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Przemysław Degórski*

Doctoral student
Adam Mickiewicz University in Poznań
Theatre and Media Art Institute of the
Faculty of Anthropology and Cultural Studies

MEANING MATTERING IN BJÖRK'S *BIOPHILIA* – AN ANALYSIS FROM THE VIEWPOINT OF KAREN BARAD'S AGENTIAL REALISM¹

Abstract: The aim of this paper is to analyse Björk's transdisciplinary project *Biophilia* in the context of Karen Barad's agential realism. I will compare how matter creates meaning in both the artist's and the researcher's approach from the relationship between phenomena occurring in the physical and 'natural' world. The first part of the article presents the principles of Barad's point of view to a new materialism paradigm and focuses on how matter takes an active role in creating meanings and how it is performatively correlated with an apparatus. This problem also highlights how new materialism approaches an intra-connected relationship between human and non-human beings. By showcasing this perspective I will try to find similarities in Björk's perspective of creating sound in *Biophilia*. I will analyse the project in terms of relationships between natural phenomena and music theory elements (that Björk connected within the songs), ways of using technology by the Icelandic artist and *Biophilia's* application as a tool with similar characteristics to Barad's apparatus.

Keywords: agential realism, Karen Barad, *Biophilia*, Björk, new materialism, intra-action

* The author's contact details: degorskiprzemyslaw@gmail.com

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Introduction

In this paper, based on *Biophilia* – a transdisciplinary music project of the Icelandic artist Björk, I will describe how it creates a specific combination of elements derived from issues of music theory and musicology with phenomena occurring in the environment. I will look at this relationship using Karen Barad's agential realism. I will trace how Björk creates a non-distanced knowledge that, like in the new materialism paradigm, is connected to the direct material engagement.² Both Björk and Barad start in their investigation from constructing theories to physical phenomena existing in the environment. In this paper I will look at how the shift from matter to discourse is shared by the researcher and the artist. I will also look at the application integral to *Biophilia* as a cognitive tool that performatively reconfigures and actively influences the musical issues under investigation as well as becoming a constitutive part of them.³ As Barad's agential realism assumes the active role of non-human matter and encourages an openness to this kind of interaction, I will analyze how the relationship between human and nature is formed through sound and technology. I will also use Douglas Kahn's material-energetic approach to sound arising from being open to the flow of electromagnetic interactions.⁴

Mattering of the world, mattering of the sound

One of the most significant and resonant postulates of Karen Barad's theoretical project of agential realism is the emergence of meaning and discourse mediated by the matter. One particularly interesting feature of the researcher's work is the way in which she sees an analogy between the material and discursive worlds by countering the transcendental and dualistic tradition of separating scientific realism from social constructivism in order to create a common field of meaning through the process of mattering the world.⁵ The philosopher built her perspective on the observation that language, interpretation, and semiotics have been assigned too large a role in knowledge pro-

² Rick Dolphijn, Iris van der Tuin, *New Materialism: Interviews & Cartographies*, Utrecht, Open Humanities Press, 2012, 52.

³ Karen Barad, "Co jest miarą nicości? Nieskończoność, wirtualność, sprawiedliwość", in: O. Ciemięcka, M. Rogowska-Stangre (Eds), *Feministyczne nowe materializmy: usytuowane kartografie*, Lublin, E-naukowiec, 2018, 64.

⁴ Douglas Kahn, *Earth Sound Earth Signal: Energies and Earth Magnitude in the Arts*, Los Angeles, University of California Press, 2013.

⁵ Karen Barad, "Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter", *Journal of Women in Culture and Society*, Vol. 28, No. 3, 2003, 810.

duction, thereby taking away the agency of the matter itself, understood as passive and unchanging or existing 'after' the language and culture as a derivative of them.⁶ Karen Barad reverses this direction with her research, suggesting that it is matter that becomes the primary force upon which discourse is constructed. Before crystallizing her proposal for a new materialism, she obtained a PhD degree in quantum field physics, and from this perspective she derives her own transdisciplinary perspective that combines quantum physics theories with feminist theory, science and technology studies, as well as philosophical and cultural studies. Her concept, as she puts it, eliminates the boundaries between the human and the non-human, the material and the discursive, acknowledging the co-constitutivity of all these spheres in relation to reality.⁷ To describe this way of understanding and perceiving reality, Barad uses historically important episodes in the development of physical research, such as those related to light radiation, Young's experiment (which involved passing light through two narrow slits in close proximity and observing the resulting image on a screen), measuring the position and momentum of molecules, or Niels Bohr's thought experiment defining the wave-particle nature of matter. It is supported by two concepts that derive from the mechanics of wave propagation – reflection and diffraction (bending of the wave). Based on the contrast between these two phenomena, the researcher draws more general models of producing knowledge.

