Crosscutting Arts, Science and Technologies

A New Understanding of The Bonds with The Living?

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In 2023, it has been well documented and widely accepted within the scientific community, major NGOs, national and international public institutions that the habitability of our planet, as we know it, will undergo many changes by the end of the century. Prospective studies are drafting case scenarios often with a bleak future and/or irreversible effects, some of which are already visible. Across the globe, there is a shared assessment: the need to radically change pollutant and destructive ways of Living and to develop new relationships with our environments and among humans and non-humans. The multiple dissonances of humanity, as societies and individuals, with regard to our capabilities to think and act in more sustainable ways tend to confirm the following hypothesis: environmental issues cannot be solved by science and legislation only. Indeed, despite the dissemination of knowledge and initiatives, political advances made are not accompanied by a reversal of overconsumption, overproduction and the destruction of endangered ecosystems as reported by the Millennium Ecosystem Assessment (2005). Some of the reasons for this could be a certain inefficiency of top-down management (Fraser 2006: 114), a persistence of ideological blockades for addressing climate change and threats to biodiversity as well as recasting negative environmental impacts of human activities as negligible. Concurrently, a guilt-inducing and/or moralizing communication neither establishes the conditions for a dialogue nor makes it the public more committed and responsible. Yet, to be an active agent when facing a situation is a key aspect towards change. To foster change and

awareness from an audience, whether at an individual or collective level, requires stimulating the sensitive, affective and behavioural dimensions of peoples' personalities. Consequently, science popularization and data processing, mainly addressing the cognitive part of human personality, do not produce the expected results (Clavel 2012: 438). Indeed, while demonstrating facts about climate change, biodiversity loss and destruction in the most objective and rational ways, science data and lectures do not automatically lead to a desired level of rationality and coherence in decision-making and behaviour.

Baptiste Morizot (2020) points out that the environmental crisis, which is a crisis of our human societies, is above all, a crisis of our "sensibility", of our affiliation with the Living, a crisis in the way we consider living beings inside or outside our affective, perceptive and political world. It is a crisis of our culture (Pierron 2013: 45); a culture that has emptied nature of meaning and frozen its presence to a reservoir of resources to be exploited; a culture that has led to an impoverishment of what it is possible to feel, perceive, understand and weave as relationships with regard to the Living. Henceforth, seeking to develop a more sensitive and enriched relationship with the Living seems to hold, as Philippe Descola suggested (2005), the potential to break with the deleterious modern tendency of reducing nature to inanimate matter.

What is articulated under the general term as ecological crisis is a clear call for a re-introduction of meaning, responsibility and sensitivity into our actions; a call for a greater availability and attention to the Living. According to sociologist, philosopher and anthropologist Bruno Latour (Latour 2021), new synergies, agencies and methodologies are indispensable to be able to embrace the complexities we are facing, and to engage in a "*politique du sensible*" (Chardel et al. 2021: 81). Such a sensibility-oriented policy would foster a wider understanding, availability and responsibility towards nature and our environments, towards the other.

Even though art is a field of human activity that needs contextualisation to be understood, its real-sensitive approach, involving all dimensions of human personality (cognitive, affective and behavioral), may indeed address key aspects of the equation. Being a marker of societal and technical evolutions, art has always accompanied human

life, enriching the links societies and individuals have developed with their environment and the other. According to prehistorian Jean Clottes (2011), the artistic experience could even be consubstantial to the human mind, and this access to the first symbolic and abstract values and thoughts having enabled us to question our environments and our future. This helps to understand why the environmental issues and challenges have entered the field of contemporary art (Demos 2009: 17). Artists have seized on these issues in a wide variety of forms, proposing collaborations with other disciplines and knowledge, involving diverse communities and technologies and by taking over public spaces. An example of such an intersection between art, science, philosophy and ethics, whilst seizing the public space is *Wheatfield – A Confrontation* (1982) by artist Agnes Denes; an artwork retrospectively considered in a 2018 New York Times article as a watershed moment in public art (Jacobs 2018). This landmark piece was a two-acre field of wheat grown on an empty landfill next to the World Trade Center. Planted on May 1, 1982 and harvested on August 16 of the same year, the wheat field was maintained for four months by Denes, two assistants and rotating volunteers.

