THE END OF THE I?

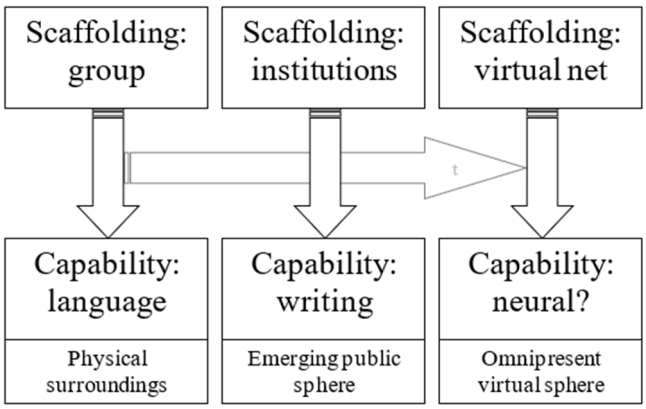
A BIOSEMIOTIC APPROACH TO SUPER-CONNECTIVITY

Jan-Boje Frauen

ABSTRACT: This paper analyses human connectivity as a process of semiotic emergence guided by semiotic scaffolding. In its first part, it is discussed that emergence comes at a cost: the internal Umwelten and external environments of individual agents must be tightly scaffolded by the super-structure to emerge a higher order of semiotic freedom. The second part examines how the emerging scaffolding has its roots in the individuals' agency but is joined by downward causation through institutions historically. It is argued that the Internet has the potential to structurally increase institutional scaffolding manifold. In an environment augmented by the virtual and in Umwelten shaped by it, entropic behavior of individual agents becomes subjectively inconceivable and objectively impossible. In the third part, it is argued that through the emerging intersubjective Umwelt, a new "interface" develops for the individual to connect to the outside. Internally, this "interface" scaffolds the individual for the super-structure. Externally, it can be seen as a "meta-membrane" for an emerging super-agent. Its semiotic freedom and subjectivity go beyond what an individual human being can experience. In return, the tightly-scaffolded Umwelt and environment of individuals in this condition might lead to a transition in the workings of individual consciousness. In super-connectivity, the temporal "person" might become a tool that is no longer needed in intersubjective interaction. However, this would neither entail a loss of conscious experience nor of subjective uniqueness.

KEYWORDS: Evolution; Information; Individual; Semiotic Scaffolding; Complexity; Consciousness

Graphical abstract



> We are not just complex material aggregates, but also subjects. Every person is genuinely an 'I' phenomenon, whereas complexity in principle can be exhaustively described as an 'it' phenomenon.
>
> Jesper Hoffmeyer in "The Semiotic Body" (p. 186)

INTRODUCTION: I WITHOUT END?

In 2015, Jesper Hoffmeyer wrote on the role of semiotic scaffolding in the evolution of semiotic freedom: "The real difficulty for evolution, then, was not to develop viable multicellular forms of life. The problem was to find […] a semiotic scaffolding mechanism that could make sure that some cell lines undertook (or perhaps more properly, could be fooled into undertaking) somatic duties on behalf of the common well, even though they themselves would thereby die as individual existents."[1] That Hoffmeyer was not merely talking about the emergence of multicellularity becomes obvious not only through his possibly intended pun on "commonwealth" (political state). Furthermore, he moves on to the discussion of "superorganisms" immediately (163-64).[2] Hoffmeyer was explicitly outspoken on many occasions about the emergence of eukaryotes,[3] multicellular organisms, and superorganisms according to the same biosemiotic principles. Eukaryotes evolved from the combination of prokaryotic cells, multicellularity from the combination of eukaryotic cells,[4] and superorganisms

[1] Jesper Hoffmeyer, 'Semiotic Scaffolding of Multicellularity', *Biosemiotics*, 8/2 (2015), 159–71, 163.

[2] "That society and superorganism are constructed similarly, like swarms, or symbiotic systems" has been noted many times, for instance in Kalevi Kull, 'Beyond Word: On the Semiotic Mechanisms', *Biosemiotics*, 7/3 (2014), 465–70, 468. However, there are many questions attached to this observation: can society turn into a superorganism, or is it already to be seen as such, and if so, can a superorganism evolve further into an agent proper, or is it already to be regarded as a "diffused agent" or "swarm agent" etc.?

[3] Stacey E. Ake sees the emergence of consciousness in the dichotomy between inside and outside that eukaryotic membranes create by shielding genetic material: "Somewhere along the evolutionary pathway, it became important (or was selectively advantageous) to shield the genetic material so that information could be passed on to the next generation in a relatively unscathed form. Could this change have been the start of some kind of 'consciousness'–or, at least, awareness?" See Stacey E. Ake, 'Consciousness', in Donald Favareau, Paul Cobley, and Kalevi Kull (eds.), *A More Developed Sign. Interpreting the Work of Jesper Hoffmeyer* (Tartu semiotics library, 10, Tartu: Tartu Ülikooli Kirjastus, 2012), 75–9, 76.

[4] This is of course an oversimplification. Multicellular organisms depend on a variety of cells. For instance, there are more prokaryotic cells in the human body than there are eukaryotes (in numbers, not mass). These prokaryotic cells, as well as fungi etc., are vital to the functioning of the body: "The appearance of

from the combination of multicellular organisms. Despite the superficial differences,[5] the way to combined states, in all cases, is semiotic scaffolding.[6]

Thus, it seems surprising that concepts of a combined human super-agent–imagined as a superorganism or otherwise–seldom took biosemiotics into account. This is due to several reasons. First, biosemiotics as a new and "radical challenge to mainstream thinking" might be a distinct, self-aware discipline only since the beginning of the 1990s or even the beginning of the new millennium.[7,8]

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multicellularity not only opened the way for a differentiation of cells and tissues allowing for a division of labor inside the organism, it also opened the way for different species to co-inhabit the same body. Thus, only 10% of the cells in the human body are genuine human cells […] more than 500 species of bacteria co-inhabit the human body." See Hoffmeyer, 'Semiotic Scaffolding of Multicellularity' (above, n. 1), 169. These other parts are not 'just there' or fulfill merely lower regulative functions. Instead, as Gerald Ostdiek put it: "Many particular thoughts result less from anything 'human' than from gut bacteria." See Gerald Ostdiek, 'Me, Myself, and Semiotic Function: Finding the "I" in Biology', *Biosemiotics*, 9/3 (2016), 435–50, 438.

[5] This does not mean that these differences are not real, of course. Especially, it must be noted that eukaryotes are single cells and can thus hardly be called 'compounded' in a literal way, while multicellular organisms (plants, fungi, animals) retain their manifold nature in different ways within a confined physical border. Super-organisms and swarm agents are even missing this distinct border to different degrees. See J. Scott Turner, 'Semiotics of a Superorganism', *Biosemiotics*, 9/1 (2016), 85–102.
According to Hoffmeyer, the first of these transitions, which is characterized by the highest level of integration, was the most unlikely to happen: "it took evolution 2 billion years or more to invent the eukaryotic cell, which indicates how difficult or even unlikely this step actually was." See Jesper Hoffmeyer, 'Introduction: Semiotic Scaffolding', *Biosemiotics*, 8/2 (2015), 153–8, 155.

[6] Scaffolding, broadly speaking, is the structure of experience: "the network of semiotic interactions connecting an organism with its Umwelt, facilitating its processes of perception and action." See Paul Cobley and Frederik Stjernfelt, 'Scaffolding Development and the Human Condition', *Biosemiotics*, 8/2 (2015), 291–304, 292. Importantly, higher-order emergence does not substitute lower-level life, but integrates it: "Quite on the contrary, [higher-level signs] constitute a higher, sophisticated class of signs, made possible only by the integration of simple lower-level signs." See Jesper Hoffmeyer and Frederik Stjernfelt, 'The Great Chain of Semiosis. Investigating the Steps in the Evolution of Semiotic Competence', *Biosemiotics*, 9/1 (2016), 7–29, 10.

[7] Arran Gare, 'Biosemiotics and Causation. Defending Biosemiotics through Rosen's Theoretical Biology or Integrating Biosemiotics and Anticipatory Systems Theory', *Cosmos and History: The Journal of Natural and Social Philosophy*, 15/1 (2019), 31–62, 33.

[8] Of course, new disciplines emerge gradually, and it is thus slightly arbitrary to name a specific time or even year. Gare mentions the annual "gatherings" conferences starting in 2001 but likewise Thomas Sebeok's earlier "call for a fusion of biology and semiotics" (32). Hoffmeyer's earlier term "semiotics of nature" was used by him (in Danish) as early as 1986. See Kalevi Kull and Ekaterina Velmezova, 'Jesper Hoffmeyer: Biosemiotics Is a Discovery', *Biosemiotics*, 12/3 (2019), 373–9, 373. If one wants to pin the emergence of biosemiotics as a discipline down to a specific point of time, the early 1990s furthermore have a case through Hoffmeyer and Emmeche's essay "Code Duality and the Semiotics of Nature" from 1991 and the first publication of Hoffmeyer's *Signs of Meaning in the Universe* in 1993 (in Danish). See Jesper

The notion of an emerging kind of collective human being, on the other hand, is probably as old as the theory of evolution itself. It is occasionally mentioned by biosemioticians that early 20th century versions like "McLuhan's notion of media as 'extensions' of psychic or physical features" seem "congruent" with Hoffmeyer's scaffolding.[9] However, writing in the 1950s and 60s, McLuhan could not have employed the biosemiotic framework yet. Instead, he wrestled with the legacy of paleontologist and philosopher priest Pierre Teilhard de Chardin: "This externalization of our senses creates what de Chardin calls the 'noosphere' or a technological brain for the world."[10] Teilhard de Chardin's 1939-treatise[11] *The Phenomenon of Man*, in turn, was rediscovered once more by the cybernetician Valentin Turchin in his 1979-book *The Phenomenon of Science*, as indicated by the similarity of the title.[12,13] This is noteworthy, as it has been argued that "biosemiotics itself, taking its impetus from semiotics, is a continuous, though uneven, development of modern cybernetics."[14] Furthermore, there are ongoing attempts to "bridge the gap between biosemiotics and cybernetics."[15] However,

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Hoffmeyer and Claus Emmeche, 'Code-duality and the Semiotics of Nature', in Myrdene Anderson and Floyd Merrell (eds.), *On Semiotic Modeling* (Berlin: Mouton de Gruyter, 1991), 117–66.

[9] Cobley and Stjernfelt, 'Scaffolding Development and the Human Condition' (above, n. 6), 301.

[10] Marshall McLuhan, *The Gutenberg Galaxy: The Making of Typographic Man* (Reprinted., Toronto: Univ. of Toronto Pr, 2002), 32.

[11] The book was written in the 30s building up on an essay from 1930 and completed by the end of the 1930s. However, it did not get published until 1955 (posthumously) because the Catholic Church did not (and arguably still does not) share Teilhard's multidisciplinary approach to understanding being in the world. See Pierre Teilhard de Chardin, *The Phenomenon of Man* (1st Harper Perennial Modern Thought ed., New York: Harper Perennial Modern Thought, 2008).

[12] Valentin F. Turchin, *The Phenomenon of Science* (New York: Columbia Univ. Press, 1977).