Barad connects representationalism with reflectivity, which results in the cognition of objects without their constitutive participation in the process. This model positions matter as pre-existing, cognition-independent objects that are free from the deformation of the cognitive apparatus. Matter in this perspective has concretely defined boundaries and separates itself from the subject. The model of reflection (which Barad attributes to the Newtonian, classical way of understanding the principals of physics) thus generates a series of dualistic divisions: between ontology and epistemology, nature and culture, social and environmental space, things and mental constructs (represented by words). Representations, moreover, serve to mimetically find similarities – literal “mirror images” of matter.⁸

⁶ Ibid., 801–802.

⁷ Ewa Hyży, “Dzielenie się światem. Nowy feministyczny realizm w ujęciu Karen Barad”, in: E. Hyży (Ed.), *Feministyczne konteksty. Multidyscyplinarne*, Toruń, Wydawnictwo Adam Marszałek, 2017, 63.

⁸ Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*, Durham–London, Duke University Press, 2007, 89–90.

In opposition, Barad presents a diffraction methodology derived from both Donna Haraway's theory and the aforementioned experiments within quantum physics, noting that this discipline not only complements Newtonian classical physics, but actually replaces it.⁹ Diffraction, unlike reflection, draws attention not to similarities but to the differentiation that takes place between the observed matter and the observer. Barad admits that in an experiment in which a diffraction grating is produced on a screen after a particle has passed through two narrow slits, the arrangement of the pattern between the bands of enhancement and extinction (that is, the arrangement of light and dark bands produced by the interference of light waves) depends on the properties of the device through which the wave is passed¹⁰ (what is meant here is the number of slits and the distances between them).

The researcher describes the diffraction methodology by suggesting Donna Haraway, who describes it as a critical practice for bringing about change in the world. It is a commitment to understanding how differences matter, which differences matter, and for whom. It is a critical practice of engagement, not a learning practice of reflection from a distance. According to agential realism, knowing, thinking, measuring, theorizing, and observing are material practices of acting within and as part of the world.¹¹

Barad recognizes that the research apparatus takes an active part in constructing the meaning of the object under study and is onto-epistemologically entangled with it:

Apparatuses are not inscription devices, scientific instruments set in place before the action happens, or machines that mediate the dialectic of resistance and accommodation. They are neither neutral probes of the natural world nor structures that deterministically impose some particular outcome. In my further elaboration of Bohr's insights, apparatuses are not mere static arrangements *in* the world, but rather *apparatuses are dynamic (re)configurings of the world, specific agential practices/intra-actions/performances through which specific exclusionary boundaries are enacted.*¹²

Barad explains this property of the intertwining of object and subject using the example of Bohr's thought experiment on the study of the position and momentum of a photon, which proves that it is not possible to measure both

⁹ Ibid., 110.

¹⁰ Ibid., 91.

¹¹ Ibid., 90–91.

¹² Karen Barad, "Posthumanist Performativity...", op. cit., 816.

properties with exactly the same precision. It is only by applying a different test instrument against which the photon is supposed to bounce (against a rigidly or movably mounted plate) can reveal and constitute the result that concerns the different property of the matter under study.¹³

Bohr's theoretical concepts are thus revealed and defined with the causal contribution of the physical circumstances needed to make the measurement. The apparatus in Barad's case is thus performative in nature, which actively affects the way knowledge is produced and transformed. The research instrument embodies certain concepts at the expense of others.¹⁴ Barad, in order to maintain methodological consistency, does not use concepts drawn from physics as metaphors illustrating or reflecting models that she will then superimpose on areas occupied by humanistic thought and theory. The researcher grounds and embeds her theories in the living matter that constitutes the perception of reality and defines the philosophical lens. This performativity of entanglement between object, observer, and cognitive tool leads to a constant reconfiguration of

locally determinate causal structures with determinate boundaries, properties, meanings, and patterns of marks on bodies. This ongoing flow of agency through which "part" of the world makes itself differentially intelligible to another "part" of the world and through which local causal structures, boundaries, and properties are stabilized and destabilized does not take place in space and time but in the making of spacetime itself. The world is an ongoing open process of mattering through which 'mattering' itself acquires meaning and form in the realization of different agential possibilities.¹⁵