The diversity of forms and proposals of contemporary artworks echo indeed the wide range of environmental issues as many challenges are breeding grounds for the artists. Artworks have been produced by taking the form of shared habitats between humans and non-humans (Fritz Haeg, in 2005–2013, Lynne Hull, in 2009): shamanic experiences (Marcus Coates, in 2004); landscaping in the city (Alan Sonfist, in 1978); unexpected encounters with the Living in museums (Pierre Huyghe, in 2014–2015, Mark Dion, in 1991 and 2002); films allowing us to see the world through the eyes of other animals (Sam Easterson, in 1998). Contemporary artists have also presented archives and/or workshops made up of exchanges with local communities (Collins & Goto Studio, since 2007, ongoing): works immersed in tar (Minerva Cuervas, in 2007); or even floating gardens (Christian Philipp Müller, in 2006); and 3D bio-prints transcribing the complexity of urban spaces (Allison Kudla, in 2010). Facing the ecological crisis, contemporary artists have also investigated areas of socio-environmental disasters in Brazil

(Paulo Tavares, in 2013), the conditions of world food production (Uwe H. Martin & Frauke Huber, since 2007, ongoing), possible correlations between futuristic imaginaries of biotech companies with current political struggles over land use, energy policy and GMOs (Kyungwon Moon and Joonho Jeon, in 2023), or even the impacts of nuclear energy (Diana Thater, in 2011) and transnational approaches to designing new modes of social organization (World f Matter, since 2008, ongoing).

The evolution of technologies has also a role in the ecological crisis as well as in artistic practices. The production and use of new technologies has both positive and negative impacts on the environment. While many recent technologies have been developed with the aim of reducing the negative environmental impacts of more traditional technologies, such as low-tech and slow-tech innovations, there is a consensus that multiple environmental problems have been caused and aggravated by diverse technologies. The manufacture and use of smartphones and touch screens, the predominant use of algorithms and artificial intelligence, generally grouped under the generic term of "digital technology", are probably some of the most significant examples. In a techno-symbiotic societal trend, the links established between these technologies and the ecological crisis, taken in its broad sense, are not only beneficial. These new practices are damaging the environment. According to a study published by the GreenIT collective (2019), which brings together experts in digital sobriety and responsible digital approaches, the manufacture and use of new technologies are a major source of energy consumption. Air pollution, climate change, water pollution, thermal pollution, and solid waste disposal are some environmental problems that are directly linked to energy production and consumption.

Simultaneously, technical systems are also cultural systems. Computers and algorithms have biases and meanings embedded into their structures. Indeed, technologies are not only tools (Harrell 2013: 57); they are evocative objects, leading us to see ourselves and our world differently. Computers play a role in shaping culture by facilitating the construction of shared knowledge, shared beliefs and shared representations, highlighting the active role of both programmers and users.

Just as the technological revolution of digital communication systems has led to a profound and global change in societies, modifying the structure of relationships between individuals themselves and the collective, digitalization challenges art and traditional figurative techniques. Indeed, art and technology are even inseparable. Artists, throughout the ages, have resorted to new instruments stimulating their imaginations, such as the *Five Senses* sculpture series (2001) developed by artist Annie Cattrell, and transcribing the experimentation with the senses by a subject; artwork that was made possible through collaborations with neuroscientists and functional magnetic resonance imaging (fMRI) technology. Since the 1960s, artists have used computers and new technologies as tools for aesthetic research, creation and as exhibition mediums. The digital has thus become not only a support for the mediation of art but also an artistic medium in itself. New digital technologies are exploited as brushes, canvases, tools and support, making art more complex and interdisciplinary endeavor. These perspectives enable the emergence of new questions and thoughts regarding art and communication, renewing the aesthetics of creation, the mediation of art and its reception. Playing a considerable role in our techno-symbiotic societies, whether positive or negative, contemporary artists have grasped the opportunities offered by new technologies, proposing interactive and immersive installations, creating "new worlds" such as the ones created by the international art collective TeamLab, or exploring what "life" might mean in a post-singularity, post-climate change future such as the underwater robotic installation by Anna Dumitriu and Alex May *ArchaeaBot: A Post Climate Change, Post Singularity Life-form* (2018–19). Experiments with data sonification are also developed, such as for the multidisciplinary art-science project *Micro Lux Chants* by ArtSciLab and Gassensmith with the aim to understand the life cycle of the bioluminescent bacterium *Aliivibrio fischeri*.

