

Understanding Natural Constructivism: A Review of *The Whole Creature: Complexity, Biosemiotics and the Evolution of Culture*

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“All stable processes we shall predict. All unstable processes we shall control” – John von Neumann, 20th century cybernetician

“The difficult thing for modernity is biology” – Wendy Wheeler, 21st century cultural critic

Introduction

Towards the end of the long dialogue on structuralist and Marxist thought that swept through the humanities in the concluding decades of the twentieth century, critical theorist Jürgen Habermas attempted to rescue from the smoldering embers of what was, by that time, a once-fiery deconstructionism, a renewed grounding for the possibility of “a genuinely democratic socialism” in what he called the “discourse ethics of communicative rationality” (1990). Here, at the beginning of the 21st century, critical theorist Wendy Wheeler is also attempting to ground the possibility of genuine democratic socialism in a theory of communicative action – but the definitions of “discourse” “ethics” “communication” and even “rationality” that Wheeler employs in her recently published *The Whole Creature: Complexity, Biosemiotics and the Evolution of Culture* are all quite a bit broader than the logocentric understandings of those concepts that so captivated and constrained both Habermas and his opponents.

Specifically: in an effort to forestall the descent into mutual unintelligibility that he felt was the logical end point of the interpretative relativism opened up by the “linguistic turn” in the humanities, Habermas’ proposed solution was to anchor human communicative understanding on the propositional logic and normative presuppositions that, he felt, must underlie discourse of every kind – including the discourse of the radical poststructuralists. In assuming such logocentric first principles, however, Habermas’ “community of discourse” turned out to be grounded on precisely the same foundations that even the most radical of his structuralist opponents had likewise assumed it to be – i.e., upon the normative presuppositions of *linguistic representation, propositional logic* and, above all: “words, words, words” (*Hamlet II:ii:192*).

It is from a very different set of first principles that the author of *The Whole Creature* is basing her analyses of the relations between society, individuals and signs. For Wendy Wheeler is grounding her interpretative framework upon the neo-Peircean understandings provided by the emerging interdiscipline of *biosemiotics*. From this perspective, the assignment of epistemological priority to the uniquely human “word” – that world-shaping sign tool that was so central to the critical theory of last century – is now seen, at best, as a myopic preoccupation with what is, in fact, an evolutionary late arrival in the still ongoing history of world-shaping sign tools.

Such epistemological privileging, moreover, makes the continuum from nature to culture an all but impossible one, and fatally occludes the critically important fact that linguaform representation yet today is still but only *one* of the many semiotic resources that we human beings employ every moment of our lives – one that could not be effectively employed at all without the plethora of non-linguistic sign processes (both within our bodies and available our shared material surround) enabling words to “mean” anything in the first place (Bateson 1951, Favareau 2007a). Human language, then – for all that its use can and does construct – is most fully apprehended when it is seen within the context of the more fundamental phenomenon of *biosemiosis* – i.e., within the ubiquitous processes of sign-making and meaning-taking that, by necessity, constitutes all living systems’ ability to negotiate externality and that is at the heart of their various ways of being in the world.

Investigating Culture the Intersection of Sociology, Science and Signs

Long developing at the intersection of semiotic study and biology, *biosemiotics*, with the advent of this work, is now being employed as a framework for a richer understanding of human culture. Thus, when on page one of Chapter One of *The Whole Creature*, the author declares forthrightly that her goal is to “present a good materialist argument about the nature of human sociality” (13) it is important to understand that Wheeler is rejecting – and not perpetuating – the reductionist and eliminativist understandings of Cognitive Science and Evolutionary Psychology. For by “nature” the author does *not* mean pre-given and essentialist, but thoroughly social and constructivist in the widest sense – and by “materialist” she does not mean lifeless and mechanical, but responsive, malleable, creative and generative. She introduces the broad outlines of her project thusly:

Evolution – physical and cultural – is a complexly (i.e., non-linear) accumulative process, and its results cannot be satisfactorily explained by reduction to earlier stages. [It is because of this] that a fully materialist account of human life and human sociality, will remain seriously incomplete until we are able to offer a compelling evolutionary biological account which is non-reductive, and has persuasive explanatory power with regard to human beings as language users, and beings who live in a complex world of signs. Sociobiology, and all forms of genetic reductionism are, unsurprisingly, silent in this score. Yet what is *Homo sapiens*, if not the creature that lives and creates in *signs*? (22)

As a way of remedying this blind spot in the scientific outlook, and in anticipation of the arguments that she will be making later in the book, Wheeler notes in her Introduction that among the many fruitful ideas that biosemiotics can offer critical theory are these two: (1) a radical re-conception of “the word” as, *in itself*, being wholly insufficient for the carrying of meaning or knowledge, and (2) an understanding of symbolic relations in general as an evolutionarily shaped meta-product of *semiosis that is understood by its users as such* (a distinction that Terrence Deacon, after Peirce, characterizes as the human use of “thirdness relations” constituting *symbolic reference* and that Wheeler, throughout her text, distinguishes from more general semiosis as “disembodied, conceptual, articulate language”).

Embedded within and arising from an evolutionary history, human sign use is at one time thoroughly natural (we could not survive as organisms without it) and thoroughly cultural (as the particular species-specific “trick” of achieving linguistic symbolic reference lies in what the *community* of sign-users are doing semiotically, as opposed to just what the individual is doing semiotically, as per Wittgenstein). Taken together, the understandings of the relations between agent, world, and sign that biosemiotics offers, Wheeler argues, carries with them a radical re-visioning of the idea of “participation in a discourse community” – one wherein the traditional subject/object dichotomy is replaced by the fluid interrelations of

semiotic causality, and wherein the “virtual reality” of symbolic language is an actively maintained system property of such semiotically lived relations.

Fostering such an understanding underlies Wheeler’s true purpose in the writing of this book – which, as she freely admits throughout, is to advance a more naturalistic and more humane socialist political agenda. For when seen from a biosemiotic perspective, she argues, “the individual” is not best understood as a kind of virtually autonomous Darwinian monad, acting upon the externality of “the world” and “culture” after the fashion of the self-interested agent of modern rationalism, *Homo economicus*. Instead, Wheeler argues, the insights of biosemiotics convincingly allows us to see the individual as not just being “caught inside of” – but, rather, as being always *a part of*, as well as *itself being* – an effervescent, identity-bestowing matrix of inextricably interrelated physical, biological and cultural signs. Understood from this perspective, writes Wheeler, “subjectivity is not a wholly individual affair, but is inter-subjective within a larger intelligence of ‘us’” (145). It is because of this, she will argue towards the conclusion of her work, that the widespread adoption of such an biosemiotic understanding may serve to set the “pre-political conditions” wherein a genuinely democratic socialism and a community of mutually supportive discourse users may flourish (154-158).

However, notes Wheeler: “Believing this is not the same as making a good, and amongst other things, scientifically based argument for how it is so” (12). Thus, she warns the reader, making her case scientifically will require an entire book – one where several lines of argument – about societies, about individuals, about scientific knowledge, and about knowing in general – must be presented linearly, but somehow held in mind simultaneously, as the author weaves the tapestry of thought allowing her to argue that the freedom that is most critical to the flourishing of human beings is not the “existential freedom imagined in liberal philosophy ... [i.e.] freedom as understood simply in terms of possessions, property and the pursuit of self-interest” but rather, “a freedom which, [like the process of evolutionary development from which it sprang] is always constrained by grammar and discourse, and the rules which are a part of human society- and culture- making, but which is also always open to the ‘rule-breaking’ evolutionary emergence of the newer grammars and newer languages in which we recognize human creativity” (19). *The Whole Creature: Complexity, Biosemiotics, and the Evolution of Culture* is author Wendy Wheeler’s attempt to articulate the validity and the naturalness of such a perspective – and the scientific and social benefit of embracing such ideas.

Synthesizing the synthesizers: Whither biosemiotics?

As noted earlier, with the publication of this work, Wendy Wheeler is among the first to attempt to employ a biosemiotic perspective in the services of critical theory. Thankfully, she has done so in the form of a largely jargon-free text that is accessible to general reader – a wise strategic move, given her intention to reach as broad an intellectual audience as possible, and because the implications of her arguments cut across so many disciplinary fields. In this sense, Wheeler’s *The Whole Creature* follows more or less in the tradition of such popular introductions to biosemiotic theory as Jesper Hoffmeyer’s 1996 *Signs of Meaning in the Universe* and (to a somewhat lesser extent) Terrence Deacon’s 1997 *The Symbolic Species*. Unlike Hoffmeyer and Deacon, however, Wheeler has an overt political agenda driving her work: For her, it is not just the explanatory practices of science, or of how we understand ourselves as minded creatures, that needs to be re-thought – but of all that *plus* entire project of “modernity” itself.

Semiotica readers may recognize in this latter challenge echoes of John Deely’s 2001 magnum opus, *The Four Ages of Understanding*. Significantly, the closing chapters of both Hoffmeyer’s and Deacon’s books likewise end on similar (if less explicitly articulated) notes

– and all three of these earlier works end by positing that *some* kind of deep change in our thinking about selves, societies and sign relations is likely to result from the adoption of a semiotically (Deacon), biosemiotically (Hoffmeyer) or pansemiotically (Deely) informed perspective. The author of *The Whole Creature*, however, is a good deal more vocal about what *exactly* those changes might – and, in her opinion – *should* be, especially at that interface of society, individual and sign relations that constitutes the realm of the political.

In the following review, I hope to convey to the reader a adequately full sense of Wheeler’s arguments for her positions, more than I wish to take up those arguments from a political position of my own. For as someone who has been deeply involved in the interdisciplinary of biosemiotics for the last seven years, my main interest in this book lies in the fact that it may constitute the first true “cross-over” book in biosemiotics. That is to say, it is a book written from a discipline outside of either biology *or* semiotics, that yet attempts to incorporate a biosemiotic perspective as support for its own arguments. With this move, the interdisciplinary field of biosemiotics is now itself being made part of a even larger interdisciplinary undertaking. How fruitfully this synthesis is achieved here, as well as what the appearance of works like this might portend for biosemiotics in general, are issues that I will address at the conclusion of this review. The book is consequential enough on its own merits, however, that it deserves a considerably full description on its own terms first.

A Spectre Haunting the Humanities

A summary of the purposes of this book can be found in its opening pages, where the author forthrightly declares that the book has been researched and written to support an overtly political argument. The essence of this argument is that a culture of capitalistic, neo-liberal individualism is a sub-optimal form of human social organization, and that there is now both strong scientific, as well as strong first-person experiential, evidence supporting the legitimacy of this claim (15, 18, 26, 30, *et passim*). It is not lost upon the author that Karl Marx also made very similar claims, likewise citing as his support both the *zeitgeist* and, more centrally, the *science* of his time. What the author wants to argue here, however, is that “science” itself has evolved almost out of recognition since Marx’s time, and that the new sciences of “complexity dynamics” and “biosemiotics” offer far more compelling support to Marxist and socialist assumptions about collectivity, identity and agency than could the older, less sophisticated scientific approaches of atomism and material reductionism.