For Barad, objects are bound not by interactions (which would suggest the possibility of subject and object existing independently of each other, entering into a relationship after their own individual constitution) but by intra-actions, a type of relationship that enables the materialization of meanings.¹⁶ This perspective dismantles the metaphysics of individualism by negating the notion that there are individually constituted subjects, times, and places¹⁷ understood as a set of initial data and fixed differences in order to ask how

¹³ Karen Barad, *Meeting the Universe Halfway...*, op. cit., 109–115.

¹⁴ Karen Barad, "Posthumanist Performativity...", op. cit., 820.

¹⁵ *Ibid.*, 817.

¹⁶ Karen Barad, *Meeting the Universe Halfway...*, op. cit., 33.

¹⁷ Adam Kleinman, "Intra-actions" (interview with Karen Barad), *Mousse*, No. 34, 2012, 77.

these differences are stabilized and destabilized, as well as their materializing effects and constitutive exclusions.¹⁸

Barad's onto-ethico-epistemological contributions, as well as the shift of the analytical lens towards relations located in the material domain, indicate, as Majbroda claims,

the need for an anthropological rethinking of the concept of humanity as such, as well as for a redefinition of the concept of 'world', the scope of which exceeds the traditional understanding of society. Human beings interact not only at the level of the social order, but also at the level of the natural order; only these two spaces allow for the emergence of a subject capable of acting in constant interaction with the external environment.¹⁹

This reflection also found its ground in the exploration of what the materiality of sound is and how it manifests itself. When analyzing sound from the perspective of the new materialist paradigm, it seems reasonable to focus on the notion of vibration, that is, the physical, material process of producing sonic phenomena. Michele Friedner and Stefan Helmreich define the materiality of sound as "a vibration of a certain frequency in a material term",²⁰ rather than as a sensation that arises only when the vibration is produced within the auditory sense. Cristoph Cox has also noted the inadequacy of discursive and textual theories to describe sound phenomena, which center around the issue of its materialization. Moreover, he notes that these perspectives highlight the separation between culture (the domain of sense-making, meaning and representation) and nature (the domain of inert and *dumb matter*²¹). Nature in such a model is either dismissed as irrelevant or considered a cultural projection or social construction, thus emphasizing the anthropocentric point of view. Textuality and discursivity treats human symbolic interaction as an unique and privileged gift from which the rest of nature is excluded, situating humans above the world around them.

However, Cox notes that the very structure of sound is incompatible with the way it is described in terms of constructivist representations. Thus, he compares acoustic stimuli to visual ones, noting that "written texts and

¹⁸ Ibid., 77.

¹⁹ Katarzyna Majbroda, "Zredefiniować rzecz: antropologia kulturowa wobec zwrotu ku materialności", *Tematy z Szewskiej*, Vol. 17, No. 1, 2016, 9.

²⁰ Michele Friedner, Stefan Helmreich, "Sound Studies 'Meets Deaf Studies'", *The Senses and Society*, Vol. 7, No.1, 2012.

²¹ Cristoph Cox, "Beyond Representation and Signification: Toward a Sonic Materialism", *Journal of Visual Culture*, Vol. 10, No. 2, 2011, 147.

images require the distance of vision that separates subject from object. By contrast, sound is immersive and proximal, surrounding and passing through the body. And while texts and images involve the spatial juxtaposition of elements, the sonic arts involve a temporal flux in which elements interpenetrate one another”.²²