Commentators on interactive media suggest that digital systems invoke imaginative meaning-making processes that involve both perception and motor action. Thus, interactions with generative animation systems form motor and sensory loops that intertwine with everyday life experiences, engendering metaphorical understanding (Harrell, Chow

2010: 256). Thus, crosscutting projects between arts, sciences, and technologies seem to hold interesting opportunities to renew our apprehension and representations of the Living to which we belong. These opportunities include increasing awareness on phenomena that escape our immediate perception, broadening our imagination and a greater attention to the Living, all of which are key for facing the ecological crisis and its ethical challenges (Chardel et al. 2021: 84).

Making phenomena visible: human invisible pollution and interferences

A large part of human activities has now become detrimental to ecosystems. Some of these effects are more apparent, while others are almost invisible and/or largely unknown. However, invisible pollution and interferences cause major issues. How do interdisciplinary artistic works capture and bring light to some of these consequences? How do these projects add value to current knowledge and change our perception?

Plankton serves as the primary basis of the marine food chain and is, as a result, a crucial component of the Earth's ecosystem, contributing between 50 to 85% of the oxygen in the atmosphere. Still, the effects of sound and noise resulting from human activities on these organisms are largely unknown. The interdisciplinary installation Noise Aquarium has been developed in order to address that lack of public awareness, seeking to immerge audiences in a "3D aquarium" of diverse planktons, with projectors enlarging these to the size of whales. Initiated by media artist and professor at UCLA Department of Design Victoria Vesna, director of the Science Visualization Lab of the University of Applied Arts Vienna Alfred Vendl, and computer animated visualization scientist Martina Fröschl, the project has also gathered biologists, digital artists, and sound designers. Made up of 3D-scans of micro creatures, the installation has been designed to be interactive; the moving 3D creatures react to the body movements of the viewers, simulating how the former would respond to representing noise sources in nature.

Figure 1: Noise Aquarium concept proposal by Victoria Vesna, Karina Lopez and Martina Fröschl, 2016

Live binaural sonic layering on the animations of plankton was also performed during the covid-19 pandemic. Through its wide representation, the immersive and interactive dimension involving the viewer's body, *Noise Aquarium* offers a unique 3D audio-visual experience of the effects of noise pollution on plankton.

Among invisible pollution, chemical pollutants, notably residues of pharmaceutical consumption discharged into most of our fresh and saltwater environments represent a significant problem. *Aqua_forensic* by artists Robertina Šebjanič and Gjino Šutić is a hybrid project which is gathering a research program coupled with a science and art residency, taking a citizen science approach to visualize the effect these chemicals residues have on aquatic micro-organisms, and to better understand what kind of impact we humans have on aquatic habitats (from micro to macro level).

Figure 2: Aqua_forensic by Robertina Šebjanič and Gjino Šutić, photo by M.E.Koch (WRO Biennale)

Focusing on specific localities in Europe (Donau River in Linz, Austria, and various localities on the Adriatic Sea in Dubrovnik and Dubrovnik-Neretva County), the research resulted in two scientific papers and visual data (research artifacts) which were used to create an interactive art installation, referred to by the authors as a "spatial morphing sculpture". *Aqua_forensic* takes the form of a piping system displaying holographic videos of the effects of pharmaceuticals on protozoa and other micro-organisms. The installation, which connects copper pipes and holographic videos, shows the timing of in-vitro experiments of microorganisms dying in pharmaceutical solutions 20,000 times lower than the average dose permitted for humans. Thus, the pipe system connects everything in an immersive environment, where the viewer is intertwined with it and invited to look at the modules where the holograms are presented. The production of the installation took place at the Projekt Atol Institute in Ljubljana, Slovenia. The artistic installations were exhibited in 2018 at Ars Electronica festival, at the Festival Rencontres Bandits Mages in Bourges, and at UNAM University

in Mexico, allowing different audiences to be confronted and informed about this issue. Among the other developments of the project, *Adriatic Garden | Aqua_forensic 2.0* sought to open a wider discussion about our solidarity and empathy with the waters beyond human perception; offering on-site and online exhibitions, panel discussions and workshops.