[13] Another pun on Teilhard, Hans Jonas' *The Phenomenon of Life* from 1966, was mentioned by Hoffmeyer as one of his "intellectual roots." See Kull and Velmezova, 'Jesper Hoffmeyer: Biosemiotics Is a Discovery' (above, n. 8), 378. Jonas's writing of the book (a collection of essays) was heavily influenced by his former mentor Heidegger. Heidegger took (a neo-Kantian interpretation of) Aristotle's idea that human beings do not perceive objects as they are, but 'as something' according to their usefulness related to their causal qualities as the steppingstone into his famous inquiry into the nature of *Being and Time*. It seems that Heidegger's view of perception has strong parallels to the biosemiotic view that information is an evolutionarily grown subjectivity manifested in an organism's Umwelt. See Hans Jonas, *The Phenomenon of Life: Toward a Philosophical Biology* (Northwestern University studies in phenomenology and existential philosophy, Evanston: Northwestern University Press, 2001).

[14] Sara Cannizzaro, 'Where Did Information Go? Reflections on the Logical Status of Information in a Cybernetic and Semiotic Perspective', *Biosemiotics*, 6/1 (2013), 105–23, 121.

[15] Alexei A. Sharov, 'Functional Information: Towards Synthesis of Biosemiotics and Cybernetics', *Entropy*, 12/5 (2010), 1050–70, 1051.

for many there yet remains the difference that "cybernetics has much stronger links with technology than with biology" (1051).

This distinction may be another reason why some of the contemporary heirs of Turchin refrain from applying biosemiotics to what is often imagined as a "Technological Singularity" and sometimes envisioned to recreate a utopian "Eden" for humanity.[16] In their scenarios, the individual human episteme remains fundamentally the same (albeit happier and enhanced). This may be because within the more mechanic framework of cybernetics information is regarded as an objective, "physical property."[17] Thus, there is neither incentive nor need to consider subjectivity or how it may change.[18] Biosemiotics, on the other hand,

[16] Francis Heylighen, 'Return to Eden. Promises and Perils on the Road to Global Superintelligence', in Ben Goertzel and Ted George Goertzel (eds.), *The End of the Beginning. Life, Society and Economy on the Brink of the Singularity* (First edition, Los Angeles, California: Humanity+ Press, 2015), 243–307.

[17] Hoffmeyer's "critiques of scientific reductionism in all its forms, from genetic determinism, to sociobiology, to the reified concept of 'information'" should not be understood as a general opposition of biosemiotics to the notion of information. See Claus Emmeche, Donald Favareau, and Kalevi Kull, 'Jesper Hoffmeyer 1942–2019', *Biosemiotics*, 12/3 (2019), 365–72, 366. To cite Arran Gare: "Hoffmeyer did not reject the notion of information entirely. He accepted Gregory Bateson's characterization of information as 'a difference that makes a difference.' This implies that there is no information outside living beings interacting with their environments." See Arran Gare, 'Semiosis and Information: Meeting the Challenge of Information Science to Post-Reductionist Biosemiotics', *Biosemiotics*, 13/3 (2020), 327–46, 328. This subjective aspect of information is displayed in what Alexei Sharov terms "functional information" in Sharov, 'Functional Information: Towards Synthesis of Biosemiotics and Cybernetics' (above, n. 15). To my mind, this should not be seen as a modification of the objective concept of information, but rather as a re-interpretation of what 'information' must entail to be information at all (i.e. to enter an agent's Umwelt in the first place).

[18] As Cannizzaro points out, it is not strictly speaking true that subjectivity is ignored in second order cybernetics: "However as one approaches the 1970s, the period in which second order cybernetics starts to establish itself, it is striking how the concept of information takes a less formal, nearly subjective turn." See Cannizzaro, 'Where Did Information Go? Reflections on the Logical Status of Information in a Cybernetic and Semiotic Perspective' (above, n. 14), 108. However, there yet remains what Sharov calls the "computational paradigm" in cybernetics, including second order cybernetics (which shifts the focus of inquiry from the observed system to the observing system). See Sharov, 'Functional Information: Towards Synthesis of Biosemiotics and Cybernetics' (above, n. 15), 1066. The notion of *agency* is thus yet unacknowledged in cybernetics, or, as Gare puts it: "Mechanisms are only intelligible as products of and as serving living processes from which their telos derives." See Gare, 'Semiosis and Information: Meeting the Challenge of Information Science to Post-Reductionist Biosemiotics' (above, n. 17), 344. An example for an attempt to reform cybernetics along these lines is Søren Brier's *Cybersemiotics: Why Information is not enough*, which follows Peircean metaphysics in assuming a primordial form of experience or feeling to be inherent in the structure of the universe. See Søren Brier, *Cybersemiotics*: *Why Information is not enough!* (Toronto Studies in Semiotics and Communication; Repr. in pbk, Toronto: University of Toronto Press, 2014). This

follows the idea of Thure von Uexküll's "Umwelt as a common concept for the phenomenological worlds of organisms, of whatever kind these may be."[19] In other words, biosemiotics takes an "observer-dependent stance on information," which is grounded entirely in subjective experience, and it is concerned with what Hoffmeyer termed the "phenomenon of experience" (188). This "phenomenon of experience" is traditionally ignored in other frameworks, including Turchinian cybernetics.[20] Biosemiotics thus opens up the possibility to consider increasing connectivity as a force for cognitive change through the changing scaffolding.

This change in the scaffoldings and its implications are the two points I intend to tackle in the present paper. In the first two chapters, I will look at the scaffolding process itself. The thesis is that scaffoldings build through virtual networks structurally amplifies scaffoldings build by institutions. In the final chapter, I will attempt a more speculative analysis of how individual subjectivity changes with increasing connectivity; building on Hoffmeyer's belief that "semiosis and subjectivity [are] more-or-less phenomena that have a tendency to grow during evolution."[21] An important aspect of this growth is the notion "accepted by Hoffmeyer" that "emergence occurs through new enabling constraints."[22] My thesis is that the emergence of higher-order semiotic freedom of a compounded agent (superorganism, swarm agent, super-agent or other) is ultimately bought by tightening control of the semantic scaffoldings of its units and that this tightening control, therefore, cannot be thought without transitions in the individual units' subjective Umwelten.

THE I'S AGE

Thomas Sebeok called for a synthesis of biology and semiotics in his attempt to

approach, however, has been called "incompatible with biology as a science" by biosemioticians. See Sharov, 'Functional Information: Towards Synthesis of Biosemiotics and Cybernetics' (above, n. 15), 1052.

[19] Jesper Hoffmeyer, 'The Semiotic Body', *Biosemiotics*, 1/2 (2008), 169–90, 188.

[20] Andreas Weber calls this a "paradigm shift" in biology, which he sums up as follows: "Subjectivity, not objective relationships, are at the forefront of any biologically possible experience–including our own." See Andreas Weber, 'The Book of Desire: Toward a Biological Poetics', *Biosemiotics*, 4/2 (2011), 149–70, 151.

[21] Morten Tønnessen, Alexei A. Sharov, and Timo Maran, 'Jesper Hoffmeyer's Biosemiotic Legacy', *Biosemiotics*, 12/3 (2019), 357–63, 361.

[22] Gare, 'Semiosis and Information: Meeting the Challenge of Information Science to Post-Reductionist Biosemiotics' (above, n. 17), 332.

build a unified theoretical framework for what is often called the "3Cs": cognition, communication, and culture. He saw these "3C's" as "derivatives of species-specific sign systems, but not separated from the physiologies of the given species."[23] Biosemiotics, in other words, provides a framework to treat social phenomena as higher-level manifestations of a common driving force behind evolution[24] instead of as unconnected to and different from the natural world.

Cartesian dualism is often cited as the root of misconceptions of an alleged fundamental difference between the physical and the mind (or self) in standard biosemiotics literature.[25,26,27] However, it is less frequently remarked that the Aristotelean opposition of "nature" and "culture" is likewise to be seen as an important reason for the fragmentation of human knowledge production into the academic trinity of the natural sciences, the social sciences, and the humanities (i.e. world, society, and self as allegedly unconnected epistemic spheres). Thus, not merely the phenomenon of mind, but likewise, the phenomenon of society

[23] Filip Jaroš and Timo Maran, 'Humans on Top, Humans among the Other Animals: Narratives of Anthropological Difference', *Biosemiotics*, 12/3 (2019), 381–403, 394.

[24] To go back to the fundamentals of biosemiotics outlined in Hoffmeyer and Emmeche's 1991-paper, the paradigm shift is "that *evolution is semiosis*, a process of continuous interpretation and re-interpretation of hereditary signs alongside other signs that originate in the environment or the body." See Alexei A. Sharov, Timo Maran, and Morten Tønnessen, 'Comprehending the Semiosis of Evolution', *Biosemiotics*, 9/1 (2016), 1–6, 2. Semiosis, however, is the way in which evolution happens. The driving force behind it–and this is an equally important aspect of biosemiotics' paradigm shift–is the agency and creative, goal-directed force that is in the emergence of subjectivity (i.e. life). The evolution of species is thus driven by life as an active force that emerges increasing complexity (as opposed to seeing it as passively emerging from it): "a capacity of any living being to be agentive amounts to it being the self" all the way down to unicellular life. See Katsiaryna Suryna, '"Subject" and "Self" in Biosemiotics: On Conditions of a Legitimate Application of "Subject" in Biosemiotics and Prerequisites of a Biosemiotic Approach to the Self', *Chinese Semiotic Studies*, 10/3 (2014), 509–20, 513.

[25] Jesper Hoffmeyer, *Signs of Meaning in the Universe* (Bloomington: Indiana University Press, 1996).

[26] Jesper Hoffmeyer, *Biosemiotics*: *An Examination into the Signs of Life and the Life of Signs* (Chicago: Univ. of Chicago Press, 2009).

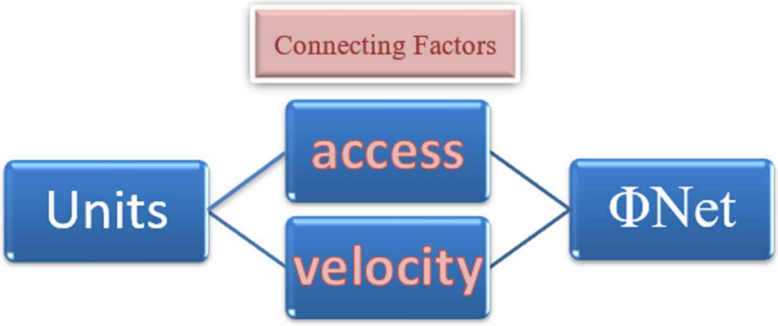
[27] Wendy Wheeler, *The Whole Creature*: *Complexity*, *Biosemiotics and the Evolution of Culture* (London: Lawrence & Wishart, 2006) In academia, this opposition is the opposition between the sciences and the humanities, which has led to each side of the divide pretty much ignoring the other. In the words of Wendy Wheeler: "The puzzling story […] of how many intelligent people in the humanities […] came to ignore the theory of evolution, and believe that everything we think we know is just an effect of written or spoken language, is yet to be told […]. Its roots probably lie […] in the now infamous mind-body dualism philosophically developed by Rene Descartes" (24). It has furthermore been noted that the nature of the humanities is somewhat culture-dependent: "In Russian, in German, and in Estonian, the humanities are sciences […], while in the English-language tradition tends to separate the humanities from the sciences." See Kull, 'Beyond Word: On the Semiotic Mechanisms' (above, n. 2), 465.

can be approached within the framework of an ongoing evolution by biosemiotic emergence. In the words of Gerald Ostdiek: "The sense of personhood is a consequence of continuity across various scales of life, […]. Moreover, the binding of these scales into a single experience (of having a self) is thoroughly biosemiotic, thus biosemiotics is as much a study of self and society as it is of biology."[28] Since "information" in biosemiotics is always a subjective experience, emergence always manifests itself as the emergence of higher-order subjectivity of a higher-order agent through gaining a new level of semiotic freedom.