Moreover, claims the author, these new scientific approaches also reveal to us some of the fundamental shortcomings in Marxist theory and in the practice of top-down social engineering schemes of all kinds, as well. “An understanding of biology in culture – biosemiosis,” writes Wheeler, “does not conform entirely to the political lines and formations drawn up in modernity” (155). But before she can even ask her largely humanities-based audience to engage with the labyrinthine interdisciplinary arguments necessary to evaluate her theses, the author realizes that she is going to have to do a good deal of remedial and rehabilitative work in order to justify to them how it is that she is asking them to take seriously idea of basing one’s arguments about culture in anything as supposedly retrograde and politically incorrect as “Western science” in the first place.

For, writes Wheeler, “following the bursting of Continental Theory upon the Anglophone world from the late 1960s onwards, and the related development of cultural studies as a new discipline in the 1970s, a problem - in the form of a silence - in cultural studies, the humanities and the social sciences in general, has remained” (138). This problematic “silence” replaces a principled acknowledgement of, and acquaintance with, the empirical findings of science in general, and (especially to the extent that it can inform us veridically about human beings) biology in particular. Yet whether or not the majority of cultural theorists wish it to be so, Wheeler argues, the contemporary world in which we all

must live is *justifiably* defined and “driven, above all, by scientific and technological development. A yearning for the lost organic community which attempts to float free of this, or an opposition of art to science, or culture to nature, or the placing of ‘community’ in articulate language alone ... instead of in our enworlded body-minds and biology ... cannot have any real, significant and lasting purchase in a world characterized by the emergence of scientific understanding” (132).

Accordingly, Wheeler has addressed her text primarily to critical theorists in the humanities and the social sciences – for it is there, she observes, that “the great nervous silence in progressive thought” regarding science (and in particular, biology), has critically impoverished those fields, rendering them all but superfluous to the modern communal project of world-making (14). Such silence and denial – whether in the form of uneducated neglect or of reactionary contrarianism – has had the effect in the humanities of removing virtually all constraints on hypotheses about the world, notes Wheeler, and has reduced the scientific literacy of far too many of its scholars down to “the level of technological development in a third world country” (26). Therapeutically, one of the self-professed aims of this book is to make a “creative *intervention*” into this “great nervous silence” that haunts cultural studies.

A lifelong toiler in the fields of the humanities herself, the author of *The Whole Creature* well recognizes many of the reasons *why* “scientific explanations” have become anathema to the humanities: Atomism, neo-Darwinism, materialist reductionism, naïve positivism and the thoroughgoing rejection of subjective experience both as a legitimate object and a legitimate mode of inquiry – all of these extremist tendencies in modernist science are fundamentally anti-humanist. Yet their astonishing successes in practical application and in the popular imagination has left those working outside of such sciences in the apartheid ghettos of the Cartesian “all that is not matter must be ghostly essence” divide.

But in ignoring and in attempting to “reject” the value of the understandings offered by science, writes Wheeler, cultural theorists of the last few decades have implicitly accepted – and perpetuated – the absurd terms of the modernist dichotomy as codified by Descartes. Such a “rejection” concerning the orderliness and the specifics of material reality, she writes, perpetuates “a philosophical idealism in spite of its efforts to escape it... [a move that ultimately turns out to be] complicit with the derealisations and alienations of bourgeois liberal philosophy” (17).

Thus, with Latour (1993, 1999) and Deely (1999, 2001) Wheeler rejects the pose of an anti-scientific “post-modernity” – arguing that by implicitly accepting the dualistic terms of the modernist debate, such theorists themselves “have not moved an inch beyond Descartes” (Latour 1999:8). From this perspective, the reactionary proposal that the communal human project of science has nothing of value to tell us, because: (1) it studies “matter” and not “mind,” and (2) because it does not and cannot ever reach the impossibly *a-perspectival* status of “absolute truth” (and both (1) and (2) are deeply Cartesian notions if ever there were!), is not at all a “post-modernity” but is in fact an “hyper-modernist” approach to the very real and causally efficacious relations between being, description and knowledge.

As noted, this is an argument that John Deely lays out in extraordinary detail and with extraordinary power in his massive *Four Ages of Understanding* (2001). There, as here, the true “post”-modernism – i.e., the future of human understanding, once it has genuinely outgrown the adolescent excesses and counter-reactions of Cartesian modernity – lies in the development of the perspective of *semeiotic* – which is to say: in the deep understanding and personal accommodation to the ineliminable logic of relations between materiality, representation, and agency.

Consequently, argues Wheeler, humanists must come to realize that the alternative to a criminally incomplete realist ontology of material reductionism is *not* a correspondingly myopic, nominalist ontology of linguistic constructivism. Instead, and in solidarity with the manifesto wherein Thomas A. Sebeok and colleagues initiated the modern-day project of biosemiotics in 1984, Wheeler believes that to move forward, we must actively transgress the restrictive boundaries drawn up at the beginning of modernity – the “forced choices between realism and idealism, as though this exclusive dichotomy were also exhaustive of the possibilities for interpreting experience” (Anderson et al. 1984:8).

Both positivistic reductionism and idealistic anti-scientism, then, are non-starters for Wheeler – and accordingly, not much of the book is devoted to arguing in depth against these positions *per se*. Rather, it appears that Wheeler feels that the poverty of these two positions as fully explanatory frameworks is by this point evident to all but the most die-hard proponents of such hidebound ideologies. Instead, what Wheeler wants to achieve with the publication of *The Whole Creature* is a Sebeok-esque *rapprochement* of the sciences and the humanities, and the message that she brings to her colleagues in the humanities is that science – particularly in the form of the newer scientific projects of biosemiotics and of complex adaptive systems theory – has become ready to be a partner in the study of culture and of genuinely human being at last. But it is up to the humanities now to recognize this and to proceed accordingly. Writes Wheeler:

“The value relativism that the sociolinguistic constructivist arguments produced, made it impossible to argue for the superiority of one set of ideas (social justice over self interest, for example) above another. For this reason, among others, it is now necessary to push the pendulum back towards an acknowledgment of the materiality of the world. This is made into an easier task by the fact that, although unevenly, scientific positivism has been for some time under steady attack from scientists themselves, as the understanding of complex systems, and especially biological evolutionary complexity, slowly spreads” (18).

This last point is indeed an important one, for within most science circles today, it is now openly admitted that the linear “reductionist” model of causality that underlied the early work in physics (and which was then naively adopted for biology) cannot, even in principle, meet the demands put upon it by the data of such massively non-linear phenomena as genetic expression, organismic development, or even the interactions within a single cell. Accordingly, the biological sciences are more and more each year becoming “systems sciences” – ones wherein the incessant processural dynamic of “bottom-up” interactional processes recursively giving rise to “top-down” organizational constraints and possibilities define the transient but self-perpetuating “nodes of entity” under investigation.

Moreover, such poly-causal, irreducibly interactive explanations about living systems are dovetailing nicely with the corresponding rise of systems approaches being taken in physics, cosmology, theoretical mathematics, and engineering – where concepts such as “structural coupling” “self-organization” “processual being” “reciprocally determinate feedback loops” “downward causation” “symmetry breaking” “emergent effects” “decentralized control” “implicate order” and “organizational heterarchy” provide, at last, concepts that the humanist and the social scientist can relate to what they observe taking place within their own massively complex areas of inquiry.ⁱ

Wheeler, following the physicist Robert Laughlin, refers to this recent turn in the history of science as the ending of “The Age of Reductionism” and the beginning of “The Age of Emergence.” Convincingly, she argues that the transition from the hegemony of materialist reductionism in science to “a complexity/emergence understanding of change, potentially transforms so much in our customary modern understandings of the world that it deserves to be called a shift in paradigmatic thought in Western modernity” (13).

But in order to most accurately describe this new understanding and its implications, Wheeler knows that she must first make more visible to us our currently received pictures of science, societies and individuals that these ideas challenge. She does this in the form of a historical narrative, in order to provide the reader with an accurate enough lay of the land to see both where we are now, and how we got here – and to alert us to what consequences may await us as the result of the directions that we choose to pursue next. She thus begins her history of scientific thinking and its reciprocal influence upon society, smartly, in 17th century Europe, and retraces a path through the thicket of social change and scientific progress that has led us to our present pass.

Of course, the story of how science and the humanities came to cultivate a deep distrust of each other's explanations and claims to legitimacy has been told elsewhere (cf: Snow 1964, Deely 2001, Latour 1999 and, indeed, I have even taken a shot at telling this tale myself: Favareau 2007). But if a genuine *rapprochement* is to be made in reconciling these polar representatives of the two essential elements of every human being's cognitive repertoire – the “objective (third person) view” operationalized by science and the “subjective (first person) view” characteristic of lived experience – then the story bears re-telling, and from as many disciplinary perspectives as possible.

Science and its Discontents

The development of scientific inquiry into a positivistic and reductionist epistemology is not just a linear progression from the initial conditions set by Francis Bacon's radical mechanism and the dualism of Rene Descartes, writes Wheeler, but was a phenomenon that was recursively fueled by the burgeoning Machine, Industrial, Telecommunications and Information Revolutions that such scientific practices helped to bring about. Thus, writes Wheeler, just as the history of Western science has been one marked by the application of mathematical representation and by the methods of materialist reductionism to the majority of problems that it has successfully solved, it is concomitantly the case that people in the societies in which such sciences have flourished, have increasingly come to adopt (and eventually to demand) atomistic and materially causal understandings to ever-widening domains of action and of inquiry, reserving – and later relegating – all phenomena that fall outside of such explanatory frameworks to the immaterial, the mental, and finally, the mystic (to the point where these latter three domains are now themselves said to be either imaginary non-existents, or at best, misdescribed illusions of purely material relations).

The consequences of adopting this mindset, maintains Wheeler, are dire. Over time, human subjectivity itself comes to be devalued (or, in reaction, over-valued, as we shall see shortly), as solutions to social and individual problems are increasingly sought in the mechanics of purely efficient causation. Too, under the utilitarian survival demands of the mechanistically inspired workplace, individuals come to see themselves as interchangeable atomistic monads – while in their off-time, their non-instrumental skills and tendencies increasingly either atrophy completely, or are co-opted under the natural selection pressures of the capitalist system.