The preservation and restoration of forest ecosystems are another crucial ecological area. Forest ecosystems are at the heart of a functioning "Earth organism". However, despite their incredible capacities for adaptation and resistance, these organisms have become vulnerable. The beneficial influence of a significant number of studies goes well beyond the scope imagined until recently. While being threatened, for forest and timber sciences specialist Ernst Zürcher (2016), the tree represents the lever, on a human scale, which makes it possible to act for the conservation and even the restoration of the vital functions of our planet. Among the various threats, the impacts of electromagnetic fields on trees have been scientifically demonstrated. Ambient levels of nonionizing electromagnetic fields (EMF) have risen sharply in the last five decades to become a ubiquitous, continuous, biologically active environmental pollutant, even in rural and remote areas (Blake Levitt et al. 2021: 327). Studies have shown that in areas where a mobile phone antenna is installed, trees almost immediately show changes in their trunks, leaves and branches. Many species of flora and fauna, because of unique physiologies and habitats, are indeed sensitive to exogenous EMF in ways that surpass human reactivity (Blake Levitt et al. 2021: 327). Usually, a disturbance heralds another disturbance. Hence, *Arboreal Receptors* developed by transmedia narrator and sound artist Ioana Vreme Moser aims to disclose the occurrences of radio-electromagnetic disturbance moments, from the perspective of a tree. *Arboreal Receptors* is based on two large networks, which are on the one hand the radio-electromagnetic fields of our communications systems, expanding in the air and crossing urban and natural landscapes. On the other hand, a network linking the trees to the mushrooms, tangled in the roots and expanding in the underground. This network is based on the impulses circulating chemical information between the trees and the mycelium, establishing mutual partnerships, in a very deep and essential exchange

to balance the two organisms. Trees have evolved to live in cooperatives maintained by a collective-like intelligence. What happens when these very sensitive ecosystems are interfered with? What kind of landscape dynamics emerge when these two different types of networks meet? Has human-made electromagnetic radiation changed and shaped natural ecosystems and environments?

Inspired by the operating principles of previous experiments with radio reception from trees, *Arboreal Receptors* is composed of sound sculptures forming sculptural instruments, kinetic garments, gently suspended from tree trunks. These objects incorporate thin toroidal coils wound around the trunks that intercept field fluctuations. The sculptures thus react on radiation whenever it is involuntarily captured by the trees, creating movements in a small electronic circuit.

Figure 3: Arboreal Receptors, installation, 2021

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Placed in an arboreal collective, the circuitry thus converts the radiations to an audible and visible movement. The sonification through various noises and rhythms materialises the invisible conflicts from the clash

of two fundamentally different systems of information and exchange. Commissioned and funded by the Federal Government of Lower Austria, the City of St. Pölten and the Federal Ministry of Arts, Culture, Civil Service and Sports BMKÖS, exhibited at the Institute of Media Archeology St. Pölten, *Arboreal Receptors* initiates a close investigation towards the daily operations of a tree, from its perspective, and its exposure to human interferences.

Towards an enriched presence and a careful listening to our environments

Participating in seeing the world in other ways, the question of our awareness, our attentive listening and our contacts with our environments, natural, technological, with humans and non-humans, is of utmost importance. The art-science research project *Interactions férales. La réponse de la baleine à bosse* (*Feral Interactions. The Answer of the Humpback Whale*) was first developed (2012–2017) to imagine the relationship woven between humans and whales, these fragile and endangered cetaceans. Based on similarities between the sounds of the bassoon and the humpback whale vocal generator, electroacoustic composer and radio documentary maker, Aline Pénitot, and bio-acoustician, cetacean sound specialist, Olivier Adam (Sorbonne University) conducted research, with other experts in biology, bioacoustics and musicians, and designed a first interface with the aim to build a bidirectional interaction between human musicians and humpback whales. In their motivation to consider the discrete tonal sounds of humpback whales and to measure the interaction level with some objectivity, Pénitot and Adam were driven by the necessity to go beyond human musical instruments, which have their own acoustic limitations and constraints and to allow opportunities for one-on-one interactions at the same level. Indeed, each family group of whales has its own set of unique sounds, or distinct calls, which together form a unique dialect. The songs of the humpback whale, which can last for hours, are among the most complex in the animal kingdom.

