Rothschild's ouroborus

Review: Friedrich Salomon Rothschild, *Creation and Evolution: A Biosemiotic Approach*. 1994. Mevasseret Zion, Israel: J. Ph. Hes, C. Sorek, iv+360 pp.
Translated from the German
(*Die Evolution als innere Anpassung an Gott*;
Bonn: Bouvier Publishing Company, 1986) by Jozef Ph. Hes.

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German-born Israeli Friedrich Salomon Rothschild (1899–1995) left behind a wealth of psychiatric-pragmatic, empirical-neurological, and exploratory-philosophical works, much leading to theory and much of that theory integrated into his final book, *Creation and Evolution*, translated from the German (1986) to English in 1994. This semiotic tome resists reviewing in any conventional sense; what seems imperative, though, is to provoke as many readers and reviewers as possible by breaking the symmetry (*pace* Spencer-Brown 1969) of our collective ignorance while indexing the ripples from an earlier discoverer of Rothschild's, Kalevi Kull (1999).

Kull dubbed Rothschild an "endemic semiotician", as Rothschild was quite aware that semiotics grounded and synthesized his own work in psychology, psychotherapy, psychoanalysis, embryology, neurobiology, theoretical biology, and philosophy (and theology!), although his most intense interactive discourse community must have sometimes been limited to himself alone.

Thomas A. Sebeok was wont to identify certain prescient thinkers (e.g., Jakob von Uexküll) as "cryptosemioticians" if their work had been only unconsciously motivated by semiotics, while "protosemioticians" are those groundbreaking ancestors of the field (terms summarized by Rauch 1984). Throughout the 1980s, John Deely organized a series of symposia for the Semiotic Society of America to unpack a host of "neglected figures" in semiotics, and this commodious category has space for any and all of these species of semioticians.

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Rothschild's oeuvre towers over many of those neglected figures and cryptosemioticians, and warrants the inauguration of a renewed series of symposia to dust off the deeper roots of each of those earlier semioticians, as well as to uncover more pioneers still lurking in every imaginable field. It will be particularly fascinating when we can detect any cross-talk, any choruses, with or without the participants being aware of their syncopation. If a future semiotics can digest Rothschild's physical-cum-metaphysical turn — wherein signs also thrive in inorganic realms and where the paranormal is normalized — that putatively possible post-everything, punctuatedly-transformed semiotics might point back to Rothschild as a protosemiotician, if not *its* protosemiotician. Rothschild triangulates ordinary biological evolution through *deep* time; organismal internal integration of significant exteriors in space and time through the experience of sensation, perception, intuition, and cognition in *shallow* time; and finally the role of creation beyond all spatiotemporal realms.

Hence, Rothschild deserves to claim recognition for much besides his coining of "biosemiotics" in 1962, a year before Thomas A. Sebeok put "zoosemiotics" on the map of our minds (Sebeok 1963). Rothschild later specified the biosemiotic as "the psychophysical nexus within the central nervous system and in other structures possessed of psychophysical functions within organisms" (Rothschild 1968: 163; see also Nöth 1990: 148). While Rothschild frames biosemiotics more narrowly — in fact being indifferent to some of the animal kingdom and other biotic realms — he nonetheless plows, sows, tends, and harvests his restricted concept more deeply than typifies other usages; one might say more devotedly as well. Keep in mind that, while he construes biosemiotics almost anthropocentrically, Rothschild's overarching semiotics is ecumenical, and recognizes sign behavior in inert as well as in living realms, even in psychokinesis and in telepathy.

Like other neglected figures choreographing the subtexts, and subversive texts, of the 20th century, Rothschild eschewed the dominant positivist paradigm(s) — paradigms that denatured the mystery and history and prehistory, that is, evolution, of ontologies; that reduced nonlinear complexity to flat complication; that sought deterministic narratives. Eerily, Rothschild celebrates creativity as did Bachelard (see Anderson 1986 for this "neglected figure") (p. 8); joins Jaynes (1976) in positing an evolution of our species' inner experience (p. 110); parallels Hutchinson (see Anderson 2000) in pursuing the negotiated configuration of insides and outsides (p. 137); anticipates Bateson (1972) in emphasizing the indivisibility of relations (p. 92); resonates with the markedness theory in linguistics (Waugh 1982) and in propositional logic (Spencer-Brown 1969) (p. 291), and dramatically adumbrates contemporary cognitive science and philosophy about body-*cum*-mind (Lakoff and Johnson 1999) (p. 16). But these citations to pagination in *Creation and Evolution* are superficial ones, since Rothschild probes all such themes throughout his densely-populated book.