To cite Gerald Ostdiek again: "'I' truly am a society" (448). Accordingly, the obstacles to making the individual "I" must be overcome to analyze society–or, more broadly, human collectivity–in its potential to produce a higher-order agent based on the same biosemiotic framework. How the multitude that is "me" functions as one "I" is semiotic scaffolding: the "network of semiotic controls that are tuned to the needs of the system and meaningful interpretation of signs."[29] However, even before one looks at the emergence of scaffoldings in more detail, it is already obvious that such scaffoldings can only get built if individual parts are connected. This is not meant to imply that the connection must exist before the scaffolding takes place. In a dynamic process, it is the scaffolding that produces the structure, which makes connections. Based on this, further scaffoldings can get built, which then again increases connectivity, etc. However, let us take a quick look at what the scaffoldings must achieve on the most general terms. Roughly speaking, the degree of connectedness between units depends on the individual access levels to the network and the exchange velocity of signal transmissions (Figure 1).

[28] Ostdiek, 'Me, Myself, and Semiotic Function: Finding the "I" in Biology' (above, n. 4), 437.
[29] Tønnessen, Sharov and Maran, 'Jesper Hoffmeyer's Biosemiotic Legacy' (above, n. 21), 358.

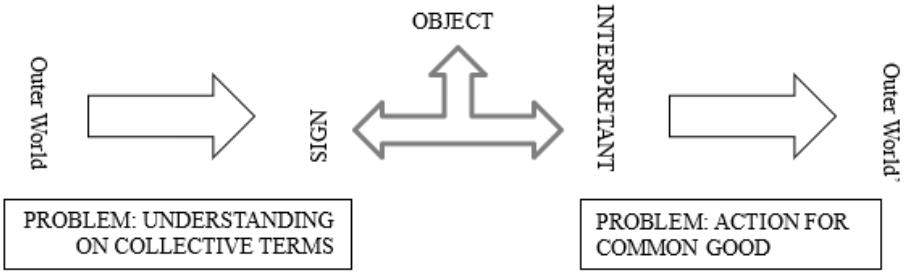
Fig. 1 ***Connectivity***



However, it is not merely the presence of a physical network that creates access, but also the individuals' ability to participate; i.e. the individuals' ability to exchange information. As has been said, information in biosemiotics is always thought to be subjective and arising from semiosis. Thus, participating agents must be able to decode and encode signs in the same way, which requires a similar subjective Umwelt of all participating agents. However, all agents have their own Umwelt, which is always subjective, or *individual*. Perhaps, then, one could argue that the emergence of a higher-level agent and thus a higher level of subjectivity is only possible when the constituting agents' Umwelten become somewhat *objective* to each other–i.e., when sign-object-interpretant relations correspond between individuals to a high degree. A problem for the emergence of the higher-level agency is thus not merely Hoffmeyer's "hard problem" in the emergence of multicellularity to "suppress the inherent agency of individual units and 'persuade' them to obey the necessities of cooperation in the interest of the whole."[30] Equally, it is a problem to provide the epistemic means for rapid communication. There is thus a problem on the sensual input side as well as on the intentional output side (Figure 2).

[30] Hoffmeyer, 'Introduction: Semiotic Scaffolding' (above, n. 5), 155.

Fig. 2 Connecting the subject



For the emergence of a super-agent, the scaffoldings must achieve that individual agents understand their environment on collective terms and act upon the outer world in collective terms. This double structure is displayed in the definition of semiotic scaffolding as "facilitating [an organism's] processes of perception and action."[31] However, the first driving force behind this process–culminating perhaps in the semiotic emergence of a higher-order agent, or super-agent–must be the lower-order agents. Biosemiotics sees evolution as driven ultimately by subjectivity. To quote Hoffmeyer: "Semiosis or sign action is always embedded in sensible material processes and for that reason has a dynamic side that allows communicative processes to run, as well as a complementary or mediating side. The first of these sides is governed by the compulsive force of efficient causation, the second expresses the controlling agency of *semiotic causation*, i.e. bringing about things under guidance of interpretation in a local context."[32] In other words, the driving factor for semiotic emergence is the agency and intentionality of the individual agents ('semiotic causation or causality' is defined as a scientific term for 'final causation' by Hoffmeyer).

The utilitarian roots of semiotic emergence are plain to see. Trade of information makes diversity accessible: information that I have might be useful for somebody else, who can supply valuable information for me in return. Trade of material goods makes diversity accessible and useful: I trade what is useless to me to somebody, who can use it. In return, I receive something I can use, and for which she has no use. This type of cooperation enables individual units to impose

[31] Cobley and Stjernfelt, 'Scaffolding Development and the Human Condition' (above, n. 6), 292.
[32] Hoffmeyer, 'The Semiotic Body' (above, n. 19), 171.

order upon the physical realm in a way that yields useful objects or scaffoldings from useless diversity. Meant here is semiosis, which translates into an advantage. To quote Cannizzaro, semiosis is most successful for semiotic causation when "an interpretant is objective and physical, that is, when the object upon which it is based does correspond to a physical thing. Thus, the interpretation of a dyadic interaction or an event is relatively accurate, workable and relates to what has actually taken place."[33] Despite the subjective nature of information, scaffolding, and Umwelt, the biosemiotic framework is not an idealist philosophy. Science and knowledge production arguably bring the individual organism closer to what is actually 'out there' by shaping its Umwelt in a useful way for survival.[34] To quote Cannizzaro again: "what matters for an interpretant to form is not whether this is true or false, natural or constructed. By means of being based on experience, any view of the physical world can always be considered as natural, or real. What matters is that this world view *works*, and that it provides a workable picture of the environment, or a model, for living beings to live within" (113-14).[35]

Connectivity thus enables humans to shape their environment to their needs and desires much more efficiently than they could individually, and it is, therefore, the individual unit's will to prosper that drives the process *and yet* self-organization. In other words, the network emerges through the multilateral connections that develop through the individual's will. It is in the steady tightening of communication networks through self-integration, then, that will of

[33] Cannizzaro, 'Where Did Information Go? Reflections on the Logical Status of Information in a Cybernetic and Semiotic Perspective' (above, n. 14), 112.

[34] Even within the small community of researchers preferring the "interface" model to the "physicalist" viewpoint, this view has been challenged. Chetan Prakash published a mathematical model that allegedly proves that interfaces that aim at "fitness" will lead to the extinction of "truth" based interfaces. See Chetan Prakash, 'On Invention of Structure in the World: Interfaces and Conscious Agents', *Foundations of Science*, 25/1 (2020), 121–34.

[35] Going back to Wendy Wheeler's claim that "many intelligent people in the humanities and social sciences came to ignore the theory of evolution" and regard reality to be a purely subjective, linguistic construct, it is thus obvious that biosemiotics connects the humanities and the sciences in a way that takes both the subjective nature of experience and the physical reality of the outer world likewise seriously. See Wheeler, *The Whole Creature* (above, n. 27), 24. Furthermore, it becomes clear why the humanities and social sciences must ignore (or even deny) subjectivity in animals other than human beings, while biosemiotics "makes amble space for the vision of the world as an emergent process in which those peculiar things we call living systems and their bodies might well have evolved as genuinely semiotic creatures." See Hoffmeyer, 'The Semiotic Body' (above, n. 19), 170.

individual units transforms increasing complexity into information (in the biosemiotic sense) by making human units mutually accessible to each other within an emerging network.[36] This is not contradictory to the Darwinian law but follows from it. The evolutionary urge to fit into one's environment accelerates the process under increasingly socially modified conditions in both physical surroundings and Umwelt: the better the individual's Umwelt corresponds to the emerging super-agent, the more she connects to her environment, but therefore also connects her environment by establishing connections and thus increasing overall connectivity.[37] The semiotic scaffolding thus changes gradually for all agents involved in the process. It becomes increasingly impossible on material terms to stay outside of the network for individuals unwilling to integrate. Likewise, it becomes increasingly impossible to construct an Umwelt that is not scaffolded by the emerging super-structure.

Talking about material terms, it is to be noted here that all parts of semiosis are subjective, including the object, which is not the same as the thing in the outside world, or, Kantian speaking, the thing itself. Within the triad of semiosis, it is thus the sign that is closest to the outer world, not the object. To cite Cannizzaro's interpretation of Deely: "What is really important here is the distinction that Deely makes between thing and object. According to this distinction, a thing is that which exists beside being known; it constitutes 'mind-independent reality' and reflects a physical situation. When one comes across a thing, an informed 'object' is generated. This amounts to 'mind-dependent reality'" (111).[38] The emerging structure thus scaffolds individual agents' Umwelten by performing alterations on the physical. There are two sides to the process:

1. Immediate situations are analyzed by individual agents in terms of the interpretive scheme of not merely personal experience, but of the network's database (inside exterior: Umwelt).
2. Individual agents' physical environments are increasingly shaped by collective structures through 'artificial' or 'cultural' modifications (outside

[36] Jan-Boje Frauen, 'Fire & Language. The Two-Faced Process of Progress in Deep-Structural Sociocultural Evolution', *World Futures*, 76/4 (2020), 189–213.
[37] Ibid.
[38] See John N. Deely, *Basics of Semiotics* (Advances in semiotics, Bloomington: Indiana University Press, 1990).

exterior: environment).

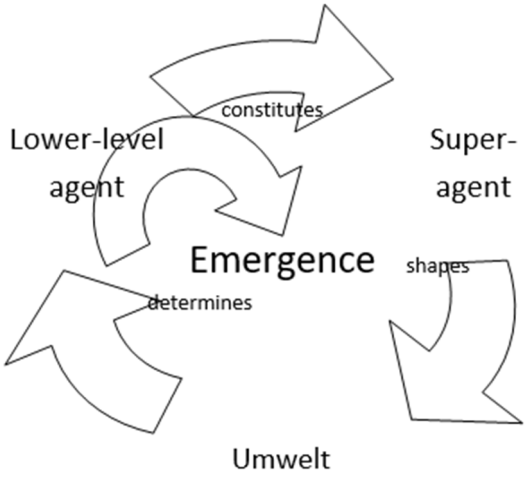
The augmentation of the individual with the collective might increase profoundly through 'augmented reality' adding to the internal dimension, and through the 'Internet of Things' adding to the external dimension in the nearer future. Society has been undergoing a steady process of extension of the (human) semiotic sphere, meaning a steady increase of connectivity over steadily growing distances in steadily accelerating transmission rates.[39] With the creation of the virtual sphere, this process is accelerating like never before. Firstly, there seems to be a bilaterally constitutive process at work: individual units build up a network of interdependency out of their self-interest. Over time, then, the network increasingly constructs the individual episteme, as it increasingly comes to shape ecology and Umwelt. This process tightens through the previously discussed connecting factors, namely the access level and signal exchange velocity of individual agents.[40] The dual aspect in semiotic emergence unfolds dynamically in the "perception-action cycle" by modifying perception to trigger an action that alters the environment; which then further modifies perception by gradually changing the Umwelt of an organism.[41] This follows from biosemiotics' emphasis on agency (as opposed to reductionist views). It is not a special case, but a central aspect of semiotic scaffolding: "Still another aspect of much, if not all, 'scaffolding' […] is its external, material aspect […]: many organisms do not simply exist in an otherwise unchanging, neutral environment; rather, their activity to some degree shapes and changes their Umwelt so that its affordances more easily allow for the organism to enact its activities" (292). Emergence, then, is driven by subjective agents' "perception-action cycle" and may result in subjectivity and agency of a higher-order super-agent or superhuman agent (Figure 3).