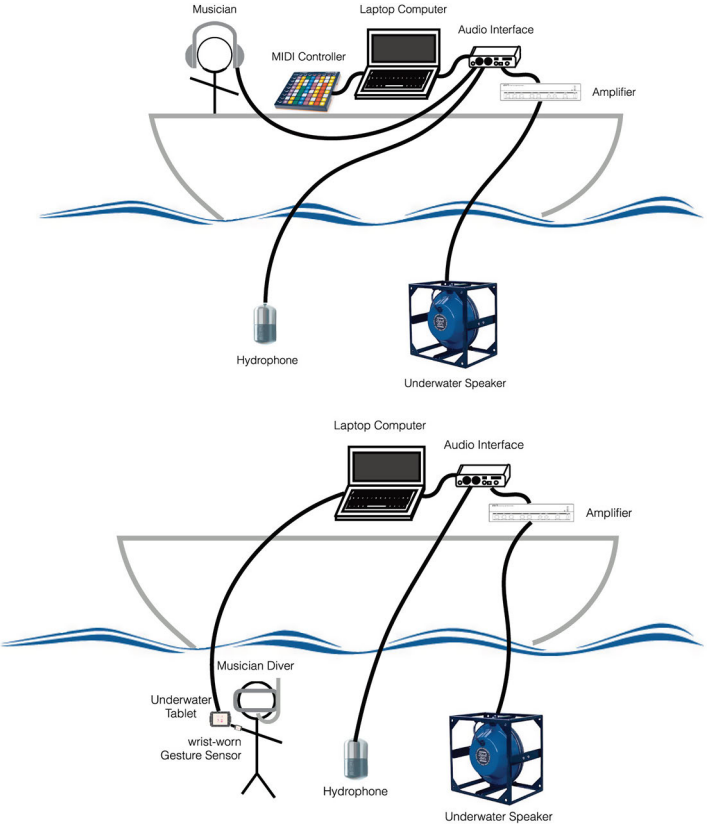
In 2018 and 2019, Aline Pénitot made several trips, notably to Reunion Island, and was able to experience this relationship in vivo. From an underwater human-whale sound interface (an aquatic loudspeaker and underwater microphones), Pénitot and Adam recorded each situation, each outing, each song, each whale breath and above all each response to sound stimuli. Observing the whale staying around the aquatic loud speaker, without any fears, was a moving experience for the researchers.

The sound material of these recordings and the responses of the whales make up the second phase of the project. After scientifically demonstrating the similarities between the sounds of the bassoon and the humpback whale vocal generator, the next step, as explained in Frontiers in Psychology (2019), is to design a new human-whale interface called *Gestural Underwater interactive Whale–Human interface* (GUiWHi). This interface is developed to enable an enhanced communication with whales. With interactions still based on humpback whales' own language, GUiWHi proposes a new configuration. While for the first phase, the musician was on the boat, the new interface and its specific equipment and configuration would allow the composer to be under water to potentially add a visual contact with humpback whales.

Since its beginning, the project *Interactions férales* has been shared and presented in France to various audiences through events combining conferences, live performances, immersive and spatialized concerts. Opening inspirations to compose new music pieces in different styles, based on "*musique concrète*" to be as close as possible to humpback whales' sounds, the interdisciplinary team look for entering a new kind of relationship with these cetaceans.

Technologies can enrich our listening to the Living and our environments, bring us closer to what surrounds us or what escapes our immediate perception. Yet, our perspectives can also be infringed by the large scale use of technologies which cause a loss of curiosity-driven exploration in the world.