Rothschild does not cite any of the particular neglected figures above, although he could well have encountered them, as he ranged widely and wildly in the literature. Prominent among the neglected and not-so-neglected semioticians he does cite, however, are: Klages, von Weizsaecker, Peirce, von Uexküll, Dilthey, Teilhard de Chardin, Fromm, Erikson, Buber, Whorf, Koestler, Waddington, Jantsch, Ricoeur, Chomsky, and Prigogine — but especially the phenomenology of Klages (e.g., 1921). Despite the voracious appetite of Rothschild, and despite his scattered resonances with still other thinkers, he has rendered a cosmology unto itself. I leave others to discuss the consonance of a creator-god together with psychokinesis in semiotic theory, or theories. Rather, I will nibble on smaller crumbs that suit the capacity of my interpretive organs.

But first, even a less ambitious reviewer would point out some "rich points" (Agar 1996), or are they glitches! The above-cited full title, starting with the super-title, *Creation and Evolution*, appears on the book's cover, whereas on the title page the subtitle is missing: *A Biosemiotic Approach*. The subtitle seems less than necessary, yet more than appropriate, and very helpful in English, especially for its prime audience. Immediately one notices that the original German title was quite different, referring to "inner adaptation" and "God". Indeed, a page showing this German title translated into English appears *between* the title page and acknowledgment pages, *and* the table of contents followed by the introduction (only there does pagination start, with p. i) — reading "Evolution as Inner Adaptation to God: On the symbolic interpretation of the structure of the brain and the philosophy of biosemiotics". This review will touch on the former (inner-adaptation), and also on outer-adaptation, but not on the latter (God). Note that pages prior to the introduction are not incorporated into any numbering system, but that will not handicap this review.

In addition, the English volume's table of contents indicates no titles for the book's three parts, which captions are nonetheless made explicit leafing through the text, and prove useful to the reader. Part One is "The Role of Inner Adaptation in the Biosemiotic Theory of Evolution" (p. 1), containing chapters 2 through 16. Chapters 17 through 27 comprise Part Two, "The Inner-Adaptation Between Sign Systems" (p. 97); and chapters 28 through 52 make up the final Part Three, "Inner-Adaptation in Religion and History" (p. 175), almost half of the book. The appendices cover a list of abbreviations, a glossary, a bibliography, and the index—an essential touchstone for a book whose contents spiral and swirl from head to tail. "The carpet too is moving under you", a 1960s lyric from Country Joe and the Fish, came to the rescue of my mind as I tried to meet Rothschild by going only half way.

The glossary of 18 items will not bail out the reader; in fact, some entries attribute a notion *to* Rothschild, suggesting that the glossary was composed and appended by someone else. Compared with the glossary, the index is much more generous on the surface, yet if one consults "fertilization", the

only reference will turn out to be late in the chapter on Yoga, and the first reference for "pole" sends one to the glossary. This aside, if there is any real impediment to surfing in this book, it would be the absence of figures. Well, there is an unlabeled table on the penultimate page of the book, characterizing in two columns "inner-adaptation" and "outer-adaptation", corresponding to bodily left and right, and ending with sacrifice and conquest, respectively. As to the absent figures, perhaps Rothschild very cleverly left that for us to complete!

The 52 chapters are uniformly slender, which is fortunate, although they might with benefit have been structured to maximize our cognitive proclivities and capacities (referring to Miller's [1956] "seven plus-or-minus two"), especially as the subject matter so often dwells on cognition and the central nervous system (CNS)! The bite-sized chapters lure the reader like a serpent, but if the chapters' contents are apples, it is the apples which digest the reader, rather than vice-versa. Unlike with McLuhan, the medium is not the message, or is it: perhaps the structure and content of *Creation and Evolution* induce a mind-set receptive to issues of spirit, spirits, and the spiritual? It is certainly the case that Rothschild's notions grow like ganglia and tangle recursively about and throughout the text, inviting the uninitiated to explore in a nonlinear fashion.