[39] Frauen, 'Fire & Language. The Two-Faced Process of Progress in Deep-Structural Sociocultural Evolution' (above, n. 36).

[40] Ibid.

[41] Cobley and Stjernfelt, 'Scaffolding Development and the Human Condition' (above, n. 6), 292.

Fig. 3 Wheel of self & society 'turning itself out of itself'



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This theory on emergence is not out of touch with the biosemiotic interpretation of past transitions. It has to be kept in mind here that in a biosemiotic framework there is no structural difference between an alleged inside and outside: "*endosemiosis*, the semiotic regulation that takes place inside an organism, is as much part of the great chain of semiosis as is *exosemiosis*, the semiotic interaction between organisms."[42] Indeed, this *must* be the case for biosemiotic emergence and individuation to happen, as we know from the emergence of multicellularity. Furthermore, it is not even always entirely clear what is 'inside' and what 'outside:' "In the biological world, the delimitation of an individual is far from being always as clear-cut as it may seem in the world of vertebrate animals."[43] This, also, *must* be the case when we take into consideration that emergence through the development of intersubjective scaffolding happens gradually, as has been shown. Thus, increasing connectivity can be seen as a biosemiotic net of relations and semiosis. From here, it can also be considered as part of the

[42] Hoffmeyer and Stjernfelt, 'The Great Chain of Semiosis. Investigating the Steps in the Evolution of Semiotic Competence' (above, n. 6), 9.
[43] Hoffmeyer, 'The Semiotic Body' (above, n. 19), 182.

evolution of semiotic freedom, another theory proposed by Hoffmeyer. To quote Deely's summary of Hoffmeyer's theory: "Hoffmeyer shows how the reality of relations (within animal awareness in particular) makes possible an increasing *freedom* in living activity (*vis a prospecto*) as we ascend the evolutionary scale. In turn, this increasing freedom brings about new conditions and states which become the *scaffolding* upon which biological evolution depends in and for development of increasingly complex forms."[44]

However, the increased semiotic freedom of an emerging super-agent depends on the organization of its constituents: "The semiotic competence of subunits, whether these subunits are cells in a multicellular organism or ants in an ant colony, is the medium through which the behavior and integrity of the higher-level entity is maintained. […] The evolutionary formation of this kind of autonomous macro-entities is the quintessence of what is called emergence. […] [I] claim a connection between semiotic emergence and what has been 'downward causation.'"[45] In other words, the agency of individual units that builds up an emerging structure is joined by a downward force from this structure that organizes this agency. This means that individual agents are controlled in the process not merely by their mutual relations, but increasingly also by the emerging scaffolding itself. Gare notes on emergence: "The existence of boundary conditions as constrains allows for the possibility of hierarchical ordering through new levels of constraint, facilitating specific control of lower level organization by higher level organization. […] Emergence occurs through new enabling constraints."[46] The structure built by the scaffolding–both internal and external–becomes an *agent*. This higher-level agency, however, comes at a lower-level price: "in emergent processes, freedom of possibility will always be constrained at the simpler level in order to allow an altogether new kind of freedom to appear and unfold at a more complex level."[47]

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[44] John N. Deely, 'Vis a Prospecto', in Donald Favareau, Paul Cobley, and Kalevi Kull (eds.), *A More Developed Sign. Interpreting the Work of Jesper Hoffmeyer* (Tartu semiotics library, 10, Tartu: Tartu Ülikooli Kirjastus, 2012), 315–9, 316.

[45] Hoffmeyer, 'The Semiotic Body' (above, n. 19), 183.

[46] Gare, 'Semiosis and Information: Meeting the Challenge of Information Science to Post-Reductionist Biosemiotics' (above, n. 17), 332.

[47] Quoted in Hoffmeyer and Stjernfelt, 'The Great Chain of Semiosis. Investigating the Steps in the Evolution of Semiotic Competence' (above, n. 6), 14. Original quote in Hoffmeyer, *Biosemiotics* (above, n. 26), 258. In the following reference only to original quote.

Ultimately, emergence is hence driven by the self-interest of individual human agents, as has been said. Historically, the more educated individuals were, the higher was their status in society.[48] Being part of the more educated is fundamentally tied to being more integrated:[49]

1. **Internal scaffolding driven by agency:** Being 'educated' means to be able to partake in collective knowledge production, which in the social state entitles individuals to evolutionary advantages through the Bourdieusian trinity of cultural, social, and economic capital. It is helpful here to compare Bourdieu's division of labor to determination in multicellularity: "Early on in embryogenesis, almost all cells lose their totipotentiality, i.e. their potential to become whatever cell it might be. A so-called *determination* takes place, or rather a sequence of determinations, whereby the cells step-by-step become more and more specializes."[50] From parental upbringing including norm internalization processes (Elias)[51] and habitus generation (Bourdieu)[52] to education in the institution (Foucault),[53] all social upbringing can be regarded as a "sequence of determinations." These determinations, however, are driven by the individuals' agency. Somewhat in the same way in which physical strength entitles the α-Chimpanzee, education enables individuals to think in a common epistemic reference frame–an intersubjective Umwelt emerging through scaffolding–[54]and to

[48] Jan-Boje Frauen, 'The Machinery for Change. A Historical Analysis of the Roots of Liberal-representative Democracy, a Critical Approach towards Forced Democratizations and an Outlook on the Future Evolution of the Liberal Order', *European Journal of Political Science Studies*, 2/2 (2019) <https://oapub.org/soc/index.php/EJPSS/article/view/535>.

[49] Ibid.

[50] Hoffmeyer, 'The Semiotic Body' (above, n. 19), 176.

[51] See Jan-Boje Frauen, 'The Compulsions of Interdependence. Norbert Elias' *Civilizing Process* as Evolutionary Realism', *The Review of International Affairs*, 70/1174 (2019), 5–21.

[52] See Frauen, 'The Machinery for Change. A Historical Analysis of the Roots of Liberal-representative Democracy, a Critical Approach towards Forced Democratizations and an Outlook on the Future Evolution of the Liberal Order' (above, n. 48).

[53] Social institutions are manifold and fulfill determination functions on various levels. In analogy to the scaffolding in multicellularity, there are at least the two problems of the "semiotic individuation process" by which cells are forced to grow into their required roles for the multicellular organism to function in the first place and the problem "if stable solutions are found to the challenge of 'disobedient cells,' cells that have mutated to become insensitive to the signals from other cells telling them to do supportive work." See Hoffmeyer, 'Semiotic Scaffolding of Multicellularity' (above, n. 1), 161, 165. In sociocultural emergence, likewise, the scaffolding is not limited to the upbringing of individuals, but requires further institutions like prison etc. to deal with disobedient individuals. See Michel Foucault, *Discipline and Punish*: *The Birth of the Prison* (Penguin social sciences; Reprint, London: Penguin Books, 1991); Gilles Deleuze and Seán Hand, *Foucault* (Athlone contemporary European thinkers, London: Continuum, 2004).

[54] It is important here to see that the individual organism's Umwelt is likewise an intersubjective Umwelt made of the manifold interpretive patterns (Umwelten) of its parts. With Hoffmeyer, we can state that: "Perception, understood as the process of creating internal models of events or things in the surroundings,

send their thoughts back into the public sphere. In other words, *the educated have a voice.*

2. **This is not the hermit's voice**: Through the development of a collective sphere of knowledge production and rule administration, collective 'discourses' evolve which are fed and influenced by individually performed thought-acts.[55] Thus, the agency of those individuals having access to the collective sphere is increased compared to those individuals without access.

3. **External scaffolding by downward causation:** Education in institutions and growing up in collective spheres increasingly integrates individuals into a social super-structure. Aside from increasing the voice of the individual (as described above), this also opens up the possibility for the social super-structure–gradually evolving into an agent of its own–to *use* the participating individuals. The external alteration of the human environment and internal Umwelt thus alienates individual nature towards a 'multicellular' or intersubjective state in a twofold way:

    a. The sanctioning environment of institutions enables individual units to get educated or *receive* signals: "Sit and listen!"

    b. Through this process they are enabled to function in highly normalized social positions or *send* signals into the sphere in return: "Sit and work!"

Let us take a look at how these institutional scaffoldings correspond to Hoffmeyer's claim that "freedom of possibility will always be constrained at the simpler level" by emergent higher orders.[56] To do so, we need to consider the fundamentals of being alive: "It is creative interaction between the versions of the message that is entailed in code duality. Where the digital code takes care of the objective, conservative (or inherent) aspects of life, the analogic code–i.e. the actual organism–is designed to deal with the here and now; the presents the

is a high-level activity based on the integration of hundreds, thousands, or, in some cases, even millions of semiotic interactions in the body and between the body and its environment." See Hoffmeyer and Stjernfelt, 'The Great Chain of Semiosis. Investigating the Steps in the Evolution of Semiotic Competence' (above, n. 6), 9. What the intersubjective Umwelt of the collective of human agents is missing, arguably, is a super-agent's consciousness in Hoffmeyer's definition of it: "consciousness supports a long series of different processes and scaffolds perception, cognition, reasoning, categorization, action, communication, language, and a host of other abilities. [Hoffmeyer] has suggested that consciousness, as an iconic inner experience, works as a holistic marker focusing the enormous diversity of ongoing calculations upon a single path of action" (24). See also Jesper Hoffmeyer, 'Uexküllian Planmässigkeit', *Σημειωτική-Sign Systems Studies*, 32/1-2 (2004), 73–97.

[55] See Frauen, 'The Machinery for Change. A Historical Analysis of the Roots of Liberal-representative Democracy, a Critical Approach towards Forced Democratizations and an Outlook on the Future Evolution of the Liberal Order' (above, n. 48).

[56] Hoffmeyer, *Biosemiotics* (above, n. 26), 258.

subjective, active, ecological protagonist in life."[57] The relation of the digital code and the analogic code can well be described as a relation from past to present in the digital code and a relation from present to future in the analog code.[58] The first is what Hoffmeyer described as "traces of the present in the future" that "survive as messages in the genetic material" (145). These traces are constitutive: "In time these traces became intertwined and a network of interrelations arose to form the basis for increasingly sophisticated forms of foresight" (145). However, they are not the driving force of change: "digital codes are not action-oriented" (50). Instead, the force of change stems from the analog interaction of "subjects, of 'someone'" with the outside world that happens inside-exterior in the organism's Umwelt and outside-exterior in its semiotic niche. This action is directed into the future by foresight on whichever evolutionary level of experience, and it is this agency that constitutes the animation of living beings.

This subjectivity manifest in understanding translated into action by semiosis can be defined as the internal urge to *move* and *communicate*. Schooling essentially inhibits these reflexes by creating an environment, in which both movement and communication are severely sanctioned: 'sit down and shut up!' Moreover, the most ancient reflex for any living organism to avert an unpleasant pressure situation is twofold, with the choice between the two made by rational evaluation of the chance of success: fight or flight. In school, the attempt to execute either aggression or escape gets severely sanctioned, which is the first and foremost thing individuals learn in the 'institution.' This learned 'alienation' from the individual's inherent reflexes then enables individuals to function in their socialized environments later on: cavemen cannot work in companies. They cannot because they do not have the skills required for operating a computing machine. Equally, however, they cannot because they would not be able to sit still and stare at a screen for the largest part of the day. Thus, it is the analog side of code duality

[57] Hoffmeyer, *Signs of Meaning in the Universe* (above, n. 25), 50.