This is emphasized, for instance, by the manifestations of 20th and 21st century sound art that goes beyond the structure of musical notation and focuses on the material and energetic properties of sound, for example the activity of such artists as Christina Kubisch, Alvin Lucier, Francisco Lopez, and Max Neuhaus. According to Cox, the works of the aforementioned artists reveal that sound art is not at all more abstract than visual art, but more concrete, and that it requires a *materialist* rather than a *formalist* analysis.²³ Luc Döbereiner also speaks in relation to Cox's article (supplementing the argument with the relational aspect of sound's functioning in the area of its materiality), who, like Barad, believes that matter is neither a pre-existing nor a purely subjective fantasy, but the objective result of a material-discursive system. He understands compositional models or systems of sound synthesis as cognitive tools (Barad's performative apparatus) that mark the boundary between subject and object, which are both the result of the operation of this boundary. For this reason, Döbereiner encourages to understand compositional practice not as an anthropocentric activity based on imaginary discursive frameworks that give access to the actual creative material forces of sound-in-itself, but as a practice of materially (re)configuring the world.²⁴

In the next section, I will show, using Björk's *Biophilia* project as an example, how the materialization of sound and music occurs, and how the artist combines science and music theory in a transdisciplinary weave, drawing attention to the human-non-human causality that emerges within the assemblage of the album-application.

²² Ibid., 148.

²³ Ibid., 148–149.

²⁴ Luc Döbereiner, “How to Think Sound in Itself? Towards a Materialist Dialectic of Sound”, Proceedings of the Electroacoustic Music Studies Network Conference Electroacoustic Music Beyond Performance, Berlin, 2014, viewed at 24 February 2022, http://www.ems-network.org/IMG/pdf_EMS14_dobereiner.pdf.

Mattering of the Meaning in Björk's *Biophilia*

Biophilia is a multidimensional musical project that was released as an album-application in 2011. The term biophilia itself denotes the tendency “to participate in natural processes and systems, and especially to live in a living environment (...). The term biophilia, as a scientific concept, was first used by Erich Fromm²⁵ to describe the psychological orientation of being attracted to everything living and relevant”.²⁶ *Biophilia* addressed the theme of the interdependence and interaction of humans with their environment, it raised questions about the relationship of human and non-human entities, and sought the relationships that lie between actual chemical and physical phenomena and musical, sonic matter. The project was developed by the Icelandic artist, Björk Guðmundsdóttir, with a multi-person team responsible for creating its individual elements. It consisted of musicians, builders of musical instruments specially designed for the occasion, creative programmers developing the accompanying application, academics and teaching staff responsible for the substantive content of the project and developing the didactic part of the *Biophilia Educational Project* undertaking (this transdisciplinary team called the Nordic Team included composer Sunlif Rasmussen, astrophysicist Anja Andersen, playwright and director Pipaluk Jörgensen, doctor of philosophy in music education Cecilia Björck, professor of astronomy Esko Valtaoja, professor of science education Alex Strömme, chairman of the board of the Teaching Centre of the University of Iceland Guðrún Geirsdóttir, and Björk herself).²⁷

The thematic axis of *Biophilia* is rethinking the non-human environment, the relationship between human, nature and the technology that mediates it. The aim of the project was also to investigate the origin of music and the specificity of its structure, taking as a starting point the phenomena occurring in nature. In the documentary made for *Channel 4*, which promoted *Biophilia*, it was said in the introduction that the project was created “to change the way we see, hear, think about and make music”.²⁸ Björk thus de-

²⁵ Erich Fromm, *The Anatomy of Human Destructiveness*, New York, Holt, 1973.

²⁶ Bogusz Modrzewski, Anna Szkołut, “Biofilia – teoria i praktyka projektowa”, in: F. Górski, M. Łaskarzewska-Średzińska (Eds), *BIOCITY*, Warszawa, Wydział Architektury Politechniki Warszawskiej, 2015, 181.

²⁷ *Biophilia Educational Project*, viewed 24 February 2022, <https://biophiliaeducational.org>.

²⁸ Louise Hooper, *When Björk Met Attenborough*, 2013, Youtube, from 00:00:20, viewed

cides to delve into what we understand as nature, in search of a rudimentary musical connection between all its creations.²⁹ The project is thus a transdisciplinary attempt to produce a new, multithreaded kind of knowledge about music, in which scientific and cultural contexts intertwine and overlap in a hybrid discourse. *Biophilia* thus realizes the new materialist postulate, in which one of the most important issues is the abolition of the binary division between culture and nature.