Consequently, I will browse, not graze, on certain *other* topics of immediate interest to me as an anthropologist, linguist, and general-purpose semiotician. So many of Rothschild's central themes thread throughout virtually all the chapters, so systematic and exhaustive grazing will not be called for or even feasible. Given Rothschild's own early research into morphological and physiological lateralization throughout much of the animal kingdom — culminating in his observations about human brain lateralization — asymmetry is a theme that decorates most of the discussion about the human CNS.

Peeling off from this theme of the brain-mind-spirit-soul-CNS, is the body itself (pp. 282–284), which of course is also asymmetric and implicated in the functions of the CNS.

Finally, from the asymmetries, Rothschild draws some ethical implications for the state of the earth and its populations (pp. 9–12, 280–281, 322–326), which I can summarize, and some resolutions, which I cannot. All asymmetries organize around communication, particularly through hierarchizing bootstrappings of insides and outsides, fertile sites for the playground of the structures and meanings of signs.

Asymmetries all the way down, and up

Rothschild's complaint with Darwinism *cum* Neo-Darwinism is that it allows for no distinction between "inner and outer adaptation" (p. 3). This is where

he asserts his first cut, an asymmetry, and many other asymmetries cascade in turn: from cerebral hemispheric lateralization to bodily asymmetries, the latter much less acknowledged but at least as compelling, and more so if one takes into account that lateralization of all bodies antedates that of the human brain (pp. 282–284). Rothschild was a pioneer in this research dating from the 1920s, inasmuch as he published results on the subject already in 1930.

Let's then visit the body. "The left body side is open to the world" (p. 282). The left is endowed with some sort of nonlinear topology providing a matched impedance with the substrate. "It is built in such a way as to fuse with the world's influences and capable of transforming itself to obtain an inner adaptation to the essential characteristics of the environment" (p. 282). It seems that the bodily left corresponds to the brain's right — which indeed is open to pattern rather than linear logic. Of course, this discussion stereotypes the left-right asymmetries most typical within brains and within bodies, especially regarding hands. It is, however, an empirical question how dedicated that linkage is between brain and body, or between brain and hand and balance of body, and worth exploring briefly.

We know more about brainedness and handedness, or think we do, than about the body generally. Besides the ambi-minded and ambidextrous, there are at least four configurations, not just two: first the by far most numerous left-brained/right-handed and second the seldom right-brained/left-handed. There also occur more than incidentally the left-brained/left-handed and the right-brained/right handed. Our terminology sadly labels one pole of the asymmetries "dominant", a pretty muscular word, and the complementary pole "non-dominant". Regarding cerebral hemispheres, dominant refers to some "language centers" typically in the left hemisphere, and these actually index temporal, syntagmatic, linear *speech* production, not spatial, paradigmatic, nonlinear *language* storage. Communicating between and contributing to those hemispheres is literal connective tissue, the *corpus callosum*, found among mammals and birds, which orchestrates the increasingly specialized, or lateralized, "functions" attributed to each hemisphere throughout early ontogeny. Moving to the hand, "dominance" refers most often to the one preferred for writing (should one live in a society with written language), or for eating (unless otherwise proscribed). This terminology masks *other* roles for the "dominant" hemisphere and hand, and *all* the roles of the "non-dominant" but equally essential organs.

Rothschild understandably enough simplifies his discussion to the stereotypic "functions" and their locations (p. 289), resorting with few reservations to the notion of "dominance" (pp. 73, 283). Although he outlines how reversals between dominance and non-dominance come about, he is mute on its incidence, which may well also vary across populations. Rothschild also fails to address two questions already lurking in the literature: (1) can handedness be a proxy for the asymmetry throughout the rest of the body; and (2) how dedicated *or* uncoupled are the brain and body, or the brain and hand

and balance of body? He mentions only in passing (p. 77) that Penfield and Roberts reported cases of nonalignment of left-dominant brainnedness with right-dominant handedness. In spite of this relative silence, Rothschild's discussion of the body deserves top billing — and this research started 75 years ago! His work integrated opportunistic naturalistic observation and quite radical experimental procedures (the latter of course not with humans), together with scientific results and philosophical musings reported in the literature from around the world.