[58] This is not meant to imply that the two sides are not bilaterally constitutive or do not dynamically influence each other. In the words of Cobley and Stjernfelt: "The brain is not to be conceived as a computing mechanism dictating motor actions and cultural interactions. Nor are culture and civilization any longer to be taken as mere icing on the biological cake already baked. Rather, culture and evolution have, at least since early development of language in hominids, if not earlier, fed back into evolution. […] features such as the large human neocortex, the brain's linguistic circuits, hands able to grasp objects, and so forth seem very likely to have co-evolved with human culture, communication and tool use." See Cobley and Stjernfelt, 'Scaffolding Development and the Human Condition' (above, n. 6), 295.

that is tackled in downward causation by the scaffolding that institutions achieve for the emerging super-agent. Therefore, two statements are equally true in a dynamic manner:

1. The institution enables the individual to function within the superstructure in a way beneficial to the individual.
2. The institution restricts the freedom of the individual by creating a semiotic scaffolding that guides the individual's exterior movement and translates into a scaffolding of the individual's interior Umwelt.

The fundamentals of the institution are hence to remove the organism's inside-out reactions (i.e. animation) towards a less entropic (i.e. random) condition by making human units mutually accessible to each other. It is a process that is still accelerating and unfolding.[59] The velocity of the transition increases dynamically between individuals and social systems through increasing interdependence.[60,61]

Schooling is essential in the mechanics of this reduction of individual "freedom of possibility."[62] The institution erases our 'brutish' reflexes (movement following sensual stimuli, physical aggression and escape reflexes) to interconnect individual units. Coercion is an essential part of the process. It has been said that the process is driven by individual will and yet self-organizing because it is the individual units' selfish desire to prosper, which tightens the inclusion. However, this is not entirely true. Schooling is essentially enabling individual units to connect. However, schooling is not voluntary. It is parents who force children into schooling. The transition thus enters a stage, at which human agents decide for other human units what is best for them, which is a step removed from individual self-interest. Moreover, if parents do not force their offspring into the institution, they are forced to force them. This, however, is still self-interest via interdependence: the police officer who drags a child to school does so because she depends on her paycheck. Remarkable, though, is that at this point it becomes the social superstructure itself that forces individuals into its institutions

[59] Frauen, 'Fire & Language. The Two-Faced Process of Progress in Deep-Structural Sociocultural Evolution' (above, n. 36).
[60] Frauen, 'The Compulsions of Interdependence. Norbert Elias' *Civilizing Process* as Evolutionary Realism' (above, n. 51).
[61] Frauen, 'Fire & Language. The Two-Faced Process of Progress in Deep-Structural Sociocultural Evolution' (above, n. 36).
[62] Hoffmeyer, *Biosemiotics* (above, n. 26), 258.

through acts that are merely performed by other individuals: the police officer, other than a parent, does not care about what is better for the child when she drags it to school; she cares about her income.[63] Individual units that insist on their private sphere to a degree that makes them unfit to prosper in the increasingly all-encompassing environment of the system, therefore, get forced to integrate by the mechanics of the system. In a way, one can thus say that the superstructure itself is becoming an *agent* in the process, which is to be expected from semiotic emergence.

Schooling is external scaffolding translated into internal scaffolding. It thus creates an intersubjective Umwelt that enables agents to connect in intersubjective thought acts. Only by this common reference frame is the emergence of an externalized sphere of intersubjective knowledge production–an emerging super-agent–possible.[64] Individuals moving chaotically according to semiosis in highly individual Umwelten–i.e. Umwelten that are not scaffolded by the superstructure–are inaccessible to each other and thus useless for the network (i.e. the system is in a state of high entropy). However, random movement according to direct sensual input is the human condition before social scaffolding.[65] Thus, (random) movement has to be restricted and guided by the

[63] This picture is simplified because the social superstructure constructs individuals' Umwelten through the scaffolding. Thus, the police officer would likely believe that the child *should* get dragged to school. Material and ideational factors go hand in hand in sociocultural evolution. See Frauen, 'The Machinery for Change. A Historical Analysis of the Roots of Liberal-representative Democracy, a Critical Approach towards Forced Democratizations and an Outlook on the Future Evolution of the Liberal Order' (above, n. 48).

[64] It is to be noted here that the process is dynamic: internal inclusion levels give rise to external connectivity and vice versa. See Frauen, 'Fire & Language. The Two-Faced Process of Progress in Deep-Structural Sociocultural Evolution' (above, n. 36). Cobley and Stjernfelt mention a couple of sources for the idea of an external sphere of intersubjective thought acts. Among them are Ernst Cassirer, *The Philosophy of Symbolic Forms* (New edition, London: Routledge, 2019); Andy Clark and David J. Chalmers, 'The Extended Mind', *Analysis*, 58/1 (1998), 7–19 <https://philpapers.org/rec/clatem>. On Cassirer's work from the 1920s, they comment: "The symbolic forms idea addresses the large, interlinked domains of human activity insofar as such forms are externalized in institutions, signs and practices. […] art, myth, religion, language, science, politics, technology are sure to count among them." See Cobley and Stjernfelt, 'Scaffolding Development and the Human Condition' (above, n. 6), 296.

[65] Meant here are children, not historical stages. For adults, it is a purely hypothetical scenario. Human beings are by nature social and linguistic creatures and thus always get socially scaffolded during their upbringing. In the words of Susan Petrilli: "human semiosis is characterized by a double modality of existence, at least: as biological organisms interconnectedly with other organisms in the *biosphere*; and as a specification of this vital sign network thanks to the human species-specific capacity for *metasemiosis*, or *semiotics*, or *language understood as a primary modelling device*" (244).

scaffolding to make individuals accessible in the network. This enables intersubjective thinking. It has been said that the educated have a voice. This means that the connected have a voice. The educated can read and write (among, today, many other connecting abilities, of course). To exemplify, let us look at a passage from Cobbey and Stjernfelt's paper on external scaffolding through the humanities: "the book remembers far more, and far more accurately, than the brain involved in its construction. But that is not all: having externalized an argument structure in a book chapter, the writer is free to take the results as new starting points, as scaffolds, for the next chapter–effectively constructing the book as a long, coherent argumentative arc which was never present to the author in its entirety."[66] The point here is not merely that the book scaffolds the author's temporal selves and thereby transcends this author's understanding at any given point in time (though it is noteworthy that already on this level the book itself seems to be endowed with some level of proto-agency that utilizes the author for its writing). However, the main point is that this does not merely happen between the temporal selves of the same agent. Books are written between individual agents over large geographical distances and extended periods. They are connected to the books that their authors' writing was building up upon and they are connected to the books building upon them (or sometimes refuting them) within a worldwide web of transsubjective thought processes governing both knowledge production and social action. To quote Cobbey and Stjernfelt again: "external scaffolding […] involves [the] issue of the cognitive economy along with a broad series of other affordances, stability, intersubjectivity, repeatability, negotiability, storability, reinterpretability, cross-cultural communicability–and much more" (300). Noteworthy here is that all of the factors mentioned by Cobbey and Stjernfelt seem to grow with technological progress and aim at the connection of separate parts (subjects, cultures, etc.). This picture of evolutionary progress is reinforced in their conclusion: "cultural scaffoldings are in constant development, competition, collaboration, and hybridization" (303).

However, only the externally or socially scaffolded individuals can partake in these processes. Only they read and write, speak the lingua franca, and internalized the norms and habitus that enable them to enter the circles of

[66] Cobley and Stjernfelt, 'Scaffolding Development and the Human Condition' (above, n. 6), 295.

knowledge production and decision making. For most of humanity's history, the vast majority of humankind was outside of the field of emergence to a large degree (though never entirely). Historically, few institutionally scaffolded individuals have been connected to an exclusive network of societal elites. Over time, the percentage of the global population that got institutionally scaffolded has been steadily increasing.[67] Today, scaffolding processes have outgrown the institution to some degree. The virtual networks of today are an amplification of the institution. They fulfill the same function much more efficiently. Today, an individual's status increases with representation in virtual-social networks. *The connected have a voice.* Thus, self-interest drives individual agents online, just like it drives them into school (or, more accurately, drives them to send their children to school). Structurally seen, the virtual sphere is an amplification of scaffoldings from institutions. In the institution, natural dispositions are sanctioned externally to create an internal scaffolding: physical movement is sanctioned and so is attacking or running away in social pressure situations. With the growth of the Internet into all areas of everyday life, the execution of many of our natural tendencies becomes increasingly inconceivable. With the gradual augmentation of perception and physical reality, an environment is being created that makes fight or flight impossible. The movement that happens in the virtual sphere is not a real movement in the physical sense, and it becomes increasingly impossible to run away from the Internet. The so-called 'digital natives' of today are 'moving' on their smartphones while sitting still. Likewise, physical aggression becomes impossible in the virtual. *Flight* (escape) from the Internet and an actual, physical *fight* are therefore inconceivable.

The connectivity stemming from the intersubjective (or "externalized" in the sense of Cobley and Stjernfelt) scaffolding build by institutions might thus evolve into a super-connectivity through the intersubjective scaffolding that the Internet provides (though it is not there yet and there are grave ethical concerns if we *should* go there). On this level, also, it is the individual agency that is the driving force behind the process, which is joined by downward causation. It is increasingly impossible for individuals to stay outside of the virtual-public sphere

[67] Frauen, 'Fire & Language. The Two-Faced Process of Progress in Deep-Structural Sociocultural Evolution' (above, n. 36).

due to their very own nature as self-interested agents. As of today, a hermitical absence from the network is already resulting in an inability to support one's living. To give an obvious example, only very few of us can still afford not to have an email address, a smartphone, or a social network account. Furthermore, an absence from the Internet inhibits individuals' chances to produce offspring; both in the literal genetic sense of biological reproduction and in the memetic sense of spreading one's thoughts. The 'offlined' are out of touch with discourse and mating rituals. However, they are a minority now. Ironically, the less virtually one lives, the fewer opportunities for physical encounters one will have. This trend is bound to amplify: it seems sensible to assume that the immediate augmentation of individual perception with information (from the collective database) and feedback (from other agents) will be the next step in the gradual process of emergence. After all, this is what smartphones already accomplish today with merely one more degree of immediacy.

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Individuals become increasingly incorporated into intersubjective (or transsubjective) thought processes in sociocultural evolution. The sphere in which intersubjective knowledge production and rule administration (thought and action on the collective level) happens can be seen as an emerging super-agent in the biosemiotic framework. The semiotic scaffolding that guides this emergence is accomplished by institutions. Institutions scaffold individual subjects internally (schooling etc.) and externally (police, prison, etc.). Social and technological progress has forced steadily increasing numbers of individuals into social institutions historically. Furthermore, it has connected separate societies throughout human history. The scaffolding tightens. Human beings are radically open to such semiotic scaffolding due to what Emmeche calls "the social nature of the human self, seen as the dynamic product of developmental and social processes of construction, interaction, and internalization of a linguistic and social world that form the emerging self from early childhood through adolescence and adult life."[68] The scaffolding function of the institution, however, is amplified manifold by the Internet, which can shape the human external

[68] Claus Emmeche, 'Semiotic Scaffolding of the Social Self in Reflexivity and Friendship', *Biosemiotics*, 8/2 (2015), 275–89, 277.

environment and internal Umwelt in previously inconceivable ways (though it is still in a rather messy state compared to stately institutions).