Working on *Biophilia* was also interlinked with the introduction of the first model of the Apple iPad tablet on the market (April 2010). During the work on the album, the device was considered both as an album-application medium and as a musical instrument used during performances. The Icelandic artist, observing the agencies emerging between human, technology and the environment, wanted to create an interface that would bring the viewer closer to the issue of biophilia. By creating an interactive app in which each piece relied on a different kind of interaction with the user, Björk wanted to take a multifaceted look at the issue of the mutual correlation between the human and the non-human. The app was released in sync with a physical and digital “standard” album. The program consisted of a “mother app” (called “box” by the creators³⁰), which itself acted as an interactive visualization of the *Cosmogony* track on the album.³¹ This application was also the interface where users could access further specially designed, unique applications assigned to nine consecutive songs. Each song had its own application, resembling an interactive audiovisual game that was a didactic carrier of developed connections between natural phenomena and issues derived from music theory and musicology. The assemblage created by *Biophilia* consisted of many elements and interrelationships – both in the compositional layer, the performance layer, and the layer which is closely related to the interaction of the application’s user. Each consecutive track was assigned a different environmental phenomenon and a different musical concept or term: *Thunder-*

24 February 2022, https://www.youtube.com/watch?v=c_jVvTW8Oco&ab_channel=Mr.G.

²⁹ Marek Susdorf, “Björk’s Biophilia. A Musical Introduction to Feminist New Materialism”, *Junctions*, Vol. 2, No. 2, 2017, 114.

³⁰ Nicola Dibben, “Visualizing the App Album with Björk’s Biophilia”, in: C. Vernallis, A. Herzog, J. Richardson (Eds), *The Oxford Handbook of Sound and Image in Digital Media*, Oxford–New York, Oxford University Press, 2013, 683.

³¹ Björk, *Björk: biophilia: cosmogony app tutorial*, Youtube, 2012, viewed 24 February 2022, <https://www.youtube.com/watch?v=3dlRg6lM4mQ>.

bolt: lightning – arpeggios; *Moon*: moon phases – musical sequencers; *Crystalline*: crystal structure – structure and spatial musical environments; *Hollow*: DNA – rhythm and speed; *Dark Matter*: dark matter – musical scales; *Mutual Core*: tectonic plates – chords; *Solstice*: Earth’s tilt and gravity – counterpoint; *Sacrifice*: interaction of the sexes – musical notation; *Cosmogony*: music of the spheres – state of equilibrium; *Virus*: viruses – generative music.³²

Initially, Björk envisioned *Biophilia* differently – looking for a different way to present the issues addressed by the songs, the Icelandic artist wanted to build a special musical house that would function as a *Biophilia* museum, with each room designed for a particular song and containing interactive exhibitions related to them.³³ Ultimately, Björk was most concerned with providing an experience that was strongly integrated with physicality and tactility. The relationship between sound and visuality, relating directly to musical structures and processes was to be affectively mediated. Björk’s idea was to use touch screens as an intuitive tool for music making and as a means for interactive, educational experiences that would allow the user to explore an aspect of musical structure through the phenomena of the physical world. According to the app’s lead developer, interactive artist Scott Snibbe, the song apps are “not merely a music video, and also not just some kind of pure musicological analysis, but they’re actually a new creative experience that uses music, nature, technology and interactivity”.³⁴ In addition to providing an interactive way of exploring the content of the songs, each of the apps enabled both traditional and linear listening and viewing of the songs, as well as the creation of customized versions of the songs. The apps thus had the markings of an experimental and generative musical practice that enabled personalized cognition of particular musical principals. Songs on the app did not exist as fixed versions: the app allowed users, for example, to improvise a bass line

³² WIRED UK, *Bjork: On Music and Biophilia – The Sound of Nature* | WIRED 2013 | WIRED, Youtube, 2013, viewed 24 February 2022, <https://www.youtube.com/watch?v=UTcy5c73ZZY>.

³³ Charlie Burton, *In depth: How Björk’s ‘Biophilia’ album fuses music with iPad apps*, 2011, viewed 24 February 2022, <https://www.wired.co.uk/article/music-nature-science?page=all>.