Rothschild provides hints to some of these somatic puzzles. "The right side is more tuned to self-assertion" (p. 282); this certainly could apply to the hand, confirming a link between the body generally and the hand. The left side of the body and its communication systems are in tune with the "creative intentions" of the whole, being more "divine", while the right side of the body attunes to outer adaptation (p. 317). I took careful notice of the following associated with the left side: the stomach, blood and blood circulation, heart — all left — "[…] nutrients and oxygen […] reach the body via the left atrium and left ventricle" (p. 282). Numerous circulatory vehicles in a number of phyla originate ontogenetically on the left, and in a counter-clockwise pattern. These details reveal Rothschild's embryological roots.

Polarization is not confined to left and right, but can also be between up and down. "In addition to the decussation between the sides of the body, there is an inversion of above and beneath in the human cerebrum compared to the localization of the mid-brain roof" — such that human lower appendages connect to the CNS above and the head on the bottom of the cerebral cortical gyri (p. 317).

Most people have become aware of the odd double-wiring of each eye, to which research Rothschild contributed; in fact, he carried out a "comparative semiotic analysis" of the optical structures in arthropods, cephalopods, and vertebrates, published in 1950 (p. 117). The "signs of foreign bodies" are absorbed in the "own body" and represented as alien, leading to two centers. When the two centers collaborate, Rothschild terms that "fusion". Interestingly, bilaterally symmetric (well, almost symmetric) creatures move horizontally and their vision is geared to communication of the contrast between their own bodies and others in motion (p. 119). He also remarks on the inner tension that flows from the upright posture and gait of humans, situating the CNS's noetic system above much in our significant outer world (p. 140). This also leads him to consider sleep and wakefulness, termed a stressful vigilance. Among other conditions scrutinized are play, miming, laughing, smiling, and crying, including the lateral movement of the mouth in the latter activities. Rothschild would no doubt be delighted with some very current research on the babbling of babies, wherein slowed videotapes revealed which utterances were genuine nonrandom babble with semantic meaning — these initiating with movement on the right side of the mouth (and presumably the left side of the brain).

In inspecting other asymmetries in the wider animal kingdom, both ontogenetically and phylogenetically, Rothschild finds many examples of morphological skewing. He goes on to observe asymmetries in locomotion, but falls shy of answering the specific questions I pose below.

Asymmetry has long fascinated me, and one puzzle has been the tendency for humans to veer counter-clockwise in *open* territory; well, at least in the northern hemisphere! No, we would be surprised at a Coriolis effect when we're dealing with a single significantly asymmetric species. Then there are reindeer, again in the far northern hemisphere, who consistently circulate counter-clockwise in *enclosed* space. I had a hypothesis about humans, just considering the placement of the heart and the possibility that the right leg might swing a bit farther, pivoting on the more heavily rooted left. Then it seemed that the different size of the two feet could vary by sex—particularly since mothers holding babies on the left and near their heart eventually expand the width and length of the left foot. The variables were multiplying. Some 30 years ago I took this matter to my mentor, G. Evelyn Hutchinson, who said that the Victorians pondered some of these questions and that the issues were probably overdue for being pulled onto a front burner. Reading Rothschild now does not resolve matters, which are much too interesting just to cancel out by answering them, but Rothschild does permit sharpening some of the questions and generating many more.

For instance, Rothschild would concur that the left foot, on average, would be more "rooted", and attuned to the earth. Sure enough, he notes that in a canoe, the right side will be more strongly moved along than the left (p. 283). No mention of humans in open territory or of reindeer in confined landscapes, nor of canoes propelled by left-handed (but only right-brained?) individuals! Anecdotal evidence from several semiotician-colleagues in Tartu confirms my suspicion that the body may not be so indelibly polarized from hand to foot. For example, young athletes may be quite aware of giving each foot an equal opportunity to develop a proper kick; this empirical process argues against any correlation with handedness. Among Saami children, too, I observed both boys and girls trying out both right and left arms in throwing a lasso, before settling on one, and this was not predictable from handedness. These children went even further and experimented with hanging the lasso from each shoulder before settling on a habit. The tossing of a fishing line did not correlate with the casting of a lasso, either. Careful observation in naturalistic settings could provide a sleugh of puzzles to freshen our curiosity. Even here, Rothschild beats us to the punch and ups the ante:

> It would be an interesting biosemiotic exercise to describe the life cycle of an anthropoid, say a chimpanzee, and to compare it with a human in order to emphasize the difference between an animal with a dominant neural system and an "animal" with a dominant noetic system (p. 78).