This vision – which is applied compellingly throughout *The Whole Creature* in addressing some of the major social pathologies of our day – was Marx's also, of course. For in a passage that is as arresting and relevant to the “scientism” of today as it was 150 years ago when it was written, Marx writes in the *Communist Manifesto* that the world-shaping power of the bourgeoisie – prime sponsors and beneficiaries of the science-based Industrial Revolution:

has drowned the heavenly ecstasies of pious fanaticism, of chivalrous enthusiasm, of philistine sentimentalism, in the icy water of egoistical calculation ...has stripped of its halo every occupation hitherto honored and looked up to with

reverent awe ... has torn away from the family its sentimental veil ... and has left no other bond between man and man than naked interest, than callous cash payment ... In place of exploitation veiled by religious and political illusions, it has put open, shameless, direct, naked exploitation. Constant revolutionizing of production, uninterrupted disturbance of all social relations, everlasting uncertainty and agitation ... all fixed, fast-frozen relationships, with their train of venerable ideas and opinions are swept away, all new-formed ones become obsolete before they can ossify. All that is solid melts into air, all that is holy is profaned, and men at last are forced to face with sober senses the real conditions of their lives and their relations with their fellow men (1848: 61-63).

This “real condition of our lives,” at least as Marx believed, was the class struggle – which, on closer inspection, turns out to be merely the evolutionary latest manifestation of the amoral, blood-soaked Darwinian struggle. Even more telling of the narrative beneath the narrative here,, perhaps, is the fact that in Marx’s vision it is once again the “detached” and irrefutable “truth teller” of Science that alone can strip away all the artifices and force us to face such sober “truths.” Such assumptions – and even such prose, as Marshall Berman (1980) astutely notes – puts Marx squarely in the Modernist camp, heir to the Romanticism of the late 18th century, and yet sufficiently in thrall to science and its successes to consider it his highest justificatory appeal. Here, then, and throughout his writings on the “evolutionary inevitability” of communism itself, we see Marx bowing to a god higher than that of mere Historical Materialism *per se* – this is the god of Science, for it is only by appeal to “Scientific reason” that the inescapable “truths” of Historical Materialism may be known. Wheeler takes note of this incipient scientism in Marx’s thought, and observes:

“The problem with [Marx’s] compelling analysis (and its being carried through) was ... the philosophical, and hence scientific, air in which it was expected to breathe, live and have its being ... For in order to ‘get heard’ in the nineteenth and twentieth centuries, it was necessary to put on the clothes of Science and ‘Objective’ Materialism. Eighteenth-century philosophy and science was dominated by an atomistic view of the world in which society was composed of striving, economically self-interested, individuals. In this context, the essentially socialist impulse which evolved at the end of the eighteenth century, and manifested itself in large part in romantic philosophies, did so in a context in which its completely correct understanding of human society as a complex evolving whole must either: find a ‘scientific’ (i.e., objectivist and positivistic) basis or, and as in fact generally happened, retreat into the sphere of the aesthetic (45).

It is as a result of this latter phenomenon, Wheeler will proceed to argue that we find ourselves all still reluctant Cartesians today.

A Dialectic of Undervalued and Overvalued Selves

In the sections of her book detailing the connections between the rise of materialist reductionism in 18th to 19th century science and the corresponding rise in reductive materialism as an organizing force in the intellectual thought and social relations that the citizens of Europe and America were constructing with one another at that time, Wheeler provides an illuminating discussion of how early Romantic and Counter-Enlightenment thinkers such as Blake and Schiller declaimed what they perceived to be the encroaching eliminativism and hyper-utilitarianism of the still quite revolutionary scientific project. “The first wide-scale response to [the culture of] scientific reductionism took the form of Romanticism,” writes Wheeler, noting that “what we have come to call Romanticism consists essentially of all those thinkers in whom we recognize the confraternity of the

thought that says that complex wholes (such as societies and their natural and historical contexts) are not to be understood by reduction to parts, that the whole is greater than the sum of its parts, and, relatedly, that real knowledge does not consist simply in objective, abstract, propositional knowledge, but is also, and just as importantly, deeply experiential” (43).

As was the case with Marx, claims Wheeler, many of the Romantics’ intuitions about reductionism may have been scientifically justified – but the science of their time was incommensurable with such thinking. Thus it was, writes Wheeler, that in the late 18th century, the term “romantic” took on its present-day connotations as “unscientific” and “unworldly” – while the sciences of materialist reductionism assumed the mantle of “objectivity” whereby the final “facts about reality” could be exclusively known (45). Not surprisingly, writes Wheeler, the results of such intellectual polarization has been calamitous for the development of both a scientifically informed humanism *and* a humanistically informed science. Instead, she writes, the logical entailments of the dualistic Cartesian paradigm has produced “paradoxically, both the development of a powerful “objectivism” – by which [it is thought that] the world can be seized “as is” as an object of knowledge – and also, eventually, a kind of romantic subjectivism in which “my” knowledge [is thought to be] absolutely particular to me, and uncommon” (24).

Caught within such a dichotomous double-bind within which to explain reality, the reaction of so many of the Romantic thinkers to this mutual estrangement between themselves and the world of science was much the same as that of many of their counterparts in the humanities today – i.e., to either: (1) stake out their places in that diminishing space of inquiry still left open to them by the terms of the Cartesian divide [e.g., the retreat into the subjective and the aesthetic] or (2) renounce science and its doings wholesale and attempt to rebelliously embrace instead irrationality, supernaturalism, mysticism and the “authenticity” of pre-scientific ways of understanding.

In this way, science (a human way of knowing) and the humanities (a human way of knowing) became worse than antagonistic to one another – they became indifferent. And this, sadly enough, remains pretty much the situation on the ground today.

Mending the Divide

As she has made clear from the outset, the author of *The Whole Creature* believes that a retreat from engagement with the very real and vital information that science can provide for us is irresponsible of any so-called humanist, as our materiality and our place in the natural order as embodied and embrained creatures are as central to our *contemporary* humanity as are our cultural histories, practices and artifacts. Only an implicit (or explicit) acceptance of the Cartesian divide, argues Wheeler, can blind us to the coenoscopic reality that are lives are simultaneously bio- *and* psycho- logical – and that these two modes of order are deeply, inextricably intertwined.

As support for this argument, Wheeler cites several popular review studies examining the relationships between social inclusion, interpersonal efficacy, and individual health. The three works that she cites from extensively in this section are political scientist Robert Putnam’s *Bowling Alone: The Collapse and Revival of American Community*, epidemiologist Michael Marmot’s *Status Syndrome: How Social Standing Directly Affects Health and Life Expectancy*, and behavioral biologist Paul Martin’s *Sickening Mind: Brain, Behaviour, Immunity and Disease*. The argument that Wheeler makes from her readings of these studies is that the flourishing (health) or non-flourishing (dis-ease) of the human individual are deeply dependant on the affordances for meaningful interaction that are made available to them by their material and semiotic surrounds. “It is here,” she writes, “that we see most

starkly ‘the language beneath language,’ the language of the group, and the ways in which it is written in the fortunes of bodies” (111).

Wheeler argues that such studies strongly suggest that “mental” (or more properly: symbolic) issues – particularly regarding one’s perceived sense of social standing and efficacy, i.e., how much one feels valued or devalued within a particular community, and the extent to which one’s words and actions make a noticeable difference upon others, along with similar interpersonal concerns – have as much of an effect upon our bodily health and flourishing as do the physical environments we inhabit and the physical materials we eat. As creatures whose survival and thrival in the world takes place interminably within a symbol-based system of social interactions, “our emotional and our physical well-being is correspondingly linked” (153).

We should not find it surprising then, claims Wheeler, that a social system that “empowers the social significance of the few against the needful claims of the many” (35) turns out to be ill-equipped to promote the kind of semiotic flourishing that purposive agents such as human beings need. Markets can only deliver us a life of “good” in the form of *products*, writes Wheeler, but human beings also need their lives to be meaningful to be “good.” Thus, she argues: “we are most free when the lives of our bodyminds - which is to say our lives as phenomenologically whole creatures embodied in an environment which also is really a part of us are socially and politically recognized.” (18). Yet such a consequential recognition of the ineliminable mind/body nexus is occluded, she will argue, by the persistent modernist tendency to reflexively and destructively pull body issues and mind issues – as well as “individual” and “society” issues – apart.

The Discourse of Being

It is at this point in her argument that Wheeler explicitly asks her reader to try to keep all the preceding threads in hand as she proceeds along what might look like a detour from her main political argument – but which is, in actuality, the road that will lead to the place where all of her prior arguments converge. For in inquiring into how it is that such immaterial factors as “social standing” may have material effects on a physical body – when all of our best science has assiduously argued against such a conflation of the realms of the physical and the mental, the objective and the subjective – Wheeler strikes out for the heart of the problem itself: What *is* the relation between the physical and “the mental,” and between subjective feeling and “objective knowing?”

In order to try to get a handle on these huge and contentious philosophical questions – ones that are routinely ignored and bracketed in the daily practices of the natural sciences – Wheeler turns to the conceptual framework of *biosemiotics*: the study of the rich diversity of organismic sign processes, as such processes occur naturally across the biological spectrum. Within this framework, she finds a way of looking at the empirical data of biology that is unafraid to loosen the Cartesian reins – if only just a little bit – to inquire into the possibility that “knowing” might *not* consist, in its most essential form, in the language-based, self-conscious use of signs *as* signs that we humans routinely engage in when we are thinking about things, mathematically working out science problems, and reading, writing and speaking with one another (and with ourselves).

Instead, when seen from the biosemiotic perspective, such late-evolutionary phenomena (extraordinarily late, in fact, occupying a virtual fraction of a second on the evolutionary time scale) is just the latest, most species-specific manifestation of a system of embodied relations that literally has to be in place in order to enable any living organism – even the simplest of unicellulars – to successfully negotiate its external environment so as to maintain itself in existence. Such an understanding invokes no supernatural forces, mysterious yet-to-be-discovered principles, or extra-scientific thinking of any kind. Instead,

it simply examines the embodied relations that science already knows to be the case (e.g., the physical relations that take place as an amoeba follows a nutrient gradient, or as a paramecium detects its prey) and – instead of reflexively deeming such actions cognitively empty, understands them instead as cognitively primitive – that is, as precisely the kind of embodied agent-object-action relations upon which our whole later cognition is built, both evolutionarily and in real-time.

For the amoeba and the paramecium, as for ourselves, biosemiotically speaking, the primordial form of “knowing” is “knowing what to do right now” at this particular moment, in this particular situation, so as to not go out of existence. And for them, as for us, the trial-and-error subtraction process that is evolution has “built in” the majority of what such *bodies* must “know” how to do when faced with various external conditions. No brains or brain-based “minds” are needed to instantiate such primordial knowing – yet without these most fundamentally embodied agent-object-environment relations, the more laminated kinds of “knowing” that brains (in complex animals) and brain-based minds (in human social animals) are able to produce, would be impossible – again, both evolutionarily and in real-time. For such embodied relations constitute us as co-ordinated living systems in interaction with our environment still, and without them, we could hardly “think.”