³⁴ Jason Lipschutz, *Bjork’s App Designer Scott Snibbe Talks In-Depth About ‘Biophilia.’*, 2011, viewed 24 February 2022, <https://web.archive.org/web/20110926185904/http://www.billboard.biz/bbbiz/industry/digital-and-mobile/bjork-s-app-designer-scott-snibbe-talks-1005293722>.

(*Thunderbolt*), create a path through the structure of a song (*Crystalline*), delay the progression of a song (*Virus*), compose musical sequences (*Moon, Solstice, Hollow, Dark Matter*) and record musical notation (*Sacrifice*). This meant that the listener could personalize their experience and the album could be listened to in different versions.³⁵

Scott Snibbe also notes that when designing the application, he was most concerned with its openness, which would allow for any kind of investigation into how the application works and how the sound is shaped. The programmer specifically did not create a scripted application that relies on the sequential activation of successive buttons in order for the *Biophilia* experience to reconfigure itself each time and be different from the previous one.³⁶

The *Biophilia* application can be compared in this context to the apparatus described by Barad – it changes depending on its potential user. It reveals reconfigurations of the connections between technology, science and music differently each time, as it remains open to the changing ways of accessing information. Moreover, it takes an active part in the production and constitution of knowledge. It is not fixed like a musical score or any other kind of musical script. Nicola Dibben furthermore points out the processual nature of Björk's songs. The songs are not a constant, single object, but “remade in different performances according to available resources: not only are the versions of songs on the app suite and music album different, the versions on the song app, score, and animation also differ. Other features also allow interactivity and user-generated content”.³⁷ Their matter is thus performative, only revealed when the subject comes into contact with the object and undergoes its constant transformation.

The digital, interactive format of the touch screen device is also central to the project through the way it makes the creation and learning of electronic music a more embodied process based on somatic experience.³⁸ Björk thus opposed textual and constructivist approaches to music; she wanted to make music education a more embodied experience. She wanted to go be-

³⁵ Nicola Dibben, “Visualizing the App Album...”, op. cit., 693.

³⁶ Julia Kaganskiy, *Interactive Artist Scott Snibbe Gives Us The Scoop On Björk's Biophilia Apps*, 2012, viewed 24 February 2022, <https://web.archive.org/web/20140817213211/http://thecreatorsproject.vice.com/blog/interactive-artist-scott-snibbe-gives-us-the-scoop-on-björks-ibiphiliai-apps>.

³⁷ Nicola Dibben, “Visualizing the App Album...”, op. cit., 693.

³⁸ AlmaDís Kristinsdóttir, “Infectious Virus: Biophilia and Sustainable Museum Education Practices”, *Museum and Society*, Vol. 16, No. 3, 2018, 399.

yond the abstract theorization of musical processes. It was also her intention to make the world of music equally accessible to anyone by including people who do not need to have special musical training or education to learn about it. The app was also meant to be an educational tool, which Björk said would replace notation and book theory with instinct and creativity.³⁹

Additionally, Björk wanted to show with her project that musicology is connected to existing forms in nature and the environment and to reveal its spatial and physical aspects.⁴⁰ In doing so, hers is reminiscent of Karen Barad's approach – the Icelandic artist starts from constructing a theory (in this case a musical theory) through the very materialization of the sound world. Björk's approach is also rooted in a critique of the model of music education that she attended, which was based on an overly intensified training of a rigidly defined and reproductive repertoire of classical and romantic Western European music.⁴¹

For the Icelandic artist, materializing the world meant opening up to non-human agencies and establishing a post-human kind of community with them, going beyond the anthropocentric perspective. As Marek Susdorf observes, Björk “does not fall prey to the patriarchal presentation of ‘nature’ as an ultrapositive, romanticised, woman-like figure, overgrown with myths of fertility. On the contrary, she tries to become a scientist but of a special kind. (...) the singer starts to listen to the world that surrounds her, rather than to observe and to discursively colonise it”⁴² Björk allows matter to materialize on its own, thus becoming a recipient of the ways in which it reveals itself.

A similar openness to acoustic phenomena can be found in Douglas Kahn's description of an alternative discovery of natural radio made by Thomas Watson (Alexander Graham Bell's assistant during his work on the invention of the telephone).⁴³ Kahn, through the analysis of electromagnetic interactions, creates a new way of understanding the sound relation between human and nature, as well as the role of telecommunication technologies (especially those processing acoustic signals) in the production of this relation. As Kahn recalls:

³⁹ Ryan Dombal, *Björk* (interview), 2011, viewed 24 February 2022, <https://pitchfork.com/features/interview/7996-bjork/>.