Figure 4: Interactions férales, La réponse de la baleine à bosse, illustrations from the published article, Frontiers in Psychology, 2021



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To counter the influence of technologies that tend to constrict our perception, researcher and engineer Gershon Dublon proposes, at the crossroads of science and artistic creation, alternative technologies that would extend perceptual presence, amplify attention, and leverage intuitions. Creating systems and methods to apprehend massive and longi-

tudinal data from sensors and AI systems at the service of a connection to the individual and environment, Dublon aims at critically reinventing presence in a world of ubiquitous computing and distributed sensing (made of spatially distributed autonomous sensors monitoring environmental conditions and passing the data at real-time to a data processor). What are the roles of senses in the future of our understanding and experience of landscape? What opportunities are created by weaving a geographically dense, continuously sampled sensor network into the natural environment, from the ground up? Transforming sensor networks into extensions of individual human perception, Dublon explores these questions holistically, and has showcased his work on a large-scale environmental sensor network, the *Living Observatory*. Designed to support a wide range of applications, interpretations and expressions, from primary ecological research to musical composition, the objective of the *Living Observatory* is to understand how the data produced by this type of network could improve a natural feeling of presence for on-site and remote visitors.

Aiming at making this frontier between the inside and outside world as thinly as possible, and to increase the feeling of presence, Dublon designed *HearThere*, an augmented reality (AR) headset that expands perception and amplifies attention, connecting its wearer to distributed sensor networks in the surrounding environment.

Using bone conduction transducers and on-board sensing, *HearThere* produces a digital layer of auditory perception that blends into the wearer's natural hearing. The user's attention and listening state are inferred from the user's motion, pose sensors, EEG and eye tracking which accordingly adjust the sound presented. *HearThere* and its research platform were originally designed for use at the Tidmarsh Wildlife Sanctuary, a restored publicly accessible wetland in Plymouth, Massachusetts. Formerly a large-scale industrial freshwater cranberry farm, it now houses hundreds of real-time environmental sensor nodes measuring a wide range of environmental conditions (air and ground temperatures, humidity, barometric pressure, light, soil moisture, water levels and wind) and dozens of live streaming microphones capturing the different soundscapes of space.

Figure 5: HearThere, 2017

© Gershon Dublon

HearThere comes with a mobile app, *Sensorium*, to allow users to easily switch between real-time and recorded audio streams. Two modes are thus available. In "real-time mode", users experience an amplified present moment. In "history mode", users can immerse in and explore the sound of the previous morning, the last season, or any time period

contained in the database. On the Tidmarsh site, at least five years of recordings are available, corresponding to more than 300,000 multichannel hours.

Gershon Dublon also created *Hakoniwa*, an augmented reality landscape miniature also based on Tidmarsh's sensor and microphone arrays. Conveying the idea in the Japanese tradition of box gardens and using Microsoft's Hololens, *Hakoniwa* renders a scene, visualization, sonification and sound, in real time at the scale of a table (1/1000), driven by the sensors and microphones of the wetland landscape. Users can experiment in a virtual cloud of visualizations and sonifications of sensor data on a 3D terrain. Live audio and recorded sounds are presented spatially on the miniature landscape. Events such as bird and insect calls are detected by a deep neural network audio classification system and rendered on the scene as icons. Thus, *Hakoniwa* increases visual and auditory detail in the user's field of vision, allowing the user to focus smoothly. Multiple users can share a viewing experience, both in co-located scenarios (where the mini-landscape is rendered on the same table for all participants) and in remote scenarios (where two or more users can watch the same activity on the site from afar). Designed as a new way to share and experience complex ecological processes as they unfold, Dublon creates sensory landscapes and physical sites that merge distributed sensing and sensory perception to offer new perceptual sensitivities.

Citizen participation and environmental public policies

The development of cross-disciplinary projects jointly by artists and scientists has enriched their respective practices and methods. These projects demonstrate the richness of cooperation and insights that can be achieved through collaboration between arts, sciences and technologies. Art-science research can give new interpretations of scientific data from nature, proposing unique immersive and sensitive experiences on the complexity of the Earth system, its vulnerabilities and specific modes of enunciation. However, more specific operating procedures need to be addressed and developed.

