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# Engaging the Anthropocene beyond disciplinary boundaries: Biosemiotics and ecosemiotic perspectives

**Significance:**

In this Commentary, we discuss biosemiotics and ecosemiotics as two interrelated fields of thought that, in our view, create a platform for natural, social and humanities scientists to join hands in exploring issues relating to the environment and ecology. The insight that ecological systems are also semiotic systems and not only physical-chemical-biological systems means that the ecological debate cannot be reduced to the interests of natural scientists.

**Introduction**

Humans have always pondered the meaning of their existence and their relationship to the world around them. The 21st century is no exception; scholars from all over the academic spectrum are currently engaged in various questions regarding human existence and its ecological implications. While neuroscientists are trying to explain the workings of the human brain and how it gives rise to complex phenomena such as language and art<sup>1</sup>, philosophers and humanities scholars generally are trying to understand what it means to be human in this century. One of the factors that is central to questions around human life in the 21st century is the ecological crisis.

One could argue that humanity is, on the one hand, trying to figure out how far it *can* go with its technical abilities, exploring advances such as space travel and artificial intelligence. On the other hand, it is trying to figure out how far it *should* go, in other words, what the ethical and ecological implications of its technological ‘progress’ are. The question of how far humans *should* go is currently closely linked to the impact that technological advances might have on the more-than-human environment. One of the core problems in this ecological debate is what Timo Maran<sup>2</sup> calls ‘symbolocentrism’, i.e. the idea that humans are under the illusion that they exist in a symbolic universe only, with little contact with, and therefore little consideration for, the material world. Hence, the rise of a plethora of approaches broadly known under the term ‘new materialism’.<sup>3-7</sup>

Biosemiotics and the concomitant ecosemiotics offer, in our view, transdisciplinary perspectives for engaging with this complex debate that are promising for both biological and semiotic reasons. We use this Commentary to explain the two approaches and consider their implications for scholarly work on the ecological crisis in South Africa.

**Biosemiotics**

Biosemiotics is a fairly recent addition to the smorgasbord of scholarly interests. It entails an interdisciplinary collaboration between biologists and semioticians, emerging from the insight that semiosis and life are probably co-emergent. The development of this field in the 20th century has been documented in detail<sup>8,9</sup>, so we do not repeat it here. Rather, we focus on some of the foundational concepts and research opportunities that the field provides.

As indicated above, the basic tenet in biosemiotics is that life and semiosis are co-emergent. From the molecular level upwards, life requires semiosis, i.e. meaning-making and meaning-taking, both internally and externally to the organism.<sup>10</sup> Internally, information is shared between the cell and molecules such as DNA. This process is called endosemiotics.<sup>10</sup> In multicellular organisms, at a next level, information also needs to be shared between the cells, and between organs in the organism, to maintain the whole organism. Equally, externally to the organism, all living organisms need the biological ability to perceive information in their environment, judge its relevance and act on that judgement, which is a semiotic activity.<sup>11</sup> In the biosemiotic view, life cannot be reduced to either biophysics or semiotics, but must entail a biosemiotic component because living organisms are semiotically active.

One of the implications of a biosemiotic approach is that semiosis does not require a brain and is not limited to lingual action. Recall that semiosis happens even at a cellular level. Semiotic processes take place both within and between the bodies of living organisms and their environment, irrespective of whether that organism has a brain. A good example is the ability of bacteria to sense a higher gradient of glucose in a Petri dish and then move in the direction of this higher solution. This means, per implication, that there are levels of semiosis. The argument is that semiosis at a cellular level and semiosis between human organisms and their environment are not at the same level. Emergent levels of semiosis are, according to this view, increasingly complex<sup>12</sup>, starting as chemical interaction and evolving into ideational interaction. Generally speaking, biosemioticians distinguish between biosemiotics, which covers semiosis in all non-human living organisms, and eusemiotics, which deals with human organisms only. Biosemiotics itself is usually divided into zoosemiotics and phytosemiotics to distinguish between semiosis in animals and plants. We need to point out that there is debate about these (categorical) distinctions, not only about whether they are valuable in the first place, but also about the boundaries between them, should one argue for the need to make them. An implication of this emergent view of semiosis is that one could also describe the translation processes at the various levels, starting from making protein on the basis of messenger RNA<sup>13</sup> and moving on to the ideational translation processes involved in the creation of human culture. Describing these levels of translation has only just begun<sup>14</sup>, and poses fascinating research possibilities.

Another key consideration in biosemiotics is Umwelt, a concept developed by the Estonian biologist of Baltic German origin, Jakob von Uexküll.<sup>15,16</sup> Despite criticism that can be brought against Von Uexküll’s political agenda



and some of the philosophical implications of his work<sup>17</sup>, Umwelt remains a useful concept. The notion is used to capture the idea that every species is endowed with a particular set of perceptual apparatus, which means that every species perceives reality in the way allowed for by their perceptual apparatus. This means that every species constructs its Umwelt, its phenomenal world, in a unique way.

