebenswelt*.

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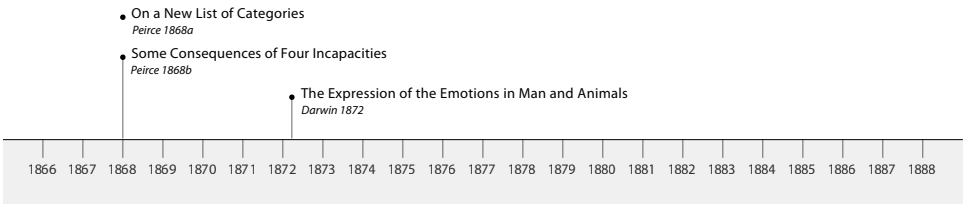

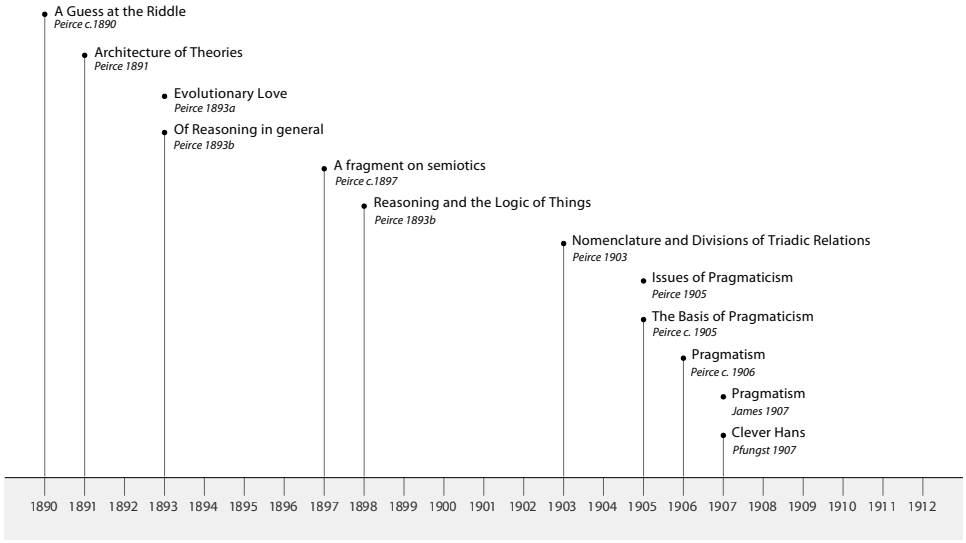

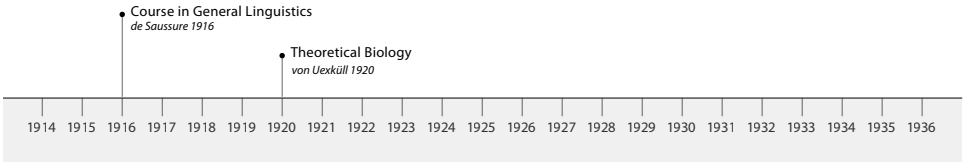

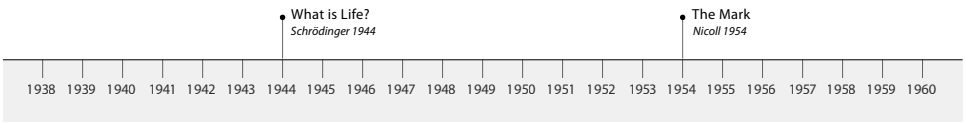

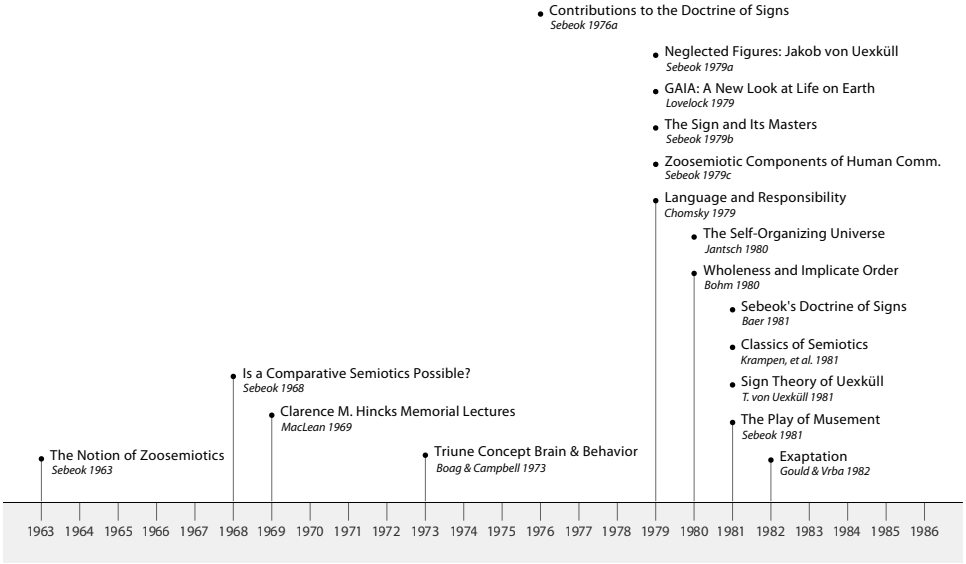
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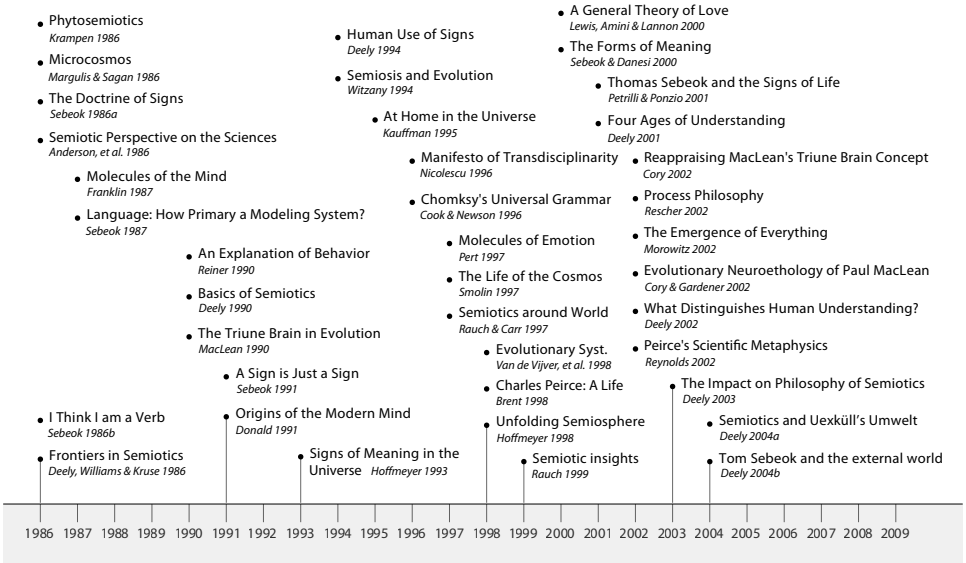
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