The ongoing research program EDEN ARTECH (Ethics, Design and Empowerment for Nature through Arts and Technologies) has identified the importance of aesthetics as a condition for environmental ethics and how the alliance between arts, sciences and ethics can generate empowerment. How can media art and art sciences arrangements contribute to a new care of and concern for nature? How can the creation of artworks and artistic experience help humans immerse themselves in nature and adopt a sustainable relation to it? Co-ordinated in its first phase by Pierre-Antoine Chardel, a professor specializing in the ethical-political issues of digitalization and hypermodernity (Institut Mines-Telecom), Jacob Dahl Rendtorff, professor of philosophy of management and business ethics (Roskilde University), and Olga Kisseleva, artist whose work involves science, installation and media art, the project EDEN ARTECH pursues interconnected objectives. Among these goals is the development of a socio-philosophical approach led by an arts-sciences alliance, which proposes interdisciplinary modes of education, and the hybridization of perception through a dialogue between different systems of knowledge. Science is no longer the only source of knowledge; it is now possible to think of knowledge beyond the Anthropocene. With a focus on the vegetal world and the life of trees as emblematic phenomena that we are not able to perceive, the three researchers, their team and their areas of expertise allow them to combine scientific data, ancestral knowledge and immersive experiences to rethink our coexistence with nature.

From a fundamental need to clarify the ethical significance of nature, forests and trees, and the role of aesthetics as a condition for environmental ethics, the research program combines various theoretical horizons. The theories of care which extend to non-humans, and to natural environments; the attention given to vulnerability that is re-framed no longer negatively, as a weakness, but positively as an expectation of a healthy relationship (Pierron 2013: 48), are contributing to the project's development. Through principles of applied ethics, in the plurality of its expressions, EDEN ARTECH also works towards the perspective of bioethics and biolaw. How can bioethics and biolaw make

sense of artworks and artistic experiences for public policy towards sustainability and a green transition?

With the purpose to help formulate fundamental ethical and legal principles for environmental protection, sustainable governance, ethics and legal dimensions of the relation between human beings and trees in society, EDEN ARTECH aims at proposing new dynamics of interaction and citizen participation through integrative synergies and immersive installations. Assuming to confront the "complexity" of these issues, the research program thus intends to create a new arrangement of knowledge and actions to participate in a paradigm shift. In contrast to an exploitative relation to nature, the ethical and aesthetic dimension of an artistic approach, such as proposed through EDEN ARTECH and its consortium, opens up new imaginaries and conceptualizations of the relationship between human beings and nature.

Immersive installations between arts, sciences and technologies

There is an urgent need to change our worldview in the face of ecological crisis, and to learn new ways of inhabiting the Earth. From an anthropocentric perspective, where humankind is seen as separate from nature and superior to it, other entities (animals, plants, minerals, etc.) are viewed through science and technology solely as resources for humans to exploit. In the light of the current classification of living organisms and of the ecological crisis, anthropocentric notions of superiority and being "more evolved" have been challenged substantially. Centuries of dominant exploitative culture and modern naturalist ontology that have enabled the hegemonic deployment of our technical, economic and procedural systems globally are recently being challenged by other approaches, for which it is necessary and urgent to make room (Descola 2005: 242). Knowledge resulting from objectivity are, according to philosopher Michel Bitbol (2016), only the structural residue of the world. This residue has thus little by little replaced the world of experience, located and embodied, by abstract, delocalized, disembodied

mathematics (Bitbol 2016: 66). This echoes the call of anthropologist Arturo Escobar (2018) for a plurality of worldviews and a new experience of the relationships between human beings and territories inspired by the concept of "feeling-thinking with the Earth". Drawing the contours of a "pluriverse" to be inhabited in solidarity, a "pluriversal" political future, both at the societal level and through the academic and institutional world, the anthropologist emphasizes the need for designing a radical transition, detached from its rationalist base, decontextualized data and knowledge that have led to an impoverishment of our social contacts and understanding of the Living.

Today, our societies, or at least part of them, increasingly understand that the values of nature are richer than an approach viewing them solely in terms of resources. The challenges raised by the ecological crisis require rethinking and developing a broader, systemic, integrated and encompassing vision, going beyond the compartmentalization of knowledge, based on an anchored rationality and taking into account the human personality in its entirety and its presence. This ongoing change of perspective highlights the importance of openness and making meaning in the ecological crisis. Presence and attention are fundamental within this process. As premises of contact and encounters with the world, presence and attention create experience which is, alongside sensory motor stimuli, at the roots of meaning making (Harrell 2013: 72).