Sign action or *semiosis* – seen in the expanded sense – “is built into nature,” writes Wheeler, “and we are the animals in whom it has most richly flourished, and who have moved from what we call nature to what we call culture - though they are differences only of gradation in the direction of complexity and conceptual abstraction” (153) This latter assertion is critical to Wheeler’s larger argument, and by way of introducing it, she provides an in-depth discussion of the notion of “tacit knowledge” as developed by chemist and philosopher of science Michael Polyani (1891-1976).

Knowing More Than We Can Tell

A scientist whose research included work in chemical kinetics, x-ray diffraction and solid mechanics, Michael Polyani’s reflections on the nature of his labor led him to pursue an inquiry into what he would call the “*processes* of tacit knowing [whereby] we can know more than we can tell” (61). Polyani’s own work in the laboratory made it clear to him that the aggregate of established facts alone cannot help the working scientist “intuit” that there may be a problem with the very formulation of those facts, nor what exactly that problem may be, nor even what may be the best methods for using in order to go about finding out what that problem is.

Instead, claimed Polyani, the scientist in his daily work – just like practiced, skilled professionals of every kind – finds himself as critically reliant on his hunches, intuitions, gut feelings and inarticulate understandings as he does on his profession’s given analytical tools of measurement, description and experiment. Moreover, because he is so “practiced” in his art, the scientist’s hunches and intuitions are *better* (more likely to be reliable) hunches and intuitions than would be those of a non-scientist, or of a novice scientist, in his situation ...and this is so despite the fact that the practiced scientist often cannot explain, even to himself, *why* he feels that *x* is a better choice than *y* in this particular occasion.

Even more tellingly, the author reminds us, we see examples of such “tacit knowledge” all around us every day – in the embodied skillfulness of laborers and professionals of every kind, in the unarticulated intuition of artists and of athletes, and in the interpersonal acuity of both the charismatic and the sociopath. And in fact, we can daily recognize the presence of such tacit knowledge also in ourselves – in our “gut feelings” and our first impressions, in the “sense” (or “vibe”) we get of other people and of situations but that we cannot yet articulate, and in the difficulty that we encounter when asked to teach another person something that we ourselves have learned to do so automatically that we now

find we can no longer describe its component segments verbally – even though our hands and fingers and the rest of our body involved in such practices recognize and coordinate these component segments to a precise and unerring degree.

Such “non-verbal understanding” tells us something very important, notes Wheeler, not only about ourselves, but about the world and our relations to it – for it reveals that “reality is an ordered ontological entity; it is what [Polyani] calls ‘rational.’ Were this not the case, no-one could become skilled (i.e., have internalised knowledge) of it. One cannot become skilled in true chaos, because in randomness there are no regularities or laws to internalize” (61). Thus, what the idea of tacit knowledge demonstrates, concludes Wheeler, “is the stratified and emergent nature of human knowledge” (47). And what Polyani refers to as “tacit knowledge” may be seen from the biosemiotic perspective as the practiced and internalized use of *sign relations*. Wheeler calls such pre-verbal forms of “knowing”:

creaturely skilful phenomenological knowledge ... semiosis which is not reducible to words, but which is embodied in acts [that are both born of and allow for] skilful engagement with the world and with other embodied creatures. These are not knowledges that can be easily accommodated in a propositional language, [but are embodied knowledges] semiotically conveyed and ‘read’ [in ways that] abstract, conceptual, knowledge cannot ever describe in all its fullness, [but] which turn out to be central to the human-knowledge understanding of complex totalities...it is a skillfulness, [for] *skilful being in complex totalities is what humans (and all creatures) have evolved to do*” (47, italics mine).

The Biosemiotic Origins of “Knowing”

Such inarticulable knowledge as Wheeler describes above is not generally acknowledged in the rhetorics of “reason” and “objective science” that characterize our late modernity. Science does not have much to say about it, for to understand what is really going on here, one must acknowledge that what is happening is that the body is reading, remembering, and acting upon *signs*. In other words, the “skillfulness in being” that Wheeler speaks of here is a *semiotic skillfulness*. Accordingly, she turns to the literature of biosemiotics to provide the most reasonable framework for seeing “the processes of tacit knowing” *not* as some kind of ghostly “extra-sensory phenomenon,” but instead as most *fundamentally* a “sensory” phenomenon – as the ability to detect elements of the surrounding environment and to couple such sensations to appropriately life-sustaining action is the *sine qua non* of living systems.

Indeed, long before human beings (and in particular, human culture) began encoding their experiences of the world in the symbolic terms of language-based thought (and the abstractions from reality that it alone makes possible), this kind of non-verbal, bodily associative “knowing” of iconic (sensory) and indexical (associative) relations is what organisms have been relying on for their survival ever since the first membraned creatures came into existence almost 4 billion years ago, and found themselves having to negotiate their own internal survival demands with the demands imposed upon them at each and every moment by an “external” world of alterity.

And it is precisely because of this organizational “split” between: (1) the set of ongoing physical transactions taking place ceaselessly in world outside of the organism, and (2) the very differently arranged sets of physical transactions taking place within its boundaries so as to hold the organism in place as the system that it is (rather than cohering back into the larger surround), that demands that the relations whereby the organism successfully negotiate *both* sets of transactions *simultaneously*, so as to ensure its own survival, must perforce be *sign relations*, in the most basic sense of the term.

Thus, biosemiotics asserts that the relations of an amoeba to its surround exhibit a kind of primitive “knowing,” it is *not* asserting that the amoeba possesses any kind of mentalistic concept of its surrounding nutrient gradient – for lacking brains, such creatures can have neither “mentation” nor “psychology.” Instead, we assert that the amoeba “knows” (i.e., recognizes x and acts upon it accordingly) only “perturbation x ” which, in its particular organizational configuration as an organism “stands for” a particular kind of change in the surrounding nutrient gradient (and not any of the thousands of other elements of the amoeba’s immediate physical surround, including toxins, predators and other amoeba). Such “standing for” (or *sign* relation) takes place *not* in the amoeba’s non-existent “mind” – but in the bodily hard-wiring that evolution has built and fine-tuned into it such that “perturbation x ” has come to operate reliably as an icon that triggers a particular associative behavior.

Of particular importance in understanding such substitution relations as *sign* relations is the fact that these couplings are not the result of brute physical necessity – there is no physical or chemical “law” demanding that the presence of a calcium ion “stand for” x or y to any given organism – rather, the “standing for” relation comes about, as all sign relations do, from the triadic inter-action between the organization of agents (wherein sign vehicles can *be* sign vehicles), the organization of the environment (wherein sign objects can *be* sign objects), and the specific action of the former upon the latter that brings the sign vehicle into relation with the sign object (what Peirce calls the *interpretant*).

The fact that natural selection – and not the individual organism itself – is most often the final arbiter of determining these sign relations in organisms, takes nothing away from their fundamentally *semiotic* character. And, indeed, in going down the evolutionary timeline, we see such primitive sign relations – which is to say, such sets of lived relations based on the formula: stimulus “ x ” will *stand for* phenomenon “ y ” to organism “ z ” – becoming evolutionarily codified into living creatures in an astonishing diversity of permutations, with animals exploiting a variety of naturally occurring regularities (many which yet remain invisible to us – e.g., ultraviolet light, low-barometric pressure differentials, electrical fields, low frequency soundwaves, polarized moonlight, etc) to “stand for” the presence of the food, home, prey, mates, predators, etc. around which the actions of their lives must be coordinated. Indeed, the evolution of “sensory capacities” *per se* would be pointless, were not the coordination of organismic action in the world with its sensory input from the world “knowing” in the most basic sense.

What is “known” thereby, though, is *not* the world in itself and in its entirety, but only those “signs of the world” that any given organism has been evolutionarily equipped to perceive. To a mosquito, “you” are primarily a patch of chemicals in the surrounding area – this is why if you block that mosquito’s cellular chemical receptors, “you” effectively disappear out of its reality – the principle behind mosquito repellent (which is thus misleadingly named). So, too, it is for all living systems, including us. For again, the slices of reality that human beings can experience falls into a very narrow and species-specific range: our experience of the visual world is limited to whatever falls within an extraordinarily narrow 400-700 nanometer range (out of an existing light spectrum that is trillions of times longer and shorter on each end). Likewise, our auditory capacities of 20 to 20K Hz leave us deaf to the extensive world of sound that surrounds us at this very instant, but that “exists immediately and by necessity” to the wasp, bat, canine, or elephant. Yet because the world which exceeds our senses is orderly, those sign relations that we can build with the pieces of it that we can capture (or represent) can be *veridical* sign relations. This is the basic insight of biosemiotics.

The evolution of organisms to negotiate the world by using its minutest parts as functional substitutes for wholes is, again, *sign* co-ordination at its most fundamental. And given evolution’s tendency to build effective processes by building them on top of previously

established effective processes, it is not surprising that increasingly complex networks of such sign processes would result in the accomplishment of intracellular signaling processes, nervous systems, and eventually, brains. And thus our human symbolic capacity, too – our ability to use signs (such as words and numbers) in the knowledge that they *are* signs so as to communicate with each other about non-present actualities, possibilities and impossibilities – is but one phase in the eons long evolutionary history of animal “knowing” – the latest and, as Terrence Deacon (1997) points out, in many ways, the most anomalous.

But only out of the evolutionary lineage that we share with all our animal ancestors could this ability to use signs in such a sophisticated way have its origin. Human culture may have been the medium in which the transition from reliance upon purely iconic and indexical modes of negotiating the world became augmented with a symbolic one – but those more primary modes are still in use in us, and constitute the vast reservoir of pre-articulate understandings, feelings, dispositions and embodied reasoning that eventually give rise to that small part of the “articulable consciousness” that we associate with “thought” and “mind.” We call the “unconscious” that part of our knowing that we do not express, even to ourselves, in words – few would deny, however, that that part of our organismic being is not a font and reservoir of knowledge.

Again, however, a mindset that sees *human reason* – the final, painstakingly built *product* of all these multiply embedded sign relations within and between a community of agents – as an “ontological primitive” in itself – i.e., as the *basis* of all cognition, and not merely one of cognition’s (or “knowing’s”) *least* common, if most humanly familiar, forms – this mindset will demand that animal cognition meet the requirements of human cognition *before* it can be deemed “cognition.” Yet from an evolutionary and biological standpoint, as Terrence Deacon reminds us, this “inversion of evolutionary logic [constitutes] an Orwellian rewriting of the evolutionary past in the terms of the present... no analytic method could be more perverse” (1997:52-53).

This is why throughout *The Whole Creature*, the author makes the point repeatedly that such a Cartesian fetishization of the mind “versus” the body – and of linguistically mediated symbolic knowing from experientially mediated iconic and indexical knowing – has made us all less whole creatures in many ways. Iconic and indexical relations are our symbolic capacities’ ineliminable support, along with being the interactive “glue” holding together the complex system of interactions that is our 100 trillion living-celled “self.” Such embodied, non-mental relations, Wheeler reminds us, enable “the mastery that indwells, which is intimate with and deeply knowledgeable about that which it knows. This is the indwelling of the conscious animal which cannot say all it knows but certainly knows what it knows” (47). The positing of human “reason” in some neo-Platonic nowhere space (or even only in the brain), then, collapses a massively multivariate relation into an evolutionary useless and biologically impossible monad.