More recent work in Umwelt theory has linked it to phenomenology and questions of interspecies communication.<sup>18-21</sup> This question of interspecies communication has moved the biosemiotic debate into the larger debate about ecology, giving rise to the field of ecosemiotics<sup>22-25</sup> that will be discussed in the next section. This interest covers communication between different species and also communication between humans and other species.<sup>26,27</sup>

## Ecosemiotics

As a discipline, ecosemiotics is relatively young. It emerged in the mid-1990s as a branch of biosemiotics to explore the semiotic interactions between organisms and their environments. More succinctly, it aims to connect semiotics to ecology.<sup>28</sup> It thereby offers a novel lens through which the relationship between the signs intrinsic to all life (which, as explained above, can be both verbal and non-verbal) and the environments in which they are sent and received, can be explored. As a point of departure, ecosemiotics takes a sign, which is often regarded as belonging to the domains of language and culture only, to be “not as a fully conventional and arbitrary means of human culture, but as partly rooted in the natural world and in our corporality”<sup>28</sup>. In other words, signs are as much a part of nature as they are of culture, and furthermore, human culture is fully part of nature, and not separate from it.<sup>22</sup>

Kalevi Kull argues that semiotics is about knowledge and knowing<sup>29</sup>, and as such, through an ecosemiotic lens, we can start to understand how physical objects and their meanings influence ecological systems and human understanding of – and interaction with – these systems. By physical objects he means here both animate and inanimate objects, and both individual objects, such as a particular animal, and collective objects such as ecosystems. Important to note here is that ecosemiotics does not only consider intentional signs as contributing to meaning making, but non-intentional signs as well.<sup>30</sup> In this light, we can argue “that meaning is always rooted in the material processes of life”<sup>31</sup>, hence the need to combine biology and semiotics without reducing the argument to either.

Semiotic processes in ecosemiotics involve the continuous interaction between signs, their objects and the meaning ascribed to them by a particular meaning maker (human or more-than-human). These processes are seen as fundamental to the functioning of ecosystems, as well as to the way in which these ecosystems are regarded by observers (in other words, humans). An ecosemiotic approach allows for an analysis of these processes to uncover their meaning within an ecological system as well as their cultural implications in a particular space and time. This can involve studies of landscapes<sup>32</sup>, studies of human–animal relations and human ecology<sup>33</sup>, exploration into ecosystems<sup>34</sup>, and even agricultural activities<sup>35</sup>, amongst many others.

Like biosemiotics, ecosemiotics allows for cross- and transdisciplinarity between human and social sciences and natural sciences. Moreover, one of the distinguishing features of semiotics, and, by extension, ecosemiotics, is its propensity to stimulate self-reflexivity in the researcher.<sup>34</sup> It also allows the researcher to identify the ways in which human activities impact more-than-human spaces and lives, and at the same time how more-than-human spaces and lives impact human activity. In other words, studying closely the interaction between humans and the more-than-human, or the perception of the more-than-human by the human, can be done through a critical lens. For example, a researcher can observe the impact that human action has on a particular environment, and place it in relation to the production of the human perception of that environment. For instance, expanding an urban space into a once non-urban space (an open field) replaces the trees and grasslands with buildings, which signifies habitat loss and ecological disruption. Alternatively, nature can also influence human perceptions and actions – natural phenomena such as droughts can introduce new signs, such as dry natural water sources and dying flora, that signify environmental change. These examples of interactions point to the reciprocal nature of

human–more-than-human relations in the environment, where material signs (such as dry dams or buildings) mediate the dynamic interplay between nature and culture.

In our view, biosemiotics and ecosemiotics create a platform for natural, social and humanities scientists to join hands in exploring issues relating to the environment and ecology. The insight that ecological systems are also semiotic systems and not only physical-chemical-biological systems means that the ecological debate cannot be reduced to the interests of natural scientists. Rather, what seems to be emerging is a transdisciplinary debate mediated through translations between species, languages, and disciplines. Having recently hosted the 24th Gatherings in Biosemiotics in Bloemfontein, the first time ever that these Gatherings have been held south of the equator and in the Global South, we call on southern African scholars interested in aspects of the ecology to consider participating in a bio-eco-semiotic debate about the Anthropocene.

Interestingly enough, South Africa has a rich history of thought in biosemiotics and ecosemiotics through the work of philosopher John Collier from the University of KwaZulu-Natal, theoretical biologist Jannie Hofmeyr from Stellenbosch University and evolutionary biologist Hugh Paterson from the University of the Witwatersrand. Currently, we are working in bio- and ecosemiotics and translation. It is perhaps time to formalise these scattered interests in structured discussions amongst South(ern) African scholars.