Individual thought and action thus become increasingly incorporated into the operations of the emerging super-agent. One could say that the emerging super-agent thinks and acts through operations performed by individual subjects. In the words of Emmerche: "the powers of society [are] working through the individual" (283). It is a perhaps underappreciated phenomenon that the emerging super-agent's Umwelt transcends the Umwelt of its individuals; it is a "model of the relevant parts of [the] environment" that goes beyond what the individual human being can experience.[69] From the light spectrum and the observer-dependence of time and distance in special relativity to quantum mechanics, intersubjective thought has transcended individual experience. In a way, however, the superstructure likewise becomes an emerging second interface for the individual agent. The human subject thus creates an Umwelt by technological augmentation of bodily experience that includes dimensions of perception, which go beyond what can be known sensually. One may almost go as far as to say that the individual subject's semiome itself changes. In any case, it is augmented by the ability to "readily react to a wider range of signs."[70] Individual agents are enabled to partake in semiosis beyond their natural limitations by amplified access to signs in the universe. Semiotic freedom thus increases through the spatiotemporally tightening scaffolding (possibly to the degree of immediate augmentation of sensual input). The question, then, is what influence the changing experience of being in the world may have on individual subjectivity?

It is generally acknowledged that the scaffolding processes described above influence individual experience: "Interdisciplinary analyses show that changes in the use of technological tools (from the telescope to the computer screen) affect human communication with the world, and also human cognition."[71] In analogy,

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[69] Hoffmeyer, 'The Semiotic Body' (above, n. 19), 187.

[70] Ajitesh Ghose, 'Algorithms', in Donald Favareau, Paul Cobley, and Kalevi Kull (eds.), *A More Developed Sign. Interpreting the Work of Jesper Hoffmeyer* (Tartu semiotics library, 10, Tartu: Tartu Ülikooli Kirjastus, 2012), 17–20, 18.

[71] Asuncion Lopez-Varely Azcarate, 'Emergence', in Donald Favareau, Paul Cobley, and Kalevi Kull (eds.), *A More Developed Sign. Interpreting the Work of Jesper Hoffmeyer* (Tartu semiotics library, 10, Tartu: Tartu Ülikooli Kirjastus, 2012), 115–8, 116.

I would like to consider the role of the skin for the self: "the skin might be considered a user interface that couples us to the outer world. On the one hand, the skin thus serves as a kind of topological boundary; while, on the other hand, its semiotic capacity opens up the world to us–so that the question of where our 'self' begins and ends is not at all an easy question to answer scientifically."[72] It is in this 'opening up of the world to the organism' that the triadic process of semiosis begins long before humans. It is thus not easy to define the boundaries of the "self" seen as consciousness: "'consciousness' is a strange kind of emergent phenomenon. For we are more conscious, more aware, of events external to our bodies than we are aware of events internal to them."[73,74] Likewise, then, the mind is an interface. The mind, however, works in intersubjective semiosis as well. To quote Ake again: "Thus, we can amplify upon Hoffmeyer's notion that consciousness is the body's spatial and narrative interpretation of its existential umwelt by saying that consciousness also results from the interaction between and among different narrative interpretations from different Umwelten" (78). It has been discussed here that it is the scaffolding of these Umwelten by the social superstructure that makes an intersubjective Umwelt. The thesis, then, is that connectivity and especially the Internet can be understood as an emerging interface in analogy to the skin. In the multicellular body, membrane boundaries are tightly regulated by the super-structure, resulting in what Hoffmeyer termed a "meta-membrane:" "A human body consists of perhaps as much as 30 km^2 of membrane structure. And across all of these membranes there occurs constant biosemiotics activity whereby molecular messages are exchanged in order to bring the biochemical functions on the inside and the outside of these interior membranes into accordance. Thus, the 'meta-membrane' that is the human skin is indeed a highly specialized manifestation of the very same interior interface-principle whereby life processes are most generally build up."[75] Likewise, the individual's internal Umwelt and external environment are increasingly regulated by augmentations and alterations. Perhaps, then, one can speculate with Azcarate

[72] Hoffmeyer, 'The Semiotic Body' (above, n. 19), 173.
[73] Ake, 'Consciousness' (above, n. 3), 76.
[74] Hoffmeyer even quotes Henri Bergson's claim that "my self reaches all the way up to the stars" in Hoffmeyer, 'The Semiotic Body' (above, n. 19), 174.
[75] Ibid., 175.

that "the metaphor of 'membranes' or 'borders' between organisms or systems becomes less important, and emphasis is shifted from considerations of 'space' to aspects of relationships grounded on dynamic systems and processes."[76] The Internet of internets–a swarm of swarms of higher-order semiotic activity–may become a 'meta-membrane' for a super-agent then.

In the age of the individual, 'I-lands' of consciousness emerge out of a vast subconscious swarm of semiotic swarms: "By far the major part of the swarming semiotic control activity remains unconscious to the person."[77] Indeed, the swarming is what we essentially are, according to Hoffmeyer: "we, as conscious individuals, are a kind of epiphenomenon–rather as if the shape of a swarm of bees had the absurd idea that the bees existed to create that shape."[78] This, however, does not mean that consciousness is an epiphenomenon (i.e. an illusion). Despite his use of the term "epiphenomenon" here, Hoffmeyer did certainly not hold the belief that consciousness has no function for the organism: "consciousness supports a long series of different processes and scaffolds perception, cognition, reasoning, categorization, action, communication, language, and a host of other abilities."[79] Consciousness, therefore, is to be seen as the navigation tool to maneuver the vast sea of semiotic processes following the scaffolding. The epiphenomenon, then, is not consciousness, which is functional, but the "person" that consciousness creates, which "remains unconscious" to "the major part of the swarming semiotic control activity."[80] This is an important difference.

The emergence of that "person" depends on the biological agent's spatiotemporal environment, to which we are connected by the interfaces skin and mind. Consciousness–what enters awareness at a particular moment–is what is deemed to be important at that moment: "Thousands of brain modules are constantly trying to win the attention of the body-brain, like soccer players shouting for the ball. But only the lucky ones whose output the body-brain deems to be of direct relevance to the current 'narrative' will gain admission to

[76] Azcarate, 'Emergence' (above, n. 71), 116.
[77] Hoffmeyer, 'The Semiotic Body' (above, n. 19), 181.
[78] Hoffmeyer, *Signs of Meaning in the Universe* (above, n. 25), 128.
[79] Hoffmeyer and Stjernfelt, 'The Great Chain of Semiosis. Investigating the Steps in the Evolution of Semiotic Competence' (above, n. 6), 24.
[80] Hoffmeyer, 'The Semiotic Body' (above, n. 19), 181.

consciousness."[81] The important point that is incorporated in this description is that consciousness is a 'storyteller.' However, it tells a different story at every instant–there is a "current narrative" that is guided by the scaffolding of the current Umwelt. The temporal unity that we have in our experience of ourselves is hence an illusion: "Only in our consciousness do we appear to ourselves as one, or as 'someone'" (124). This implies that consciousness constructs a different 'character' situationally: a bespoke "person" or "someone" featuring in the current narrative and finetuned to the task at hand.[82] This character or "person" is not the same as the subject, which is the experience of a biological organism.[83] Neither is it the same as the agent, which is the force for change in its analog interaction with the outer world.[84] It is also not identical to the self, which is the vast sea of traces of experience that are semiotically scaffolded in an organism.[85] Finally, it is not the same as the individual, which is the independent organism itself brought about evolutionarily by individuation.[86] Unlike the other terms, then, the temporal self or "person" that we appear to be to ourselves is a somewhat epiphenomenally constructed surplus to our conscious experience. It

[81] Hoffmeyer, *Signs of Meaning in the Universe* (above, n. 25), 123.

[82] This "person" as temporal self is not the same as "personhood," which Hoffmeyer sees in the skin, while likewise noting that it is a complicated term, which might be better avoided: "should we feel so compelled as to finally place our personhood in a definite biological locus, why not place it in the skin?" See Hoffmeyer, 'The Semiotic Body' (above, n. 19), 172. It has to be noted here that there are no uncontroversial definitions of these and the following terms, as they are not always used in exactly the same way in the literature.

[83] Hoffmeyer once defined subjectivity as "the capacity for selective (i.e. active) incorporation of the present into the future" in Hoffmeyer, *Signs of Meaning in the Universe* (above, n. 25), 103. Subjectivity is thus present in all life: "the 'subjectivity' of lower organisms and the 'subjectivity' of humans are the respective something and something else. […] there is a continuity from the lower organism precursors to the most complex experiential phenomena in life." See Paul Cobley, 'Subjectivity', in Donald Favareau, Paul Cobley, and Kalevi Kull (eds.), *A More Developed Sign. Interpreting the Work of Jesper Hoffmeyer* (Tartu semiotics library, 10, Tartu: Tartu Ülikooli Kirjastus, 2012), 274–7, 274.

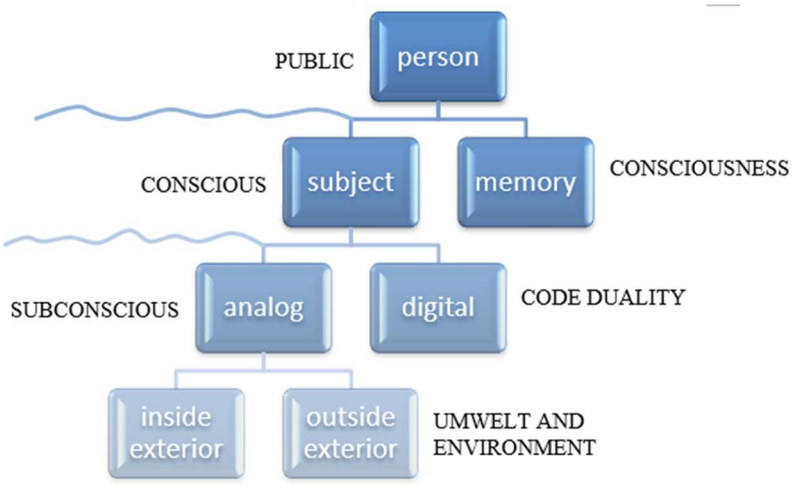
[84] Agency is thus goal-orientated action 'from within:' "I consider an agent as a system with spontaneous activity whose actions are programmed for reaching certain goals." See Sharov, 'Functional Information: Towards Synthesis of Biosemiotics and Cybernetics' (above, n. 15), 1053.

[85] The self, accordingly, is not to be regarded as a once-and-for-all, soul-like thing: "The self, then, is an open-ended semiotic process, characterized by a capacity for interpretive-propositional commitment unfolding in an infinite number of signifying trajectories." See Susan Petrilli, 'Semioindividuality', in Donald Favareau, Paul Cobley, and Kalevi Kull (eds.), *A More Developed Sign. Interpreting the Work of Jesper Hoffmeyer* (Tartu semiotics library, 10, Tartu: Tartu Ülikooli Kirjastus, 2012), 243–7, 243.

[86] While the individual is truly me, the person that I am is thus situationally constructed by interaction: "a person is not absolutely an individual." See Ibid., 244.

is not essential to consciousness (there may well be consciousness without self-consciousness). It is constructed by an interplay of subject and memory (Figure 4).