Partaking in the Act of “Mind”

Having at this point elucidated all of her major premises, Wheeler is now in place to bring all the threads of her argument together. Drawing from my own attempts to understand and to articulate of such issues, I would say that the heart of Wheeler’s argument in *The Whole Creature: Complexity, Biosemiotics, and the Evolution of Culture* runs essentially like this:

The universe is a massively complex but ultimately orderly system, and its order has emerged from the stabilizing of interactions within the system. One small sub-set of such stabilized interaction is organism and one small category of organism is human being. Because it is a semi-self-enclosed system, organism must have congress with the larger set of interactions in which it is placed, while maintaining its own internal interactional integrity.

The ability to successfully negotiate these two sets of relations simultaneously is *skillfulness* in Wheeler's terms – this, quite rightly, I think, is the *active* description of what Darwinists characterize in by the passive designation “fittedness.”

Understanding that this *skillfulness* in using parts of the world as signs with which to negotiate the whole “is what humans (and all creatures) have evolved to do,” we can understand how something such as tacit knowledge – whereby “we can know more than we can tell” – is just a normal part of any kind of organismic embodiment, as that embodiment has been fine-tuned by evolution. Understanding this reveals that “telling” – i.e., a technology of communication employing the self-reflective symbol use that underlies human “reason” – is a late (and optional, in fact) cultural-evolutionary ornament, and that “knowing” is the primary functional relationship equipping all living systems.

This complexity-driven, biosemiotic understanding makes animal “fittedness” as well as “evolution” itself more understandable (see Kull 2000, Emmeche 1998, Schumann et al. 2006). But the additional point that Wheeler makes here is that skillfully reading the signs of the *social* environment – i.e., skillfully reading the *symbolic* relations of human culture and everyday interaction, in addition to the indexical relations of felt body associations and the iconic relations of immediate perceptual experience – is no less a critical, multi-modal, animal way of being in the world than is found throughout the rest of nature.

However, and as Wheeler is astute in pointing out, the fact that we have arranged our human niche under a symbolic, and not just an iconic and indexical rubric, means that *we* can “tell” *as well as* “know” – and this adds an additional level of complexity to our animal lives, in ways both good and bad. And while an account of our transition into this symbolic way of being is not covered extensively here – the author wisely advises the reader to Terrence Deacon's masterful *The Symbolic Species* (1997) instead – Wheeler does us all a great service by showing the ways in which the occlusion of such primary experiential “knowing” by the privileging of linguistic articulation as exhaustive of “cognition” has had dire consequences for science, for the humanities, and for everyday life.

For not only does such occlusion lead us to undervalue the role of the body in affecting cognition, it also leads us to undervalue the role of cognition in affecting the body. And here, I think, is where Wheeler really adds to the existing literature of biosemiotics something new – the perspective of a cultural critic to remind all its animal ethologists, molecular biologists and philosophers of mind that all the so-called “minutiae” of social interaction, daily life, and even pop culture is *also* “biosemiotic” through and through. We do not, like monads, occupy a place outside of the symbolic matrix, “reading” its signs from without and “sending” our own messages back in, as in a computer metaphor – rather, we skillfully, embodiedly, and ever-presently negotiate those signs from *within* that matrix of interaction on a moment-by-moment basis that is closer to an immediately responsive and immediately consequential game of tennis – or to any other embodied *skill* – than it is to a deliberative and ratiocentric game of chess (see also Favareau 2007a).

Accordingly. Wheeler had earlier made the point that “feelings” of social isolation, powerlessness and disregard may be directly implicated in the health problems manifesting in the individuals who report these feelings. In her concluding sections, she makes the case that human (or any other organismic) flourishing requires not only the successful “picking up on signals” from the world – but also, and just as importantly, *feedback* on the signals that we ourselves give out in return. For humans, this means the social interaction of speaking and being heard, as it is through these actions that the symbolic matrix that is our social niche has been set up to let us have impact upon the world. But when, repeatedly, we find that our words and our actions do not have such an impact – then that absence of a response, too, is taken as a *sign* (of our meaninglessness and disempowerment), whose debilitating effects can cascade through the body.

A stratified culture of hyper-individualism, writes Wheeler, encourages just this sort of disempowering isolationism. And the research cited in *The Whole Creature* suggests that modern human beings are increasingly less connected than in prior generations with friends, with community, with nature, and ultimately, claims the author – with themselves. Thus one of Wheeler’s central calls for action here is the empowerment of the individual through the emphasis on community and on *connectivity* – because, she argues, a truly complex-adaptive and biosemiotic look at human beings reveal us to be inextricably interconnected to the world and to each other, through and through. And this realization, in turn, she argues, has powerful implications for our ideas of self and of society, and of how we may most humanely set up the relations between the two:

“What we learn [from complexity theory and biosemiotics],” writes Wheeler, “is that human creatures simply cannot be properly understood as the isolated, rationally choosing, self-maximizers so beloved of liberal politics and liberal economy. We learn that ‘mind’ cannot be understood simply as mental events going on inside individual heads; it is rather, powerfully, and really, in our bodies, in the world, and in other people” (34). Because of this, the way that we organize our world of social relations will be critical to our species’ success – or to its failure.

We forget this at our own peril, writes the author, and are now faced with a moment in our historical development wherein we can either continue to tread the paths that we have taken since the outset of modernity: separating mind from body, sign from symbol, and society from individual in the explanatory stories we tell ourselves about ourselves – or we can attempt to take what new insights are emerging from the proto-disciplines of complexity science and biosemiotics – as partial and preliminary as those insights might yet now be – and try to put together once again what we never see split apart in nature: feeling and reason, knowing and doing, life and signs.

Commentary: A Biosemioticians’s View of *The Whole Creature*

“In naming the great process of change ‘the long revolution’ I am trying to learn to assent to it, an adequate assent of mind and spirit [requiring] new ways of thinking and feeling, [and] new conceptions of relationships, which we must try to explore” – Raymond Williams, as quoted in the epigraph to *The Whole Creature*

“Semiotics has itself thrived in a generative atmosphere of specialization and synthesis. Now, in an expanding intellectual universe, we converge with several other strains of scholarship. We not only acknowledge this convergence and complementarity, but actively welcome the emerging rapprochement, which we interpret as representing a radical shift in the scientific paradigm. This conceptual revolution transcends a dichotomous Cartesian, analytic view of the world, in the direction of a view embracing the whole, respecting complexity, and fostering synthesis” – *Anderson, Deely, Krampen, Ransdell, Sebeok and von Uexküll* (1984:7).

The second passage above appeared in the pages of this journal twenty-three years ago, and since that time, the development of the kind of “semiotic life sciences” that Thomas Sebeok argued for so passionately in the last 40 years of his life is beginning – if only just beginning – to become a reality. Driven largely (though not exclusively) by scholars from the life sciences and the humanities with whom Sebeok worked closely, the interdisciplinary research project that is “biosemiotics” today now has its own journal, society and annual international conference.

Now, with the publication of *The Whole Creature*, biosemiotics seems poised to extend its reach into even more interdisciplinary arenas – and so, as my interest in this book is primarily one of a biosemiotician – I want to return now to a consideration of a few of the questions that I had deferred discussing at the outset of this essay. Those questions are these: (1) Is biosemiotics a developed enough field of inquiry to warrant its “findings” being cited as support for a political argument, as is being done here? (2) Are the conclusions about individuals and societies that are drawn here from the biosemiotic literature the only ones – or even the most likely ones- that can be drawn from this literature? That is to say, is this a valuable book from a *biosemiotic* perspective? And (3) What does it portend for the field of biosemiotics in general that books such as *The Whole Creature* are beginning to appear? In the attempt to keep the discussion proportionate to the space available, the short versions of my answer to those questions follow.

Is Biosemiotics a Science, a Pseudo-Science, or a Proto-Science?

My answer to the first question would be that biosemiotics today is not a unified field of scientific inquiry in the sense that contemporary physics, chemistry, and biology are. It as yet has no uniformly agreed upon methodology, proof procedure, experimental protocol or even terminology common among those few dozen scholars who currently self-identify as “biosemioticians” (and again, I include myself among this group). Moreover, the majority of these scholars do not run laboratories or do field work in “biosemiotics” *per se* – though some do this kind of work in “regular” scientific disciplines, and some do not. Instead, what the vast majority of biosemioticians attempt to do is to read the data of *existing* experimental work in such fields as neurobiology, genetics, and animal ethology (to name a few) in a way that does not presuppose the eliminativist assumption that the mere description of the material interactions of a given biological phenomenon *per se* exhaust all that can scientifically be said, or known, about that phenomenon – but that the *relations* across such interactions must similarly be studied if one is ever to get a principled account of how a neuron firing (or even a million neurons firing) “stands for” the presence of food to an animal, or how an inert codon of DNA “stands for” a particular kind of beak or wing.

The point here is a easily neglected one, for one would naturally assume that this type of thing is exactly what neurobiologists and geneticists are already doing. Rather, for all the incredible and well-earned successes those disciplines accrue daily, neither of them – nor any other field in the natural sciences, including cognitive science and psychology – has any explanatory theory regarding just this “representative” aspect of the phenomena under their study. This is so because each of their individual fields of study *stops* at the very point at which the one sub-set of the system that they are examining (neuron, gene, etc.) “stops” – or at the most, their inquiry stops a few levels “up” or “down” stream (e.g., tissue, organ, brain or body).

The material science being done in these disciplines is spectacular – all biosemioticians agree with this, or they would not have drifted into biosemiotics in the first place (for biosemiotics itself wishes to be grounded in the mainstream Western science approaches of observation and experimentation, falsification, verification, blind peer review, etc). But *in addition to and not in contradiction with* the mechanically efficient aspect of these material interactions (A causes B, which causes C), many of these material interactions (e.g., hormone release, neuronal activation, DNA transcription) also *stand for* something other than themselves.

In that sense, there is a *representative aspect* to these material interactions, and understanding the logic of *how* (and not just *that*) “*x* can stand for *y* to system *z* at time *t*” is the bio-logic – or semiotic (logic of sign relations) – that biosemioticians are interested in pursuing. (The “to” and “at” relations in the above formulation are as difficult to approach

with the standard tools of mechanistic reductionism as the “stands for” relation, by the way – but their undeniable presence in the working of living systems rules out the viability of an eliminative approach, as these relations are rarely if ever “isomorphic” when found in the biological world).