## Conclusion

Given the current ecological crisis and the focus on ecology and the more-than-human, biosemiotic and ecosemiotic approaches to studying the relations between humans and the material (and, by extension, the natural) world are not only significant for those working in ecology and other relevant biological fields, but also for humanities scholars who work in the broader environmental humanities. The integration of ecosemiotic and biosemiotic approaches in our understanding of the environment and the world is not just a scholarly endeavour. Rather, we believe that it is a critical shift in how we perceive and engage with the environment in an era of profound ecological and existential crisis. By recognising that all life forms – from the simplest cells, to plants, to animal communities, to complex human societies – are engaged in continuous meaning-making processes, we break free from the outdated notions that humanity is isolated in a symbolic world and that the material issues of the world are not related to humanity. Instead, we see that our actions, perceptions, and cultural practices are deeply embedded in, reflective of, and determined by, the natural world.

This realisation can be transformative, as it calls for a new ethic of understanding the interrelations between humans and the natural world. In this transformed understanding, human progress cannot be measured only by technological advances but must crucially also be measured by our ability to understand and reflect on the semiotic relationships that sustain all life on earth. Ecosemiotics and biosemiotics offer conceptual tools to navigate this complex terrain, bridging the gap between formerly disparate disciplines and fostering a more holistic, reflective and responsible approach to research about our shared environment. In doing so, these fields provide a pathway toward an interconnected future of scholarly engagement in which human culture, the environment and all of its inhabitants (from bacteria, to plants, to all animals – including humans) are inextricably linked and interdependent.

## Declarations

We have no competing interests to declare. We have no AI or LLM use to declare. Both authors read and approved the final manuscript.

## References

1. Deacon TW. *Incomplete nature: How mind emerged from matter*. New York: WW Norton & Company; 2013.
2. Maran T. *Ecosemiotics: The study of signs in changing ecologies*. Cambridge: Cambridge University Press; 2020. <https://doi.org/10.1017/9781108942850>
3. Barad K. *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning*. London: Duke University Press; 2007. <https://doi.org/10.2307/j.ctv12101zq>