Fig. 4 Construction of the 'temporal' person



The important point here is that 'memory' does not mean the inscription in the digital code (DNA) or the analog interaction with the object in the inside exterior (Umwelt) and outside exterior (semiotic niche). Rather, it is a constructed personal past from this stored information following situational incentives. Of course, information is stored in the traces of experience that make the semiotic scaffolding of the self in its Umwelt, as well as the digital inscription in the DNA on a lower level. What is termed 'memory' here, however, signifies the *dynamic* aspect of situational retrieval. For this reason, it is portrayed as external to the subject in the schematic representation of the construction of the 'temporal person' (Figure 4), which is not strictly speaking correct. Consciousness constructs a person that fits the subject's current course of action. The information employed, however, can be taken from symbolic communication as well as from experience. Individuals have been found to *construct*, rather than reconstruct,

memories from external information.[87] Indeed, they can even construct traumatic events.[88] These traumatic events, though they are externally implanted, can then in turn play a major role in individual identity construction.[89] Other 'persons' are thus not ontologically speaking more distant from my 'self' than my 'own' former or future 'selves.'[90] It merely appears to be that way due to environmental circumstances, meaning the source of information, which is currently a mostly individual database. The temporal 'self' or 'person,' then, is actually a temporal point. It is a situational construction for the interaction with other agents. This fleeting phenomenon is a construct of consciousness in response to the "narrative" of a given task. It is a character in a story that can change in the next moment, which would require a new character. The 'person' is not substantial, but situational. Currently, children eventually learn how to construct 'personal selves' through constantly reinforced histories in a somewhat stagnant environment.[91] In the twilight before adolescence, these 'personal selves' can still be modified easily.[92] The separation between the individual 'self' and other 'selves' is not firmly established during this phase: early on in the acquisition of language, children think that the knowledge they have is collective knowledge shared by everyone.[93] If the environment in which human beings grow was altered fundamentally through an interface that immediately shares collective knowledge, is it then conceivable that the mind ceases to construct a 'person' of alleged temporal continuity? The individual 'person' might become a tool that is no longer needed in intersubjective interaction.

While it is well-researched that memory is situationally reconstructed and can be deceptive, one may object to the claim that consciousness emerges anew in

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[87] Erik Vance, *Suggestible You: The Curious Science of your Brain's Ability to Deceive, Transform, and Heal* (Washington DC: National Geographic, 2016).
[88] Ibid.
[89] Ibid.
[90] For a philosophical argument against metaphysical selfhood, see Shaun Nichols, 'The Episodic Sense of Self', in Justin D'Arms and Daniel Jacobson (eds.), *Moral Psychology and Human Agency. Philosophical Essays on the Science of Ethics* (First edition, Oxford, United Kingdom: Oxford University Press, 2014), 137–55. Connecting Buddhist philosophy to Nichols' argument, Monima Chadha furthermore shows that the 'self' of our episodic memory is a narrative construction in Monima Chadha, 'Reconstructing Memories, Deconstructing the Self', *Mind & Language*, 34/1 (2019), 121–38.
[91] William Damon and Richard M. Lerner, *Handbook of Child Psychology* (6th edn., Hoboken, N.J.: Wiley, 2006).
[92] Ibid.
[93] Ibid.

every moment. If true, consciousness could potentially give rise to very different constructions by the social superstructure. These situational constructions do not necessarily have to be connected by an experience of a historically continuous 'person.' However, it is not claimed that the 'subject,' 'agent' or 'self' would lose its uniqueness or 'disappear' somehow. The parts that are substantial to the semiotic and biological organism remain. The claim, then, is that our self-understanding as continuous entities ("persons") is something that is grown evolutionarily and culturally, but it is not necessarily essential to the workings of the organism's mind and consciousness. To substantiate this approach, let us look at consciousness and whether it indeed emerges momentarily. Hoffmeyer certainly believed so: "consciousness is not one continuous stream but a sequence of discontinuous snippets of content."[94] Additionally, I want to cite an article by Seán Ó Nualláin from 2010, which introduces empirical work in neurodynamics conducted at the Freeman lab.[95] Ó Nualláin first states that what I call "myself" is a situational construction (meaning what has been termed "person" here, rather than "self"): "I will construct myself in a way that in a biased fashion posits of myself agency/potency, consistency, health, and moral integrity in the face of whatever pressures I am under" (81). Consequently, he reinforces Hoffmeyer's claim of a kind of "pseudo-unification" by consciousness (83). The most intriguing part of his paper, however, is about "selfhood" in light of his empirical findings. It has to be kept in mind here that what he calls "selfhood" and "self" is rather to be understood as my self-awareness of myself as a historical, temporally continuous person, which has been termed "person" here (with Hoffmeyer). Ó Nualláin's findings support the theory proposed in this work: "the cingulate cortex is involved in the moment to moment recreation of sense of self, which, in true multiagent fashion, occurs for each object one is dealing with: […]. We are a different self from moment to moment" (85). With Eagleman and Sejnowski, he even argues that "the brain imposes an Orwellian rewriting of history–a postdiction–certain of its perceptions" (85).[96] In each "state transition" or

[94] Hoffmeyer, *Signs of Meaning in the Universe* (above, n. 25), 121.

[95] Seán Ó Nualláin, 'Ask Not What You Can Do for Yourself: Cartesian Chaos, Neural Dynamics, and Immunological Cognition', *Biosemiotics*, 3/1 (2010), 79–92.

[96] See also David M. Eagleman and Terrence J. Sejnowski, 'Motion Integration and Postdiction in Visual Awareness', *Science*, 287/5460 (2000), 2036–8.

construction, an "overwriting of old content by new" takes place (86). These "state transitions" happen three to seven times a second, which makes it obvious that they are not consciously experienced (86). Additionally, if changes in the Umwelt and the environment of the subject are gradual, then these transitions are (mostly) so self-similar that a sense of 'personhood' naturally persists. However, if we take the ideas of the 'new interface' and 'meta-membrane' in super-connectivity seriously, it is worth a thought if the temporal way of understanding oneself might drop from emergence. This would not entail a loss of conscious experience or subjective uniqueness likewise. To quote Ó Nualláin once more: "[when growing up] we begin with a lack of differentiation initially from the physical world, and then from others" (91). Scaffolded into an emerging super-agent, then, we might go back to this state without losing ourselves or consciousness likewise. It is all a matter of the semiotic scaffolding and semiotic emergence.

CONCLUSION: AN END TO THE I?

In the biosemiotics framework, the multicellular organism is essentially a social system–a "swarm of swarms" of communicative processes. It is precisely for this reason that attempts to look into the future of human evolution should employ biosemiotics. If society is seen as entirely different from biological evolution, one might end up looking for human change merely in the genome. Finally, one may view the human individual itself as a mere machine to produce genes. Or one may end up looking for a change in the machines that humans build rather than in human beings. However, the genome-focused approach would underestimate the potential for creative change in subjectivity and agency. The machine-focused approach, on the other hand, disregards that mindedness is organic and cannot be easily simulated computationally.[97] Looking for evolutionary change in semiosis and semiotic freedom, then, there is no fundamental, ontological

[97] Indeed, it might be impossible to do so. To quote Swan and Goldberg: "The long tradition in the philosophy of mind and cognitive science of conceptualizing the mind as an object leads to the practice of forcing poor analogies between the mind and some object mainly because we are in a better position to understand the object—I am thinking here, of course, of the computer. Computationalism, the idea that the human brain is a computer and thus discoveries made in silicon are applicable to the human brain, has ultimately led us further away from a genuine understanding of organic mindedness." See Liz Stillwaggon Swan and Louis J. Goldberg, 'Introduction: Mentis Naturalis', *Biosemiotics*, 6/3 (2013), 297–300, 298.

difference between the organism and the interplay of organisms. Thus, it becomes possible to analyze human connectivity in analogy to prokaryotic and multicellular emergence. Employing the biosemiotic framework, it becomes clear that utopian visions of near singularities or regained gardens of Eden are misguided. Emergence comes at a cost. And it takes time.

The central challenge for the semiotic emergence of a higher-order agent in every evolutionary case was to scaffold single lower-order agents into a "communal self" where they "work for the common good rather than for their own best interests."[98] The root of this scaffolding process in human connectivity lies in the self-interest of individual agents, who benefit from exchange and collaboration individually. However, this agency for individual benefit becomes increasingly scaffolded by downward causation in the course of sociocultural evolution. The institutions that society builds scaffold the individuals' environment externally and their Umwelten internally. The collective, step by step, becomes an agent in the process. On one hand, individual agency is thus guided into increasing connectivity. Environments are created in which individual agents benefit from increased connectivity. On the other hand, an intersubjective Umwelt is created through the institutional scaffolding of individual Umwelten. Thereby, a worldwide web of transsubjective thought processes governing both knowledge production and rule administration (collective thought and action) emerges. This scaffolding through institutions is amplified manifold by the Internet, at least potentially. Chaotic, selfish behavior by individual agents is suppressed by institutions. Besides random movement, this includes running away or attacking in pressure situations. In an environment shaped by the virtual and in Umwelten augmented with virtual input, entropic behavior of individual agents becomes subjectively inconceivable and objectively impossible.[99]

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[98] Hoffmeyer, 'Semiotic Scaffolding of Multicellularity' (above, n. 1), 161.

[99] Arran Gare elaborates on Schelling's insight that "the evolution of nature, involving emergence of higher and higher levels of organization leading up to human consciousness and the development of Spirit" involves "limiting activity" in Arran Gare, 'Consciousness, Mind and Spirit', *Cosmos and History: The Journal of Natural and Social Philosophy*, 15/2 (2019), 236–64, 257. Essentially, this is also a Fichtean insight: the I limits itself by the positing of a spatiotemporal outer world to gain self-awareness. On Schelling, Gare writes that "nature is becoming conscious of itself" through this "emergence of higher and higher levels of organization" through enabling constraints (243). In an endpoint of evolutionary emergence, then, nature would include itself in its Umwelt, which is reminiscent of Fichte's positing of the environment. The great

Through the intersubjective Umwelt, a new 'interface' develops for the individual to connect to the outside. Internally, this interface scaffolds the individual for the super-structure. Externally, it can be seen as a 'meta-membrane' for an emerging super-agent, thus building a higher-order interior-exterior divide. This 'meta-membrane' interface made of intersubjectivity transcends the Umwelt of its individuals. Its semiotic freedom and subjectivity go beyond what an individual human being can experience. In return, the tightly-scaffolded Umwelten and environment of individuals in this condition might lead to a transition in the workings of individual consciousness. Our current self-understanding as continuous entities ("persons") is grown evolutionarily and culturally. It is not necessarily essential to the workings of the organism's mind and consciousness. The temporal self or "person" that we appear to be to ourselves is a somewhat epiphenomenally constructed surplus to conscious experience. With the emergence of consciousness anew in every instant, personhood is constructed situationally. In super-connectivity, the temporal "person" might become a tool that is no longer needed in intersubjective interaction. This would not entail a loss of conscious experience or subjective uniqueness likewise. The semiotic 'self' would yet be an agent, a subject, and an individual in Hoffmeyer's definition of "individuality in the sense of having a life history" objectively.[100] However, the single will for survival and progress of a 'super-human' agent would "suppress the inherent agency of the individual units" by semiotic scaffolding in analogy to the multicellular organism (155). Being in the world might thus go beyond good and evil–beyond the ancient either-or of action for the common good or individual benefit.

jbfrauen@gmail.com
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astrophysicist John A. Wheeler thought of this observation as the positing of the universe by itself and cites Schelling as the first author of the idea of the universe as a "self-excited circuit" in footnotes to John Archibald Wheeler, 'Information, Physics, Quantum: The Search for Links', in Anthony J. G. Hey (ed.), *Feynman and Computation. Exploring the Limits of Computers* (The advanced book program, Reading, Mass.: Perseus, 1998), 309–36, 334; John Archibald Wheeler, 'Genesis and Observership', in Robert E. Butts and Hintikka Jaakko (eds.), *Foundational Problems in the Special Sciences* (Springer, 1977), 3–33.