So: when biosemioticians say that one must study “more than” just the self-contained material interactions of a phenomenon in order to get a good picture of the nature of, say, a gene or neuron, they are saying this *not* because they believe in any ghostly New Age “spiritual phenomena” taking place above and beyond the realm of scientific understanding (the majority of biosemioticians of my acquaintance would treat such an idea as absolute anathema --- and I know most of the self-identified biosemioticians!). Rather, they are saying that the right kind of interdisciplinary science – one that would *connect* the relations taking place genetically, intercellularly, neuronally, organismically *and* in the immediate surround – is not yet in place, and thus must be bought about, if progress in this area is to proceed.

For while the combined power of physics and chemistry may, at least in principle, someday offer a unified explanation connecting all of the material aspects of such relations, chemistry and physics – the science of inanimate matter – are unequipped to explain the biological relations of “standing for” and “as a sign of” to a living system. These are *semiotic* relations *in their essence* – and since we do see these relations happening between (and within) living systems, without exception – it behooves us to try to understand in what just such sign relations *qua* sign relations consist. This is the project of biosemiotics – it is as yet a proto-science, and it is currently using such preliminary conceptual tools as it can responsibly find (e.g., Peircean triadic logic, analog/digital code duality, Barbierian molecular artifact-making, etc.) in the attempt to even to carve out a vocabulary with which to talk scientifically about such ubiquitous biological relations as “signal” “message” “communication” “significance” “meaning” “representation” and “sign.”

And from the very accurate picture that *The Whole Creature* gives us regarding the history and prevailing *epistemes* of modernist science, it may be easy to imagine how well the project of biosemiotics is welcomed or understood within the arena of “mainstream” workaday science (for the unimaginative reader: not too much). For this resistance, too, has a history in the science-culture dynamic explored in *The Whole Creature*.

The work of Theoretical Biology has a long a honorable history in science – at some point, Haldane, von Baer, Watson and Crick, Darwin, and many, many more were engaged in what could be called “theoretical biology” (i.e., reading the available data to form hypotheses that could not *yet* be experimentally tested). Today, however, such an approach is generally not even taught to science students (non-experimental “theory” often falling into the same general Cartesian wastepaper basket as the humanities, as far as the hard sciences of Research and Development are concerned), and the term now refers almost exclusively to computer and mathematical modeling and other purely quantitative study, for the most part.

Biosemiotics, however, is a branch of Theoretical Biology in the older sense – which is why one can very reasonably ask whether or not the author of the manuscript under study is premature in assigning to a nascent project like biosemiotics the implied authority of phrases such as “biosemiotics shows...” and then arguing towards a “scientifically grounded” position on the basis of what is, at best, hypothetically posited, rather than scientifically “shown.” (One could pose much the same argument about the use of the not much more fully developed “complexity sciences” here as well – with much the same defense, as I hope to provide shortly.)

However: I have taken the time above to lay out my own best understanding of the state of the field of biosemiotics at this time not, as may be expected, to denigrate the author’s use of this conceptual framework in her arguments, but to applaud it. Indeed, that this book is a hugely worthwhile contribution to the dialogue on science, knowing and

sociality is not at all in question here – were it, I certainly would not have committed myself to the writing of this long review article, nor would I be recommending to the readers of *Semiotica* to purchase and to read this book, which I most enthusiastically do. But like the “new sciences” that it is writing about, one can only really benefit from its insights by approaching them as the conceptual works-in-progress that they are. The reason that I feel that this is so regards the doctrine of fallibility that is “built in” to the whole project of Theoretical Biology – and into the very project of Science itself.

I will expand on this point in more detail when I address the point I raise in Question Three. Right now, however, I want to address my Question Two, which is: “Are the conclusions about individuals and societies that are drawn here from the biosemiotic literature the only ones – or even the most likely ones – that can be drawn from this literature? That is to say, is this a valuable book from a *biosemiotic* perspective?” The phrasing of the first question itself, of course, makes all but obvious the answer that I am about to propose. But what about the second question? And how should these two questions relate?

The Politics of Complexity and Biosemiotics

As can be seen from what has been written above, Wheeler’s three main interconnected premises in *The Whole Creature* are that: (1) human individuals are most fully understood in the context of their social being and in their “being” within other systems of complex totality of which they are a part, and this we can most fully understand using insights from biosemiotic theory; (2) such totalities (including societies and bodies) can be both better understood than they have been previously, as well as non-deterministically “worked” using insights from dynamics systems theory; and finally, (3) for optimal human flourishing, such “working” should be, for the most part, directed toward increasing the sum total of “semiotic freedom” – which, the author notes, is not just the “essentialist” freedom of you or me or the group or the wilderness, but:

is distributed freedom ... in which we discover ourselves as being in place, not only in virtue of our social role, but in virtue of our being placed as *processes of being* in a processual web of *natural, social* and *cultural* life... This is a place in a natural and cultural web of relatedness in which individual flourishing cannot be understood solely in terms of economic flourishing, and abstracted from emotional flourishing; and the individual, thus placed, cannot be abstracted from the flourishing of the whole (156)

The culture of neo-liberal individualism, the author reminds us throughout, works against this kind of processual openness by reifying human beings into quasi-autonomous but locked-away-inside-ourselves “monads” – instead of letting us realize ourselves as the transiently existing, dynamically emergent, interdependently produced and sustained nodes of system activity that we really are. Moreover, claims the author, the way that we see ourselves, will affect the way that we will act: If it is “me” versus “the system” (e.g., of society, or of nature) then the hell with “the system” so long as “me” is taken care of. But if I recognize that I can not do violence to the system without simultaneously doing violence to myself – and that, in fact, the flourishing of the system is coextensive with the flourishing of myself, then my actions will be mindful, holistic, and carefully chosen. This is the “ethics of responsibility” that the author feels a biosemiotically informed complex systems perspective entails (156).

This vision – as crudely as I may have expressed it here – appeals to me on a personal level, and is, I believe, a responsible and sublime inference drawn from the literature of organismic interaction that biosemiotics studies. Most importantly, it fully grasps and attempts to incorporate into social theory the fundamental biosemiotic realization that, at the heart of the organization of world of living things, *relationship is primary to individuality*.

An understanding that, too, has been variously expressed in many religious traditions (particularly Taoism and Buddhism), it is also yet is a scientifically commonsense one: relations give rise to individual entities (of, ascendingly: particles, atoms, molecules, cells, organisms, ecosystems) – just as these entities then in turn make possible and engage in new sorts of relations unavailable to any of their constituent parts. Such thinking is the only possible way of making sense of science’s fundamental Big Bang theory – all the diversity that exists today is the *product* of interactions (which, from the cosmological standpoint, are relationships taking place within the system) that are made possible by prior interactions (and their consequent changing of system relationships) – no “outside” force puts the order of “entities” into this system: the order is both generated and generative from within.

What biosemiotics adds to this picture of “natural physical constructivism” is the observation that – in *living* systems – all of these recursively generative physical interactions up and down system levels *also* function as *sign* relations in the co-ordination of the system of the organism with its surround. It is for this reason that Wheeler writes: “the semiological (Saussurean) escape from nature, in which human meaning is believed to be restricted to articulate language alone, must give way to a wider semiotic (Peircian) understanding, in which embodied acts and deeds are more clearly understood as meaningful signs also” (157). The reason for this is that such signs “count” in the *world* – not just in our “minds” – they organize the percepts, and thus the actions of animals – and these actions have genuine, consequential, material effects. In the *biological* realm of nature, then, there is added to the ongoing physical Interactivism a “natural constructivism” of *semiosis*. (One can think of the “evolutionary arms race” of animals evolving perceptual apparatuses that allow them to better detect their prey – and the subsequent evolutionary development those very prey animals evolving the means to deceive such perceptual apparatuses, recursively – to give just one obvious example of such decentralized, emergent constructivism).

Thus, Wheeler is right to write that: “Complex systems involve multiple feedback loops (positive and amplifying, and negative and tending to stabilize) and emergent behavior. Although we live in an epoch in which the apparent discreteness of our bodies (and their hidden away bodily functions) encourages the fiction of monadic individualism, in fact our *sociality* [the *ways* in which we relate to one another and to ourselves as human beings] is systemic and relational” (99). And because of this: “In order to make effective interventions in complex biological systems-such as ecologies and human societies, we need to have a good theory, one that is consistent with complexity science’s general observations about the characteristics of complex systems, and describes the nature of agency (in humans conscious and unconscious) in all biological systems” (41).

The biosemiotic *ethos* that Wheeler calls for seems like a good candidate for a personal code of conduct and a philosophy about being that lets human beings see themselves on just about the right cosmological “scale” – i.e., not autonomous gods of solipsism whose inner worlds and wants constitute the “only” real ground of action, *nor* are they meaningless specks in a blind, uncaring flux of matter wherein the very sense of “free agency” is but a sad delusion and a pitiful joke. As an inescapable *part* of a system that precedes and will outlast us, *all* of our actions yet consequentially *change* that system irreversibly, in ways that we can never know for certain will be ultimately infinitesimal or major. Human beings and their actions *do* “count” then – and, happier still, biosemiotics reminds us that we are not the *only* things in the universe that “count.” Again, I can think of many worse philosophies than one that both dispels existential loneliness and gives human beings meaningful work to do. “Nothingness,” biosemiotician Jesper Hoffmeyer reminds us, “is the word we give to the sinking sense of meaninglessness that is our greatest dread” (1996:145).

That said, the actual details of how such an *ethos* can be effectively instantiated (to say nothing of how it will be “enforced”) by governments and other political organizations is

not so obvious to me, especially given the last century's horrifying attempts at social engineering. Wheeler recognizes this, and writes that: "an example of scientific socialism using abstract thought at the expense of experiential thought is the view that the death of millions of people is worthwhile if it achieves a truly socialist state of perfected equal relations. ... Such an idea is abstract and disembodied in the extreme. No-one should be deemed sacrificable on the basis of it: it is inhumane" (46).

A socialist society of any kind, however, demands a level of centralized management that, like most human institutions, soon exerts more influence downward on its constituents, than the constituents can exert back upwards in return. The historical recurrence of such extreme power asymmetries may lead one to reconsider how much "control" one wants to assign to the "management" levels of such societies to begin with. Still, Wheeler has faith that such traditional problems can, at least in theory, be overcome with by the adoption of a "complexity" approach. She writes:

At the core of left progressive thought lies the conviction that society is not composed of atomised individuals primarily pursuing their own economic self-interest, but, rather, that societies are to be understood as complex totalities. Along with that conviction goes the related one that *governments are, or should be, institutions for intervening in complex totalities in strategic ways* so as to ensure the health, creativity, adaptability, and generally fullest flourishing of all the parts (humans and their systems) of that totality. No government has ever succeeded very well in that task (even where that was its professed aim) because no-one [up until now] has ever formulated a sufficiently comprehensive understanding of how complex totalities actually work (41, italics mine).