4. DeLanda M. The new materiality. *Architl Des.* 2015;85(5):16–21. <https://doi.org/10.1002/ad.1948>
5. Dolphijn R, Van der Tuin I. *New materialism: Interviews and cartographies.* London: MPublishing/Open Humanities Press; 2012. <https://doi.org/10.3998/ohp.11515701.0001.001>
6. Latour B. *Reassembling the social: An introduction to actor-network theory.* Oxford: Oxford University Press; 2007.
7. Monforte J. What is new in new materialism for a newcomer. *Qual Res Sport Exerc Health.* 2018;10(3):378–390. <https://doi.org/10.1080/2159676X.2018.1428678>
8. Favareau D. The evolutionary history of biosemiotics. In: Barbieri M, editor. *Introduction to biosemiotics: The new biological synthesis.* Dordrecht: Springer; 2007. p. 1–67. [https://doi.org/10.1007/1-4020-4814-9\\_1](https://doi.org/10.1007/1-4020-4814-9_1)
9. Kull K. A brief history of biosemiotics. In: Barbieri M, editor. *Biosemiotics: Information, codes and signs in living systems.* New York: Nova Publishers; 2007. p. 1–26.
10. Hoffmeyer J. *Biosemiotics: An examination into the signs of life and the life of signs.* London: University of Scranton Press; 2008. <https://doi.org/10.1007/978-1-4020-6706-8>
11. Kull K. Semiosis stems from logical incompatibility in organic nature: Why biophysics does not see meaning, while biosemiotics does. *Prog Biophys Mol Biol.* 2015;119:616–621. <https://doi.org/10.1016/j.pbiomolbio.2015.08.002>
12. Hoffmeyer J, Stjernfelt F. The great chain of semiosis: Investigating the steps in the evolution of semiotic competence. *Biosemiotics.* 2016;9:7–29. <https://doi.org/10.1007/s12304-015-9247-y>
13. Marais K, Kull K. Biosemiotics and translation studies: Challenging “translation”. In: Gambier Y, Van Doorslaer L, editors. *Border crossings: Translation studies and other disciplines.* Amsterdam: Benjamins; 2016. p. 169–188. <https://doi.org/10.1075/btl.126.08mar>
14. Marais K. Levels of translation, levels of freedom. In: Sharov A, Mikhailovsky G, editors. *Pathways to the origin and evolution of meanings in the universe.* Hoboken, NJ: Scrivener Publishing; 2023. <https://doi.org/10.1002/9781119865667.ch19>
15. Von Uexküll J. *Theoretical biology.* London: Kegan Paul, Trench, Trubner & Co Ltd; 1926.
16. Von Uexküll J. An introduction to Umwelt. *Semiotica.* 2001;134(1/4):107–110. <https://doi.org/10.1515/semi.2001.017>
17. Schnodl G, Sprenger F. Translated by Taylor MT, Yung W, Uexküll’s surroundings: Umwelt theory and right-wing thought. *Lüneburg: Meson Press; 2021.*
18. Kull K, Torop P, Petrilli S. Translation. In: *Biotranslation: Translation between Umwelten.* Amsterdam: Rodopi; 2003. p. 315–328. Available from: [https://doi.org/10.1163/9789004490093\\_020](https://doi.org/10.1163/9789004490093_020)
19. Kull K. Umwelt and modelling. In: Copley P. *The Routledge companion to semiotics.* New York: Routledge; 2010. p. 43–56.
20. Maran T. Ecological repertoire analysis: A method of interaction-based semiotic study for multispecies environments. *Biosemiotics.* 2020;13:63–75. <https://doi.org/10.1007/s12304-020-09378-9>
21. Sharov A, Tonneson M. *Semiotic agency: Science beyond mechanism.* Dordrecht: Springer; 2021. <https://doi.org/10.1007/978-3-030-89484-9>
22. Kull K. Semiotic ecology: Different natures in the semiosphere. *Sign Syst Stud.* 1998;26:344–371. <https://doi.org/10.12697/SSS.1998.26.15>
23. Kull K. Ecosystems are made of semiotic bonds: Consortia, Umwelten, biophony and ecological codes. *Biosemiotics.* 2010;3:347–357. <https://doi.org/10.1007/s12304-010-9081-1>
24. Maran T, Kull K. Ecossemiotics: Main principles and current developments. *Geogr Ann B Hum Geogr.* 2014;96(1):41–50. <https://doi.org/10.1111/geob.12035>
25. Maran T. The ecossemiosphere is a grounded semiosphere. A Lotmanian conceptualization of cultural-ecological systems. *Biosemiotics.* 2021;12: 519–530. <https://doi.org/10.1007/s12304-021-09428-w>
26. Jaros F. Cats and human societies: A world of interspecific interaction and interpretation. *Biosemiotics.* 2016;9:287–306. <https://doi.org/10.1007/s12304-016-9253-8>
27. Marais K. Tom, Dick and Harry as well as Puss in Boots and Fido are translators: The implications of biosemiotics for translation studies. In: Carbonli i Cortez O, Monzo Nebot E, editors. *Translating asymmetry/ Rewriting power.* Amsterdam: Benjamins; 2021. p. 101–121. <https://doi.org/10.1075/btl.157.05mar>
28. Maran T. *Ecossemiotics: The study of signs in changing ecologies.* Cambridge: Cambridge University Press; 2020. <https://doi.org/10.1017/9781108942850>
29. Kull K. On the limits of semiotics, or the thresholds of/in knowing. In: Thellefsen T, Sørensen B, editors. *Umberto Eco in his own words.* Berlin: De Gruyter; 2017. p. 41–47. <https://doi.org/10.1515/9781501507144-007>
30. Nöth W. Ecossemiotics and semiotics of nature. *Sign Syst Stud.* 2001;29:71–81. <https://doi.org/10.12697/SSS.2001.29.1.06>
31. Cosgrove D. Landscape: Ecology and semiosis. In: Palang H, Fry G, editors. *Landscape interfaces: Cultural heritage in changing landscapes.* Dordrecht: Springer; 2003. p. 15–21. [https://doi.org/10.1007/978-94-017-0189-1\\_2](https://doi.org/10.1007/978-94-017-0189-1_2)
32. Lindström K, Kull K, Palang H. Semiotic study of landscapes: An overview from semiology to ecossemiotics. *Sign Syst Stud.* 2011;39(2/4):12–36. <https://doi.org/10.12697/SSS.2011.39.2-4.02>
33. Tønnessen M. Current human ecology in the Amazon and beyond: A multi-scale ecossemiotic approach. *Biosemiotics.* 2020;13(1):89–113. <https://doi.org/10.1007/s12304-020-09379-8>
34. Maran T. Deep ecossemiotics: Forest as a semiotic model. *Recherches Sémiotiques.* 2021;39(1–2):287–303. <https://doi.org/10.7202/1076237ar>
35. Farina A. Rural sanctuary: An ecossemiotic agency to preserve human cultural heritage and biodiversity. *Biosemiotics.* 2018;11(1):139–158. <https://doi.org/10.1007/s12304-018-9319-x>