⁴⁰ Ibid.

⁴¹ Ibid.

⁴² Marek Susdorf, “Björk's Biophilia”, op. cit., 114.

⁴³ Douglas Kahn, *Earth Sound Earth Signal...*, op. cit., 25–40.

Watson heard natural radio when the long iron telephone test line acted unwittingly as a long-wave antenna. This was before anyone knew what an antenna was or, for that matter, what electromagnetic radio waves were. (...) Environmental energies had long been ever-present in the telegraph system, but the transductive capability of the telephone made them audible as never before.⁴⁴

Björk seeks musical answers through the perception of material flows of forces and energy – together with non-human actants they become jointly in need of mutual understanding.⁴⁵ The materialization of the world through sound has not only manifested itself in the embodied experience of application, but also in the search for new instrumentation used to perform the works. This is exemplified in Björk's work on the creation of *Solstice*, in which she explains musical interval and counterpoint by starting from the physical gravitational pull. An instrument called the *gravity harp* was built specifically for the piece in collaboration with MIT engineer Andy Cavatorta.⁴⁶ The instrument consisted of a system of pendulums on which 11 strings were strung, plucked by a plectron as it passed through the center of its path.⁴⁷ The contrapuntal accompaniment line created by the pendulums could be controlled via a touch screen tablet. The aural experience, the melodies created, were thus determined by the speed of the moving pendulums, their weight, and the temporal relationships between each arm deviation. Björk thus gives the possibility to non-human energy to reveal itself and materialize in the form of different sound courses.

The Icelandic artist intentionally did not want to use only electronic instruments, despite the *Biophilia* high level of technological mediation. As she mentions in the interview, she was interested in the meeting of the digitally generated sound with the acoustic one, in order to create a common meeting of these two spheres and create a closer relationship between the digital interactive production (using a tablet) of sound from an acoustic instrument.⁴⁸ In

⁴⁴ Ibid., 13–14, 27.

⁴⁵ Marek Susdorf, "Björk's Biophilia", op. cit., 115.

⁴⁶ VernissageTV, *Björk / Andy Cavatorta Gravity Harps at MoMA, NYC*, 2015, Youtube, viewed 24 February 2022, https://www.youtube.com/watch?v=Di99Y6OdnPY&ab_channel=VernissageTV.

⁴⁷ Abdullah Saeed, *A Guide To Björk's Custom Biophilia Instrument*, 2012, viewed 24 February 2022, <https://web.archive.org/web/20130912050716/http://thecreatorsproject.vice.com/blog/a-guide-to-björks-custom-ibiophiliai-instruments>.

⁴⁸ Ryan Dombal, *Björk* (interview), 2011, viewed 24 February 2022, <https://pitchfork.com/features/interview/7996-bjork/>.

this way, she wanted to blur the distinction and distance between sound generated in the electromagnetic domain and sound generated by “natural” methods.

At this point, I will refer again to Douglas Kahn. The researcher points to the distinction between types of transduction introduced by the discovery of sounds of an electromagnetic nature – *transduction in-degree* and *transduction in-kind*.⁴⁹ The first type refers to the sounds remaining in the domain of the transformation of the homogeneous type of energy (classical mechanics), e.g. wind movement is transformed through an object (an acoustic instrument, a crack between rocks) into a sound of a certain pitch. The second type describes sounds created by the transduction of energy between two different states: mechanical – electromagnetic. This dichotomy emphasized the historically widespread division between sounds derived from nature (*in-degree*) and those having nothing to do with nature, technological (*in-kind*) causing a separation of the two areas. Kahn gives yet more proof for the unfoundedness of this oppositional way of thinking about sound, finding it in the very process of listening⁵⁰ in which both types of transduction occur and giving the example of the previously mentioned natural radio – in other words the example of a sound produced naturally by the interaction of electromagnetic energies.