Plato initiated the debate about "what governments should be" in antiquity, but that is not particularly a debate that I wish to take up here. Nor do I particularly disagree with the vision that Wheeler has outlined above – indeed, who could? Rather, I merely wish to point out here that the principles of natural organization articulated by both by biosemiotics, as well as by "complexity theory," seem to me to be as compatible (and just as incompatible, when it comes down to it) with a hands-off, free market "self-organizing" capitalism as they are with a state-administered, "top-down" socialism.

Indeed, if we take the human "individual" as the "governor" of the constituent trillion-celled body (feeding it, giving it shelter, etc), then one of the first things we find – as Wheeler herself as argued so persuasively throughout her book – is that the most practical "wisdom" often occurs when the "whole" steps back and lets the "parts" make the decisions. This is what is happening in the "embodied knowledge" that Wheeler talks about – yet it is also the *emergence principle of swarm intelligence* invoked by that "irreducible complex totality" that is Adam Smith's "invisible hand." So, too, it is a strong belief in the principles of *self-organization* and *distributed causality* that grounds the "spontaneous order" theories of Friedrich Hayek – a "complexity view" of individuals and societies if ever there was one! The point, of course, is that "complexity" and "biosemiotic" principles – like all other observed regularities in nature – may not easily translate into guides for human moral action.

This can be easily observed, I think, by a consideration of the fact that the principles of natural organization are often brutal in the ways that is almost inconceivable to us, even *after* the horrors of the 20th century. Programmed cell death, the hyper-hierarchical order of the insect hive, cannibalism of one's own newborns, never-ending warlike territoriality, parasitism, role definition rigidly assigned by sex and age, violently maintained tribal enmity – *all* of these "ensure the health and fullest flourishing" of the collective in nature...as, of course, do cooperation, altruism, and symbiosis. If it is our human attempt to achieve our survival *only* (or even primarily) by the means of the latter, and *not* by the means of the former, then this is something "new" in nature – and thus the template for what form of

human “government” would be best suited to bringing this strange new way of being in nature to fruition may have to be devised in *contravention* of some of nature’s principles, and not just in accordance with them (as, indeed, we do when we protect the weak and disabled). Sociobiology looked at the natural order and saw only the brutal and the deterministic. It would be a shame for a biosemiotically-informed sociology to look at nature and see only the beauty and the constructivist – for all four qualities are a part of the nature that is a part of us and of which we are a part.

I believe that the author is alive to both of the above objections, however, as she notes that:

A biosemiotic understanding might inform pre-political thought, though perhaps in ways which do not sit easily with the political affiliations of modernity. The wisdom which the unfolding of time (deep immersion in thought and practice in a field) allows is more commonly associated with a conservative frame of mind (a conservative politics and perhaps a politics of conservation) than with the radicalism of fundamentally ‘new’ or revolutionary ideas associated with liberalism and some forms of socialism. ...A new radicalism concerned with cultural innovation and evolution might need to be a mature one in which the importance of time and human process was properly understood and accommodated (156)

Indeed, a *truly* new re-thinking of social relations that would transcend the left-right divide and “reconceptualize foundations,” is precisely the kind of thing that Sebeok and his colleagues were calling for in their clarion call initiating the modern project of biosemiotics, where they envisioned:

“a semiotics which provides the human sciences with a context for reconceptualizing foundations and for moving along a path which, demonstrably, avoids crashing into the philosophical roadblock thrown up by forced choices between realism and idealism, as though this exclusive dichotomy were also exhaustive the possibilities for interpreting experience. Avoiding this particular roadblock is no mere empty claim, still less a maneuver or tactic. It is rather the rationale *enabling* semiotics to reintegrate the natural and human sciences” (1984:8, italics mine).

Recognizing that Wendy Wheeler’s book is, indeed, just such an attempt, allows me to answer both parts of my Question Two in the affirmative: Yes, the author’s application of biosemiotic principles to cultural theory is not the only way that such principals can be applied (though it is a very far-seeing and imaginative way), and yes – by all means, yes, this book is itself a *very* valuable contribution to the biosemiotic literature, for reasons that I am now prepared to expand upon in as I address my Question Three: What does it portend for the field of biosemiotics in general that books such as *The Whole Creature* are beginning to appear?

Falling into Perplexity...

“In an academic climate suffering from terminal paradigm burnout, optimism for any general or unified approach is bound to meet with scorn. Nonetheless, a convergence is underway, a maturing of numerous guilds of thought ...The synergy of symbiosis is already underway” – Anderson, Deely, Krampen, Ransdell, Sebeok, and von Uexküll (1984:7).

I have discussed earlier in this essay how “biosemiotics” is not yet so much a “science” of sign processes in life processes, as it is a conversation about what such a science might, and perhaps should, look like. This conversation has been going on for some time now among an extremely invested group of biologists and philosophers of many kinds, and only in the last few years has it even begun developing into something of with a more

institutionalized form (see Favareau 2007 for a more complete account). Indeed, the consensus of the last few international biosemiotics conferences, writes embryologist and biosemiotician Marcello Barbieri, “was the feeling that nothing had been settled yet, that everything was on the move, and that the exploration of the new continent of meaning had just begun” (2007:112).

Why then, as someone who wishes to see this germ of an idea take root and find its place in the ecology of the sciences, would I not advise authors such as Wendy Wheeler to wait until biosemiotics has developed at least up to the stage of a fully *matured* “proto-science” with its own settled terminology and an agreed-upon set of methods for establishing the truth or falsity of any given biosemiotic hypothesis, before writing a book like *The Whole Creature? My answer, based on my last seven years immersion in this field, is this:*

Whatever it may or may not accomplish in the future, the great contribution that the project that today is going under the name of “biosemiotics” has to make to science *today* may lie precisely in its role as mainstream science’s Socratic gadfly. For on the very issues that mainstream science would like to ignore, or indefinitely defray, biosemioticians will continue to demand acknowledgement. Subjective beings are genuine natural phenomena – their “subjectivity” is an aspect of their existence that has to be accounted for. Likewise, if “consciousness is an illusion” – then the nature of the “illusion” *pe se* has to be explained. Instead, the dictum “consciousness is an illusion” is used to end – rather than to begin – scientific inquiry (e.g., Dennett 1992, Churchland 1984).

Biosemiotics, moreover, continues to point out that much of mainstream science is given to playing fast and loose with semiotic terminology. A “code,” for example, is something understood as standing for something other than itself. But how could this be, when all of our best physics tells us that things are, materially, only themselves always and not other than themselves ever? So, too, with the ubiquitous biological terms “signal” “messenger” “communicates” and “informs” – what can such terms possibly *mean* when applied to cells and tissues and organs and brains? If they are “metaphors” for human communicative acts, then what is the other term of the metaphor? If it is something purely physical (e.g., the change in *p* under conditions *q*) – then what does using a communicative “metaphor” *add* to our understanding of the phenomenon? In short, biosemioticians would ask: what *relations* are such metaphors being used to express?

Seen in this way, the interdiscipline of “biosemiotics” now, whatever else it may be, is *already* a “political” endeavor in the sense that the *polis* that it is trying to affect is the scientific establishment. And as Jesper Hoffmeyer writes in the blurb he provides to this book, Wendy Wheeler has been one of the few from outside the biosemiotic community to see this. But this is just one of many reasons for biosemioticians to greet the appearance of this book with gladness. For if the life sciences and the sign sciences are truly co-extensive, as Thomas Sebeok repeatedly claimed they are, than we should not be surprised to see the effervescence of semiotic inquiry issuing from many, many quarters – and not just from biology or from semiotics *per se*.

Noting that “people working in the same field very often come up with similar arguments or solutions at around the same time,” writes Wheeler, “from this we may surmise that any problem which presents itself as such to a large number of people is a *real* problem – and where a field of inquiry is held in common, real problems (and solutions) are, too” (65). The central question that neuroscientists and animal behaviorists, molecular biologists and embryologists, face and that bring them ultimately to biosemiotics, are the same ones that sociologists and anthropologists, psychologists and literary theorists face: How is it that this [*x*] has come to *mean* something in this instance? A non-circular answer, and one that would let us better understand what *we* mean when we are talking about “meaning,” is at the basis of the project that is biosemiotics. Semiosis - the sign use that

alone allows meaning – is ubiquitous in the world of living organisms, and thus the project of biosemiotics is by its nature interdisciplinary, as its area of inquiry is that which stretches across and makes possible all inquiry *per se*. Wendy Wheeler seems to have grasped this, which is why *The Whole Creature* is, indeed, a revolutionary “political” manifesto in more ways than one. In the next and concluding section, I hope to show exactly why I believe this to be so.

...Desiring to “Know”

In the *Meno* (iv), Plato’s discussion regarding the visceral spur of acknowledging one’s own ignorance serves as a perfect illustration for the position that biosemiotics is trying bring the contemporary biological sciences to, in order that true scientific inquiry into the nature of sign relations *qua* sign relations may begin:

S: Do you see, Meno, what advances he has made? He did not know at first, and he does not know now, but then he thought that he knew, and answered confidently as if he knew, and had no difficulty; now he has a difficulty, and neither knows nor fancies that he knows.

M: This is true, Socrates.

S: Is he not better off in knowing his ignorance?

M: I think that he is.

S: So if we have made him doubt, and given him the ‘torpedo’s touch,’ have we done him any harm?

M: I think not.

S: We have certainly, as would seem, assisted him in some degree to the discovery of the truth; and now he will wish to remedy his ignorance. But do you suppose that he would ever have enquired into or learned what he fancied that he knew, though he was really ignorant of it, until he had fallen into perplexity under the idea that he did not know, and had desired to know?

M: I think not, Socrates.

S: Then he is the better for the torpedo’s touch?

M: He is.

In a precisely similar fashion, Wendy Wheeler’s work from her side of the science-humanities chasm is as a political challenge to the humanities and the social sciences, as biosemiotics is to the life sciences. This, for all the other many admirable qualities of *The Whole Creature* – and there are many – is, in my opinion, its greatest strength. For this book provides a profoundly important service in demonstrating to the scholars in the humanities that it is “safe” again to trust in science – and that they, too, can be a part of that science as it is currently in the process of transfiguring itself, in the forms of dynamic systems theory and biosemiotics. This is good news not just for the humanities, I want to argue – but for *science*.

For far too often, “interdisciplinary” projects joining science and the humanities – we can point to contemporary cognitive neuroscience as a textbook example – consists in the scholars in the humanities providing some “data” about an observed human behavior to their scientist colleague – which the scientist then operationalizes into his or her discipline’s own format and thereby “explains.” This can be very informative, as far as it goes, but it is hardly *inter-disciplinary* in the fullest sense – for its arrow of explanation only points one way (usually from the experiential to the material), where it usually comes to rest. A humanistic understanding of a phenomenon, then, may be explanatorily transformed by its encounter with science – as, indeed, it should, if the encounter is to be worth anything. But science never seems to feel the need to be similarly transformed by its encounter with the humanities.