Henceforth, transversal and immersive projects between art and science are of pressing relevance. Science and art are surely two different ways to approach the real, however, they are not in opposition to one another. They have in common the purpose to make phenomena visible and approach the real through an experimental mode; one through proof systems and replicable experiments, the second through a sensitive experience. Cross-cutting artistic projects are hybridizations of techniques and processes, sometimes interweaving real and virtual space, in which the imagination finds new fields of exploration; hybridizations through which presences are recreated. The immersion principle which is an important part of transdisciplinary creation, participates as a present and porous way of being in the world. The temporality and the apparent three-dimensionality of the immersive virtual space is also

conducive to the manifestation of the concept of "Life Flow" or of a living fabric where interdependencies are key; a living network to be mended in reference to the exhibition curated by Annick Bureaud in 2018 in France and titled "*Raccommoder le tissu du monde*" (Mending the world's fabric).

Experiencing contemporary and transversal artworks thereupon holds significant opportunities regarding the issues that threaten life in its richness and diversity. In creating situations where emotions, sensory perceptions and concepts combine in unique ways to structure meaning and enrich our perspectives (Minissale 2013: 339), a work of contemporary art can lead to a massive and dynamic integration of concepts into complex networks. This process of absorption through art calls on conceptual fusion, long-term memory, relational knowledge – also involving our bodies as valuable and indispensable systems of relational knowledge (Minissale 2013: 200), rational induction, analogical reasoning, proprioceptive and embodied experience, emotional and sensory integration. These unpredictable connections between concepts that lead not only to a kind of metacognitive activity, but also to new solutions and systems of knowledge may also lead to new forms of commitment and participation. Displacing conventional concepts of art as something envisioned in advance by the artist and placed before the viewer, contemporary art enables the reimagining of art as a reciprocal creative process involving reflective and participatory work (Kester 2011: 7).

In many ways, art is the most complex of our psychological engagements. Involving all dimensions of human personality, through immersive and interactive installations, cross-cutting artistic projects bring together different methods and knowledge. They propose experiences that enable us to see things and phenomena differently, not exclusively from the human perspective. Accompanying societal changes, artists, activists, researchers, writers, designers, scientists and more highlight this need to work across borders and disciplines to urgently rethink together our defective ways of being in the world.

In predominantly techno-symbiotic societies, cross-cutting projects between arts, sciences and technologies lead the viewer into a sort of experimental precipice; a moving experience through which it is possible

to question and redefine conceptual categories and to produce meaning, developing new opportunities for imaginary, symbolic, cognitive and sensitive enrichment of our relationship with nature (Carlson, 2009). For philosopher Marshall McLuhan (1968), it is even the role of art to create the means of perception by creating counter-environments that open the doors of perception.

In a time of accelerated change, where the need to perceive the environment has become urgent, new perspectives can reset our sensory thresholds. We are fully human only in relation to nature and likewise nature as an environment requires interactions with humans (Pierron 2013: 48). Through an unstable reality and shifting knowledge, environmental issues reveal that the crisis of modernity is also a crisis of our societies, its relationship with the world and the rest of the living species, a crisis of our "sensibility", of our openness and care for each other. We find ourselves in a challenging era, in solidarity with what we thought we could indiscriminately extract ourselves from (Pierron 2013: 45).

Reshuffling the cards of our conceptions and representations hitherto accepted, as it was in the case of the separation and distinction of nature/culture, human/non-human, ecological challenges fundamentally question our existence. After having interpreted the world, then actively transforming it, it is therefore time to preserve it, to be more present and responsive, to be more responsible. Synergies bringing closer arts, sciences and technologies through immersive practices and citizen participation are necessary more than ever; to discover new paths, foster new ways to see the world, and to develop more responsible behaviours and caring connections with the Living.

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List of figures

Figure 1: Noise Aquarium concept proposal by Victoria Vesna, Karina Lopez and Martina Fröschl, 2016.
Figure 2: Aqua_forensic by Robertina Šebjanič and Gjino Šutić, photo by M.E.Koch (WRO Biennale)
Figure 3: Arboreal Receptors © Ioana Vreme Moser 2022, Sonic Narratives, Simultan Festival, Timisoara.
Figure 4: Interactions férales, La réponse de la baleine à bosse, illustrations from the published article, Frontiers in Psychology, 2021
Figure 5: HearThere, 2017