The direct use of electromagnetic matter is manifested in Björk’s *Thunderbolt* piece, where she used a combination of a Tesla coil with enclosed lightning and a special kind of plasma loudspeaker, in which the traditional function of the membrane is performed by an electric arc. Thanks to this combination, she generated a bass line accompanying her voice. With this, the Icelandic artist wanted to manifest a perspective that decentralizes the human subject and strike at the anthropocentrically grounded uniqueness of the human species. She thus adopted a perspective advocated by, for example, Donna Haraway, who maintains that humans have always been intertwined

⁴⁹ Douglas Kahn, *Earth Sound Earth Signal...*, op. cit., 55–57.

⁵⁰ The process of listening also involves both transduction *in-degree* – moving the eardrum and transmitting vibrations through the auditory ossicles – and transduction *in-kind* – the stimulation of electrochemical signals by the inner ciliary cells. In addition, Kahn points out that *in-kind* transduction also takes place in the form of a nervous system response to incoming sound sent back to the vibrating cells of the inner ear. Thus, this process is nothing more than an active response of the ear to an acoustic stimulus. This perspective changes the human position in relation to the surrounding auditory phenomena, in relation to which they cease to be merely passive receptors.

with organic or inorganic manifestations of matter: “no species, not even our own arrogant one pretending to be good individuals in so-called modern Western scripts, acts alone; assemblages of organic species and of abiotic actors make history, the evolutionary kind and the other kinds too”.⁵¹

In this context, there is a significant moment in Hopper's documentary, in which Björk practices her vocal part for the song *Sacrifice* while synchronizing herself to a huge *sharpsicord*⁵² specifically designed by Henry Dagg – a crossover between a barrel organ and a harp, the sequence of which is programmed manually by inserting pins into a huge cylinder with 11500 holes on its surface.⁵³ Setting up the sound sequence was very time-consuming (it takes an entire day of programming to establish one minute of sound progression). Björk singing along with the instrument therefore had to adapt to it, to harmonize herself in the face of the non-human force of the progressing sequence.⁵⁴ The act is therefore another manifestation of opening up to the non-human world – Björk thus urges us to start listening to the world around us, while emphasizing the need to avoid making authoritative statements about it.

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⁵¹ Donna Haraway, “Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin”, *Environmental Humanities*, Vol. 6, No. 1, 2015, 159.

⁵² Andy McCreeth, *Björk Biophilia instruments – Henry Dagg's 'Sharpsicord' pin-barrel harp*, 2011, viewed 24 February 2022, <https://vimeo.com/26301139>.

⁵³ Louise Hooper, *When Björk Met Attenborough*, 2013, Youtube, from 00:13:30, viewed 24 February 2022, https://www.youtube.com/watch?v=c_jVvTW8Oco&ab_channel=Mr.G.

⁵⁴ *Ibid.*, from 00:14:00.

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Summary

In this paper I have attempted to show how Björk's transdisciplinary *Biophilia* project can be approached from the perspective of the new-materialist paradigm represented by Karen Barad. The Icelandic artist presents how a human kind of musical composing can originate from areas of non-human agency. Like the author of agential realism, the Icelandic artist does not fall into the trap of metaphorizing concepts taken out of physical theories, but instead looks for their material properties, which then causally construct the discourse and generate reconfigurations of already existing theories and musical structures.

There are, however, visible voices critical of Björk's work. Nicola Dibben notes that the structure of the application treats successive elements of music theory in an isolated manner. By assigning each topic a distinct piece, a separate sub-application, it isolates musical elements such as scales, meter, harmony and tempo, thus emphasizing the conservative and traditional approach to teaching music⁵⁵ and natural phenomena from the continuum of the material becoming-world. Furthermore, as AlmaDís Kristinsdóttir mentions, the *Biophilia* content that was the basis of the educational project taking place after Björk's tour, despite its openness and unique didactic methodology, could only be taught by *Biophilia* team-trained, "approved" teachers. This resulted in the limited and exclusive nature of *Biophilia's* educational dimension, difficult to implement in informal, non-institutional educational settings.

⁵⁵ Nicola Dibben, "Visualizing the App Album...", op. cit., 689.

New materialism effectively complements the analysis of *Biophilia*, especially in terms of observing the intra-actions between human and non-human elements revealing sound matter and reconfiguring its meaning. It also provides a functional method for analyzing endeavors that elude traditional binary disciplinary divisions, combining art, science, and technology exploring the environmental connections and relationships in which humans are involved and entangled.