Yet there are insights from the humanities and the social sciences that can deeply help inform biological science – insights that our current science into organismic interaction and organization sorely lacks – even as its investigators themselves can see such phenomena taking place in the objects of their study every day. Contextual relevance, co-construction, *verstehen*, a sociology of knowledge, normative contingency, distributed cognition, *lebenswelt*, internalized order and the accountability of the relevant next, all immediately come to mind as well-developed concepts from the humanities that can have rich application in the study of organismic interaction – once it is realized that the creation and use of sign relations is not, and never was, the exclusive province of the human being.

Accordingly, when Wheeler refers to the exploration of “the fundamentally social nature of human existence” she is aiming at an understanding of something far more fundamental than is being attempted in the fields of either contemporary sociology or evolutionary biology. Rather, Wheeler, with biosemiotics, is attempting to dig down to the fundamentally interactive nature of all living systems. And since human beings are included in, but do not exhaust or define, that category of systems, such work only *can* be done, I believe, by integrating what is most demonstrably true and valuable across *both* science and the humanities.

And so, I want to conclude this review with the evaluation that the author of *The Whole Creature* is doing a brave and very much needed job in attempting to develop an overarching framework that can take both the humanists’ *and* the hard scientists’ studies seriously – and in fashioning an reasoned and original synthesis between the two. With Wheeler, I believe that the humanities can no longer ignore biology, nor complexity principles, in favor of such reified Platonisms as the Ego, the Individual, Society and the State. No can biology nor any true science of living being ignore subjectivity, agency, decision or semiosis. The time for such willful ignorance on the parts of both sides has long since passed. A similar realization seems to be Wheeler’s goal and spur in writing *The Whole Creature* – and welcome it is at this time when, to too many discouraged or unimaginative workers in these disciplines, choosing a side in the fruitless “science wars” or the moribund nature/nurture debate has been presented as the only available option.

Deliberately positioning herself at the *interface* between two huge fields of inquiry – and trying to be as responsibly informed as is as reasonably possible for any single person to be – Wendy Wheeler has produced a book that may be a harbinger and, in genuine dynamic systems fashion, play a causal role in future developments within the humanities and social sciences by setting the “initial conditions” whereby biosemiotics may be viewed therein. And what is best here is that Wheeler, like Hoffmeyer, is showing us all that *the way out of* the still too far intransigent “science *versus* the humanities” divide – is simply to refuse the terms of the debate! For like Hoffmeyer’s famous “cartographer whose map becomes so detailed that the mapmaker and the map that he is making are swept up into it” (1996:40), with the writing of *The Whole Creature*, Wendy Wheeler has set out to write a book *about* ongoing biosemiotic theorizing that winds up itself becoming *part of* ongoing biosemiotic theorizing.

This kind of interdisciplinary endosymbiosis may be just what all we inheritors of the Cartesian sundering need, if we are ever going to be able to explanatorily join subjects and objects back into their natural complementarily, understand how “mindedness” is in fact a part of “bodiedness” for living beings, and develop both a scientifically defensible metric – as well, just as Wendy Wheeler argues here, as a skillfully intuitive “feel” – for altering the conditions of our shared social life in a way that will restore human “flourishing” to the greatest extent that we can. “Explanation” of the natural world by one of its natural products demands no less, wrote Aristotle, when he noted that:

A physicist would define an affection of soul differently from a dialectician ...the former assigns the material conditions, the latter the form or formulable

essence ... Thus the essence of a house is assigned in such a formula as ‘a shelter against destruction by wind, rain, and heat;’ while the physicist would describe it as ‘stones, bricks, and timbers;’ Which, then, among these is entitled to be regarded as the genuine physicist? The one who confines himself to the material, or the one who restricts himself to the formulable essence alone? *Is it not rather the one who combines both in a single formula?* (*De Anima: i*).

Wendy Wheeler does not claim to have accomplished this great task, and neither does biosemiotics. But to realize that this *is* the task – and not to postpone it indefinitely with promissory notes or to proceed along our prior paths in denial, hoping that the questions of human meaning and animal knowing will resolve themselves on their own, if only we let them be – *that is* the “torpedo’s touch” that biosemiotics – and Wendy Wheeler’s *The Whole Creature* – offer to science and to the humanities, conjointly.

REFERENCES

- Anderson, Myrdene; Deely, John; Krampen, Martin; Ransdell, Joseph; Sebeok, Thomas A. and Thure von Uexküll (1984). "A semiotic perspective on the sciences: Steps toward a new paradigm", *Semiotica* 52-1/2, 7-47.
- Aristotle. *De Anima*. (330 BC /1941) Translator: J.A. Smith. In McKeon, Richard. *The Basic Works of Aristotle*. New York, Basic Books, pp. 533-603.
- Barbieri, Marcello. (2007). “Has Biosemiotics Come of Age?” in *Introduction to Biosemiotics: The New Biological Synthesis*, Marcello Barbieri, ed. Berlin: Springer. (pp.101-114).
- Bateson, Gregory (1951/2000). “Why Do Frenchmen?” In: *Steps to an Ecology of Mind; Collected Essays in Anthropology, Psychiatry, Evolution, and Epistemology*. Chicago: University of Chicago Press. (pp.9-13).
- Berman, Marshall. (1980). *All That Is Solid Melts into Air: The Experience of Modernity*. New York: Penguin Books.
- Churchland, Paul. (1984) “Eliminative Materialism” in *Matter and Consciousness*. Cambridge, Mass: MIT Press. pp. 43-49.
- Deacon, Terrence. W. (1997). *The Symbolic Species : The Co-Evolution Of Language And The Brain*. New York: W.W. Norton.
- Deely, John. (1999). Postmodernism and the perfusion of signs. In E. Taborsky (Ed.), *Semiosis Evolution Energy: Towards a Reconceptualization of the Sign*. Aachen: Shaker Verlag. (pp. 7-13).
- Deely, John. (2001). *Four Ages Of Understanding : The First Postmodern Survey Of Philosophy From Ancient Times To The Turn Of The Twenty-First Century*. Toronto: University of Toronto Press.
- Dennett, Daniel. (1992). *Consciousness Explained*. Boston: Back Bay Books.
- Emmeche, Claus. (1998). “Defining life as a semiotic phenomenon.” *Cybernetics & Human Knowing*, 5(1), 3-17.
- Favareau, Donald. (2007). “The Evolutionary History of Biosemiotics” in *Introduction to Biosemiotics: The New Biological Synthesis*, Marcello Barbieri, ed. Berlin: Springer., (pp. 1-68).
- Favareau, Donald. (2007a) “Collapsing the Wave Function of Meaning: The Epistemological Matrix of Talk-in-Interaction” In: *Gregory Bateson as a Precursor to Biosemiotics*. Jesper Hoffmeyer, ed. Berlin: Springer. (in press).
- Hoffmeyer, Jesper. (1996). *Signs Of Meaning In The Universe*. Bloomington: Indiana University Press.
- Holland, John H. (1995) *Hidden Order: How Adaptation Builds Complexity*. Boston: Addison Wesley Publishing.

- Kauffman, S. A. (1995). *At Home in the Universe: The Search for Laws of Self-Organization and Complexity*. New York: Oxford University Press.
- Kuhn, Thomas. (1962). *The Structure Of Scientific Revolutions*. [Chicago]: University of Chicago Press.
- Kull, Kalevi. (2000). "Organisms can be proud to have been their own designers." *Cybernetics & Human Knowing*, 7(1), 45-55.
- Latour, Bruno. (1993). *We Have Never Been Modern*. Cambridge, Mass.: Harvard University Press.
- Latour, Bruno. (1999). *Pandora's Hope: Essays on the Reality of Science Studies*. Harvard University Press. Cambridge. Mass.
- Lovelock, James and Margulis, Lynn. (1974), "Atmospheric homeostasis by and for the biosphere: The Gaia hypothesis" *Tellus: A Bimonthly Journal of Geophysics, Swedish Geophysical Society*, v. 26, n. 1, 2-10.
- MacIntyre, Alisdair/ (1980). Epistemological crises, dramatic narrative, and the philosophy of science. In G. Gutting (Ed.), *Paradigms and Revolutions: Appraisals and Applications of Thomas Kuhn's Philosophy of Science*. (pp. 54-74). Notre Dame: University of Notre Dame.
- Marx, Karl and Engels, Friedrich. (1848/1964). *The Communist Manifesto*. New York: Simon & Schuster.
- Maturana, Humberto & Varela, Francisco (1973/1980). "Autopoiesis and Cognition: the Realization of the Living." Robert S. Cohen and Marx W. Wartofsky (Eds.), *Boston Studies in the Philosophy of Science* 42. Dordrecht: D. Reidel Publishing.
- Plato. *Meno*. (380 BC /1957). Trans: Benjamin Jowett. New York: Library of Liberal Arts Publishers.
- Prigogine, Ilya, & Stengers, Isabelle. (1984). *Order Out Of Chaos : Man's New Dialogue With Nature*. Toronto ; New York, N.Y.: Bantam Books
- Schumann, John; Favareau, Donald; Goodwin, Charles; Lee, Namhee; Mikesell, Lisa; Tao, Hongyin; Veronique, Daniel and Wray, Allison. (2006). "Language evolution: What evolved?" *Marges Linguistique* 11, pp. 167-199.
- Snow, C. P. (1964). *The Two Cultures and the Scientific Revolution*. New York: New American Library.
- Wheeler, Wendy. (2006). *The Whole Creature: Complexity, Biosemiotics and the Evolution of Culture*. London: Lawrence & Wishart.
- Wolfram, Stephen. (2002) *Cellular Automata and Complexity*. Champaign, Illinois: Perseus Press.

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ⁱ Such systems approaches are referred to throughout this work by the shorthand designation "complexity science." The term is a bit misleading in that it groups under one umbrella several rather disparate projects in robotics, economics, meteorology and systems management (along with several other diverse areas of inquiry) and tends to give the impression of a unified "field" or "discipline" far more stable, reliable and advanced than the actual results of these projects might reasonably warrant.

Still, the term "complexity science" should be familiar enough to most readers by now. In a broad sense, it refers to those descendants of Betafflany's "general systems theory" of the 1940s, starting with Gregory Bateson's application of Norbert Weiner's "cybernetics" of

feedback systems in the 1950s and continuing through to the physics of “self-organizing chaos” pioneered by Ilya Prigogine (1984), the “emergent order” of computer scientist John Henry Holland (1995) and biological modeler Stuart Kauffman (2000), the “cellular automata” of mathematician Stephen Wolfram (2002) and, in biology, the “autopoietic theory” of Humberto Maturana and Francisco J. Varela (1973) and the “Gaia hypothesis” of James Lovelock and Lynn Margulis (1974). The massively interdisciplinary Santa Fe Institute (<http://www.santafe.edu/>) is perhaps the center of gravity for such research.