[100] Hoffmeyer, 'Introduction: Semiotic Scaffolding' (above, n. 5), 155.

REFERENCES

AKE, STACEY E., 'Consciousness', in Donald Favareau, Paul Cobley, and Kalevi Kull (eds.), *A More Developed Sign. Interpreting the Work of Jesper Hoffmeyer* (Tartu semiotics library, 10, Tartu: Tartu Ülikooli Kirjastus, 2012), 75–9.

AZCARATE, ASUNCION LOPEZ-VARELY, 'Emergence', in Donald Favareau, Paul Cobley, and Kalevi Kull (eds.), *A More Developed Sign. Interpreting the Work of Jesper Hoffmeyer* (Tartu semiotics library, 10, Tartu: Tartu Ülikooli Kirjastus, 2012), 115–8.

BRIER, SØREN, *Cybersemiotics: Why Information is not enough!* (Toronto Studies in Semiotics and Communication; Repr. in pbk, Toronto: University of Toronto Press, 2014).

CANNIZZARO, SARA, 'Where Did Information Go? Reflections on the Logical Status of Information in a Cybernetic and Semiotic Perspective', *Biosemiotics*, 6/1 (2013), 105–23.

CASSIRER, ERNST, *The Philosophy of Symbolic Forms* (New edition, London: Routledge, 2019).

CHADHA, MONIMA, 'Reconstructing Memories, Deconstructing the Self', *Mind & Language*, 34/1 (2019), 121–38.

CLARK, ANDY, and CHALMERS, DAVID J., 'The Extended Mind', *Analysis*, 58/1 (1998), 7–19 <https://philpapers.org/rec/clatem>.

COBLEY, PAUL, 'Subjectivity', in Donald Favareau, Paul Cobley, and Kalevi Kull (eds.), *A More Developed Sign. Interpreting the Work of Jesper Hoffmeyer* (Tartu semiotics library, 10, Tartu: Tartu Ülikooli Kirjastus, 2012), 274–7.

COBLEY, PAUL, and STJERNFELT, FREDERIK, 'Scaffolding Development and the Human Condition', *Biosemiotics*, 8/2 (2015), 291–304.

DAMON, WILLIAM, and LERNER, RICHARD M., *Handbook of Child Psychology* (6th edn., Hoboken, N.J.: Wiley, 2006).

DEELY, JOHN N., *Basics of Semiotics* (Advances in semiotics, Bloomington: Indiana University Press, 1990).

——, 'Vis a Prospecto', in Donald Favareau, Paul Cobley, and Kalevi Kull (eds.), *A More Developed Sign. Interpreting the Work of Jesper Hoffmeyer* (Tartu semiotics library, 10, Tartu: Tartu Ülikooli Kirjastus, 2012), 315–9.

DELEUZE, GILLES, and HAND, SEÁN, *Foucault* (Athlone contemporary European thinkers, London: Continuum, 2004).

EAGLEMAN, DAVID M., and SEJNOWSKI, TERRENCE J., 'Motion Integration and Postdiction in Visual Awareness', *Science*, 287/5460 (2000), 2036–8.

EMMECHE, CLAUS, 'Semiotic Scaffolding of the Social Self in Reflexivity and

Friendship', *Biosemiotics*, 8/2 (2015), 275–89.

EMMECHE, CLAUS, FAVAREAU, DONALD, and KULL, KALEVI, 'Jesper Hoffmeyer 1942–2019', *Biosemiotics*, 12/3 (2019), 365–72.

FOUCAULT, MICHEL, *Discipline and Punish: The Birth of the Prison* (Penguin social sciences; Reprint, London: Penguin Books, 1991).

FRAUEN, JAN-BOJE, 'The Compulsions of Interdependence. Norbert Elias' *Civilizing Process* as Evolutionary Realism', *The Review of International Affairs*, 70/1174 (2019), 5–21.

——, 'The Machinery for Change. A Historical Analysis of the Roots of Liberal-representative Democracy, a Critical Approach towards Forced Democratizations and an Outlook on the Future Evolution of the Liberal Order', *European Journal of Political Science Studies*, 2/2 (2019) <https://oapub.org/soc/index.php/EJPSS/article/view/535>.

——, 'Fire & Language. The Two-Faced Process of Progress in Deep-Structural Sociocultural Evolution', *World Futures*, 76/4 (2020), 189–213.

GARE, ARRAN, 'Biosemiotics and Causation. Defending Biosemiotics through Rosen's Theoretical Biology or Integrating Biosemiotics and Anticipatory Systems Theory', *Cosmos and History: The Journal of Natural and Social Philosophy*, 15/1 (2019), 31–62.

——, 'Consciousness, Mind and Spirit', *Cosmos and History: The Journal of Natural and Social Philosophy*, 15/2 (2019), 236–64.

——, 'Semiosis and Information: Meeting the Challenge of Information Science to Post-Reductionist Biosemiotics', *Biosemiotics*, 13/3 (2020), 327–46.

GHOSE, AJITESH, 'Algorithms', in Donald Favareau, Paul Cobley, and Kalevi Kull (eds.), *A More Developed Sign. Interpreting the Work of Jesper Hoffmeyer* (Tartu semiotics library, 10, Tartu: Tartu Ülikooli Kirjastus, 2012), 17–20.

HEYLIGHEN, FRANCIS, 'Return to Eden. Promises and Perils on the Road to Global Superintelligence', in Ben Goertzel and Ted George Goertzel (eds.), *The End of the Beginning. Life, Society and Economy on the Brink of the Singularity* (First edition, Los Angeles, California: Humanity+ Press, 2015), 243–307.

HOFFMEYER, JESPER, *Signs of Meaning in the Universe* (Bloomington: Indiana University Press, 1996).

——, 'Uexküllian Planmässigkeit', *Σημειωτική-Sign Systems Studies*, 32/1-2 (2004), 73–97.

——, 'The Semiotic Body', *Biosemiotics*, 1/2 (2008), 169–90.

——, *Biosemiotics: An Examination into the Signs of Life and the Life of Signs* (Chicago: Univ. of Chicago Press, 2009).

——, 'Introduction: Semiotic Scaffolding', *Biosemiotics*, 8/2 (2015), 153–8.

——, 'Semiotic Scaffolding of Multicellularity', *Biosemiotics*, 8/2 (2015), 159–71.

HOFFMEYER, JESPER, and EMMECHE, CLAUS, 'Code-duality and the Semiotics of Nature', in Myrdene Anderson and Floyd Merrell (eds.), *On Semiotic Modeling* (Berlin: Mouton de Gruyter, 1991), 117–66.

HOFFMEYER, JESPER, and STJERNFELT, FREDERIK, 'The Great Chain of Semiosis. Investigating the Steps in the Evolution of Semiotic Competence', *Biosemiotics*, 9/1 (2016), 7–29.

JAROŠ, FILIP, and MARAN, TIMO, 'Humans on Top, Humans among the Other Animals: Narratives of Anthropological Difference', *Biosemiotics*, 12/3 (2019), 381–403.

JONAS, HANS, *The Phenomenon of Life*: *Toward a Philosophical Biology* (Northwestern University studies in phenomenology and existential philosophy, Evanston: Northwestern University Press, 2001).

KULL, KALEVI, 'Beyond Word: On the Semiotic Mechanisms', *Biosemiotics*, 7/3 (2014), 465–70.

KULL, KALEVI, and VELMEZOVA, EKATERINA, 'Jesper Hoffmeyer: Biosemiotics Is a Discovery', *Biosemiotics*, 12/3 (2019), 373–9.

MCLUHAN, MARSHALL, *The Gutenberg Galaxy*: *The Making of Typographic Man* (Reprinted., Toronto: Univ. of Toronto Pr, 2002).

NICHOLS, SHAUN, 'The Episodic Sense of Self', in Justin D'Arms and Daniel Jacobson (eds.), *Moral Psychology and Human Agency*. *Philosophical Essays on the Science of Ethics* (First edition, Oxford, United Kingdom: Oxford University Press, 2014), 137–55.

Ó NUALLÁIN, SEÁN, 'Ask Not What You Can Do for Yourself: Cartesian Chaos, Neural Dynamics, and Immunological Cognition', *Biosemiotics*, 3/1 (2010), 79–92.

OSTDIEK, GERALD, 'Me, Myself, and Semiotic Function: Finding the "I" in Biology', *Biosemiotics*, 9/3 (2016), 435–50.

PETRILLI, SUSAN, 'Semioindividuality', in Donald Favareau, Paul Cobley, and Kalevi Kull (eds.), *A More Developed Sign*. *Interpreting the Work of Jesper Hoffmeyer* (Tartu semiotics library, 10, Tartu: Tartu Ülikooli Kirjastus, 2012), 243–7.

PRAKASH, CHETAN, 'On Invention of Structure in the World: Interfaces and Conscious Agents', *Foundations of Science*, 25/1 (2020), 121–34.

SHAROV, ALEXEI A., 'Functional Information: Towards Synthesis of Biosemiotics and Cybernetics', *Entropy*, 12/5 (2010), 1050–70.

SHAROV, ALEXEI A., MARAN, TIMO, and TØNNESSEN, MORTEN, 'Comprehending the Semiosis of Evolution', *Biosemiotics*, 9/1 (2016), 1–6.

SURYNA, KATSIARYNA, '"Subject" and "Self" in Biosemiotics: On Conditions of a Legitimate Application of "Subject" in Biosemiotics and Prerequisites of a

Biosemiotic Approach to the Self', *Chinese Semiotic Studies*, 10/3 (2014), 509–20.

SWAN, LIZ STILLWAGGON, and GOLDBERG, LOUIS J., 'Introduction: Mentis Naturalis', *Biosemiotics*, 6/3 (2013), 297–300.

TEILHARD DE CHARDIN, PIERRE, *The Phenomenon of Man* (1st Harper Perennial Modern Thought ed., New York: Harper Perennial Modern Thought, 2008).

TØNNESSEN, MORTEN, SHAROV, ALEXEI A., and MARAN, TIMO, 'Jesper Hoffmeyer's Biosemiotic Legacy', *Biosemiotics*, 12/3 (2019), 357–63.

TURCHIN, VALENTIN F., *The Phenomenon of Science* (New York: Columbia Univ. Press, 1977).

TURNER, J. SCOTT, 'Semiotics of a Superorganism', *Biosemiotics*, 9/1 (2016), 85–102.

VANCE, ERIK, *Suggestible You: The Curious Science of your Brain's Ability to Deceive, Transform, and Heal* (Washington DC: National Geographic, 2016).

WEBER, ANDREAS, 'The Book of Desire: Toward a Biological Poetics', *Biosemiotics*, 4/2 (2011), 149–70.

WHEELER, JOHN ARCHIBALD, 'Genesis and Observership', in Robert E. Butts and Hintikka Jaakko (eds.), *Foundational Problems in the Special Sciences* (Springer, 1977), 3–33.

——, 'Information, Physics, Quantum: The Search for Links', in Anthony J. G. Hey (ed.), *Feynman and Computation. Exploring the Limits of Computers* (The advanced book program, Reading, Mass.: Perseus, 1998), 309–36.

WHEELER, WENDY, *The Whole Creature: Complexity, Biosemiotics and the Evolution of Culture* (London: Lawrence & Wishart, 2006).