Not to limit himself to humans or to the macroscopic, Rothschild does note that water-dwelling micro-organisms screw themselves along to the left, and flagellates and infusoria larvae preponderately move leftwards, indicating that the right side is the stronger.

Rothschild could have mentioned, and perhaps has (it's a very detailed book), that asymmetry flourishes with counter-clockwise spirals at the molecular level as well. Not surprisingly, there are exceptions, just as there are at the organismal level, and these exceptions, when noted, receive attention.

Perception associates with the left hemisphere, originating with resistance to the outside, leading to verbalization, logic, sequence, control; intuition associates with the right hemisphere, the realm of whole pictures, analogy, receptivitiy, appreciation for holistics. Flexibilities built into the system of lateralization of the vertebrate body carry over to the brain as well, in reverse. Somatically, the assertive right side resists perturbation, but damage to the left side is serious as it is so embedded with its environment. When the left side of the body is damaged, it is transformed into the right and the intact right side becomes the left (p. 283). In the case of human brains, too, damage to either cerebral hemisphere before lateralization does not interfere with their functioning given a similar plasticity.

From syntax to communication

Biosemiotics transcends ordinary science through its attention to communication, a nondeterministic open process of self-realization. "Biosemiotics investigates the relationship between life and matter, soul and spirit by means of the complementary application of methods originating from the natural as well as from the behavioral sciences. […] Biosemiotics shows how to respect the values and truth of science but also to supplement what is lacking" (p. 8). Rothschild both compares and contrasts biosemiotics with cybernetics (p. 105), structuralism (p. 111), and generative grammar (p. 84). His tri-phasic ontogenetic model of experience-*cum*-communication finds productive analogies at different levels in the system. Entering at the level of either body or brain, the first phase describes fusion of stimulus with its repercussions; fusion focuses on the bodily left and the brain right. The second phase entails polarization, as the stimulus-receiving system asserts itself while the intruder becomes its own pole; assertion is evident by the bodily right and the brain left. The third phase ensues as the two poles complete each other, and the system is able to act. These processes of polarization into own- and opposite-pole are general to all communication systems (p. 317), as well as to all processes relative to experience (p. 288).

"Communication presupposes understanding, and understanding presupposes similarity, relation, resonance, and analogy […] mediators of a foreknowledge" (p. 101). Rothschild does not quake before ontologies.

One cannot simultaneously study — without emphasizing their complementarity — the mutually dependent forces of "spirit and matter, appearance and place, movement and body, quality and intensity, intuition and perception, fusion and alienation, image and drive, soul and body" (p. 30). All the first-mentioned can reinforce each other, and despite their codependency with the second-mentioned, they also stand in opposition to them. Drawing on Freud, Rothschild associates the Eros principle with communication and compounding of units; the Thanatos with the disruption of communication between units; but he does not concur that Eros looks to previous stages and Thanatos to the still previous stage before life, or death (pp. 31–32). Rather, Rothschild posits that Eros must create life before it can repeat itself, and then that Thanatos determines its singularities and completions and meanings (pp. 32–33). These adapted notions Rothschild uses for his own purposes. For instance, a haploid bacterium without the membrane separation of nucleus and cytoplasm essentially realizes itself in monologue, a sentence, so to speak, even though metabolism integrates Eros and Thanatos. Eros creatively absorbs foreign material, assimilates nutrition, grows, while Thanatos devotes itself to maintenance, regression to previous stages, and division (p. 49).

In contrast with haploidy, diploidy — with more information from the environment as well as that coursing between nucleus and cytoplasm — can have real dialogue. Also associated with diploidy is morphological differentiation into various organs throughout the organism's early development (pp. 49–50). Diploid syntax follows, or anticipates, the tri-phasic stages in cognition. First, Eros predominates as the system is open to information and experience; structures relax and disturbances expand. Second, Thanatos leads to structural resistance. Haploid stages end here, while this second stage for diploids results in polarization, the separation of poles, and the differentiation of environmental and cytoplasmic information in the nucleus, and, of course, vice-versa. These sequences match those in the fertilization process. Given polarization, a third phase of completion realizes itself in the digestion of that information.

The diploid cell can communicate with other cells beyond its own membrane; it possesses the syntax to create many more "sentences" (p. 51) than a bacterium. Rothschild emphasizes here (p. 50) and elsewhere the semiotic significance of membrane, border, edge, as mediator. The cell "expands symbolically into its environment not less than the environment invades the cell". Rothschild chooses to quote from his first biosemiotic work (1962) here (p. 50): "The world does not act primarily as a confrontation, but acts within the organism, just like the whole manifests itself in the parts". In summary, "Eros opens the possibilities — Thanatos decides on units and

structure" (p. 56). Life dances not between love and death, but love and death dancing is life.

Another contemporary developmental biologist and semiotician, Stanley N. Salthe (1993), has managed to use a less embellished vocabulary to discuss development and evolution. While Rothschild frequently and in great detail focuses on ontogeny, he is more apt to cite evolution and phylogeny only in passing. That is, evolution is often mentioned abstractly, without analysis, and without any tight relationship with its dialectic complement of development. Evolution for Rothschild seems more a *fait accompli* through stacking of ontogenetic processes than the nonlinear accumulation of individuating information of Salthe's evolution, and furthermore, there is lurking in Rothschild a tendency for a teleologic evolution, even when he distinguishes his approach from that of Teilhard de Chardin (p. 34).

While Rothschild's preferred subject matter, concerning humans, compels him to attend first to cerebral hemispheres, then mammalian morphology, then to other bilateralities among invertebrates, then to nonbilateral arrangements in the animal kingdom — he does tend to construct his argument in the opposite, developmental and evolutionary, direction. Also, humans are not "just" animals in Rothschild's theory. Although plants and other life forms are not crucial to his model, when he does mention them he has very interesting observations to make. Consider:

> The differentiation between inner and outer systems and self-pole and opposite pole form the basis for the differentiation in plants and animals. If the self-pole subordinates to the information of the opposite pole and starts interacting with its environment, we see the development of the lifestyle of plants. Animals and man, during sleep, regress to this plant-like style. From our studies of sleep and dreams, we learn a great deal about the accomplishments of passivity.
>
> No living creature illustrates so well the meaning of the cosmic dialogue than the plant with its flowers and leaves, its stem and its roots. The phase of communication through pictures reaches its zenith in the life of the plant. (p. 57)

The plant and the unicellular animal, without motility, learn little about space and time. Its world is limited by the circumference of its cells (p. 58). One might argue with this, but perhaps Rothschild would be ready with riposte.

Negotiating the CNS in space and through time

In terms of embryological stages, humans share those developmental antecedents of cellular morula, of invertebrate gastrulation, and of vertebrate neurulation. First came the ovum cell, utilizing its physical system as signs; then the outer body serves as its gastrular system, and the CNS as its

neurulation. With caution he revisits Haeckel's biogenetic law (p. 68); re ontogeny recapitulating phylogeny — "[…] in light of biosemotics, it is once again meaningful". Indeed, the algorithm for evolution in his theory is the "superimposition of layers of sign systems" (p. 138). The secret ingredient in humans is the intentioning ego (pp. 65–66). Rothschild refers to this noetic dimension as transcendental subjectivity, or TS. This links up with the sheer spiritual, if one wishes to follow him there. One is further curious whether these profound ontogenetic stages, from gastrular to neural to noetic, for example, could profitably be distinguished as having distinct modeling systems.

Underways Rothschild does not neglect more substantive issues, for example, neoteny — described but not so labeled (p. 67). Humans develop dramatically in the first years following birth, differentiating in body and especially in brain more than simply growing larger. The CNS situates a new inner system, and one which communicates also with itself. With hemispheric lateralization, cognitive and speech capabilities situate typically to the left, becoming a function of the ego. Rothschild in several places (pp. 76, 138) provides evidence against vulgar assumptions about localization of function in any part of the brain, or by extension, presumably of the body as well.

Always the psychiatrist as well as embryologist, Rothschild comments that:

> From the point of view of biosemiotics, the noetic system assimilates the celllular mode of intentionality in the oral phase, the gastrular mode in the anal phase, and the neural in the genital phase. In the latency period, the noetic mode of intention determines the ego and its development. (p. 79)

The neural system transcends the body, permitting relations in outer space. Biosemiotics can unpack the collaboration between the neural and noetic systems (p. 84). In the intentionality of the noetic system — acting not vis-à-vis the world but acting to experience the world through the neural system — the ego emerges as an endless stage of learning-for-the-sake-of-learning, what Bateson recognized as learning to learn, or deutero-learning (1972). Not surprisingly, Rothschild does not ignore the structures and roles of human language in this regard. Noetic communication rests on language and intellection. Communication takes on a wider meaning when it is regarded as the basic relation in — if not constituting — the cosmos, including in the big bang (p. 284).

In the decussation process which initiates the communication between poles, Rothschild misses a chance to extend the paired intersections along a midline in decussation to the metaphor of "crossing over", so criterial of meiosis. Similarly, while his three-stage model of fusion, alienation, and transcendence applies to fertilization of egg as well as to all other communication systems, the reader may not know which came first in the

ontogeny of Rothschild's ideas! It would also appear that Hegel might be foregrounded a bit more. Overall, though, the internal coherence and consistency of Rothschild's theoretical constructs are impressive.

Rothschild appears comfortable with the work of Prigogine; no doubt, ideas about the dynamics of far-from-equilibrium systems and dissipative structures circulated in embryonic form long before Prigogine's Nobel Prize of 1977. Rothschild can take issue, however, with some of the early interpretations and interpreters of Prigogine, including Erich Jantsch (pp. 310–315). However he does quote Jantsch, in a narrative I have several times unknowingly independently invented in my description of G. Evelyn Hutchinson's unfailing good luck in negotiating the uneven flagstones between his office and the Yale library:

> One could think […] of a man, who stumbles, looses [sic] his balance and keeps the upright position only because he continues stumbling. The end result of dissipative structures is particularly appropriate to explain the connection between the live matter of the organism and the dead substance of the inorganic. (Jantsch, quoted in Rothschild 1994: 313)

Some limits of science and the prognosis for life

Our languaging habits serve creative and destructive functions. They entail judgments (p. 83) which might lead to conflict. In conflict situations, there can be a heightened consciousness, again, providing a seed for possible resolution.

Rothschild made place in this tome for his voice as a concerned scientist and human being. Humans have not integrated their full potentials in drawing on their asymmetries. He believed that understanding humans biosemiotically would help address scourges ranging from population explosion (p. 102), industrial waste (p. 17), and weapon manufacturing (p. 320), to war (p. 9) and total self-destruction (p. 281). The problems arise "[…] because mixing up inner adaptation and outer adaptation increases the danger for self-destruction of mankind" (p. 316). Rothschild repeats that the four elementary qualities to consider are "[…] the inner- and outer-adaptation by means of respectively inner and outer intra-organismic communication systems and the asymmetry of the left and right side of the body as well as of both cerebral hemispheres […]" (p. 316) — a mindful to be sure.

Reviewing a number of historical periods, cultures, and religions, Rothschild concludes that their many natural sciences and technologies tended increasingly to stress outer-adaptation, manifested in extroversion, utilitarianism, and "conquest of facts" (p. 102). This happens more and more at the expense of creative, communicatory, inner-adaptation.

> Laughing and crying contain the elements of creative freedom of man: laughing in its relation to the spontaneity of play and crying in the surrender of the self, which prepares the acceptance of a new meaning or a new idea. (p. 174).

Right-brain and left-body experience can be contagious. Perhaps by individual and collective re-breaking of the symmetry of our preference for the other pole, reversing the state of the world may not be so utterly unattainable. Underdeterminedly so, but feasible. The status quo alternative, pathologically overdetermined, cannot be our option; this has already led us into trouble "[…] because one focused only on facts, and in that way nothing can be learned […]" (p. 283). Allowing Rothschild the final word:

> […] the more we are related, cognate with others, the more we are open to their inner life. This holds for fellow man as well as for nature (p. 291).

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