

Unruly Connections

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The article addresses a shift observable in recent artistic practices that relate to technology and the sciences, and the merger of technological and biological matter. This shift is described along a selection of the author's artistic works from the 21st century, which are paralleled with Roy Ascott's visionary writings from the last decades. This article examines a few aspects of bio + technological artistic practice: how experimental art, practices, and thinking address the networked world; how technology-infused thinking and technology-enabled connectivity have gradually become our incontrovertible reality; and, how it has impacted our perception of nature and the way we relate to the biological world.

Keywords: art, networks, connectivity, telematic art, technological, biological, Ascott

1. Introduction

Roy Ascott wrote in the 1992 an article titled “The Academy: Receding or Re-seeding? Notes towards an Electronic-Nanonic Discourse,” which addresses an art academy as an institution and called for the electronic academy. Although my article will not address an art academy as a subject matter—I will use this article as a base, additionally to few other articles by Ascott. I will shuffle, deal out, tear up and rewrite few of the cards in the article, which Ascott declares of laying out on the table for us to play with a wish to generate some small waves in the telematic discourse (Ascott 1992). The first card drawn from Ascott's stack is:

GROW-BAG Design practice is now closer to horticulture than drawing or engineering: our desire is now to plant seeds, which will allow a multiplicity of outcomes to grow. Instead of designing products or images, we design the rules by which they might emerge. The outcomes will depend on the variables in each specific case. The drafting table and computer screen will be replaced by the “grow-bag.” (Ascott, 1992, p. 23)

Today this statement can be also read in relation to biological world and our desire to manipulate it; for which the possibilities are developing increasingly sophisticated. The early claim of the artificial life field, which has been primarily connected to computer science, “not life as we know it, but life as it could be” fits very well to today's era of biotechnology and developments in the field of life sciences (Langton, 1989). The article will follow Ascott's predictive remarks concerning the post-biological age and concludes that inclusion of the biological realm into the technology-based arts is one of the directions currently developing in the arts. This is also visible in the few selected examples of the author's artistic works and experiments that are presented in this article, and which address intertwining of technological and biological agencies.

1. IT University Copenhagen. Email:

2. Ascott Unfolded

Six or seven years ago during a dinner in a restaurant in Istanbul with several colleagues and friends—one of them Roy Ascott—two interesting occurrences happened during the dinner. First, a well-known online world personality who was sitting in flesh across me was telling the story how he had become a famous female artist in the online world, and how he had few days ago accidentally blown his cover simply by activating the automatic replies of his academic email. The email was the same where he also received the messages from the online world. His years-long identity as a female web-artist was transferred back to being a male scientist in few moments.

The second occurrence concerns Roy Ascott sharing stories of his encounters with different cultures, interesting persons, and peculiar situations. At one point of the discussion he comments: “I have tried to systematically map out the handful of remaining pockets in the world, in which knowledge is understood, obtained, and produced by different means and with a different sensibility than in our rationally driven western world.” This short claim testifies to Ascott’s practices throughout his career as an artist, an educator and a thinker. It is easily visible how Ascott has questioned the obvious and taken-for-granted in his work and writings. For example, his early art works, such as *Video-Roget* from 1961,² which was strongly influenced by cybernetic theory, introduced a possibility for a viewer to become a participant in the creation of the work. Ascott’s interests in cybernetics was further extended to interest about the mind and psychic systems—not only a single mind but collective or distributed minds that are connected. This led to Ascott’s art experiments with early network technology in the 1980’s where several computer terminals and artists in remote locations were connected in creative networks. For example, in *La Plissure du Texte*, 1983,³ several artists in different locations contributed an evolving, open-ended narrative during the three weeks the work was exhibited. This work experimented not only with networks but also with an idea of distributed authorship (Ayiter, Glasauer, & Moswitzer, 2013). The emerging possibilities since the 1970’s for telematic art and connected minds became a central theme of Ascott’s work and writings.

There are several points where my work and interests have connected to Roy’s research throughout his long career. This article will investigate the following: systems and ecologies; connections and connectivity; and moist media and techno-organic practice. In the center of all these is typically an evolving human.

One of my early wearable art works utilizing network technology, *Seven Mile Boots*⁴ from 2003–2004, dealt with human enhancement in a networked world and wearable technology even before its term was widely adopted for use. This work was

2. <http://www.tate.org.uk/art/artworks/ascott-video-roget-t13977>

3. <http://www.medienkunstnetz.de/works/la-plissure-du-texte/>

See <https://isea2011.sabanciuniv.edu/paper/%E2%80%9C1pdt2%E2%80%9D-la-plissure-du-texte-2> for *LPDT La Plissure du Texte 2*, a contemporary version of the work

4. *Seven Mile Boots* is a collaborative work (Beloff, Berger, & Pichlmair, 2003-2004; see <http://randomseed.org/sevenmileboots/>)

realized as a pair of wearable and usable boots that enabled one to walk in the physical world and simultaneously in the virtual and code-based world of the Internet. The virtual walking was perceived via audio cues and real-time chat room conversations, which the walking user could eavesdrop. The work was based on familiar and unfamiliar aspects—moving on physical terrain as well as the act of walking, which both are familiar aspects to all of us. However, being able to walk on physical terrain and simultaneously walk through the Internet, which we—at the time—were accustomed to accessing through the computer terminal, opened up ideas about the gradually emerging connected world that blended the physical and the virtual realms. As an afterthought I believe this project was successful because it provoked the public to imagine beyond the actual capacities of these boots and the situation. It triggered visions of our future, connectedness and possibilities that this kind of world would open up. At the same time the project was real and functioning on the spot—it was not presented as an idea of speculative design fiction.

Already in 1984, in his article “Art and Telematics—Towards a Network Consciousness,” Ascott wrote about his fascination with the novel phenomenon of online connectivity and its addictiveness,

computer-mediated networks, in my view, offer the possibility of a kind of planetary conviviality and creativity that no other means of communication has been able to achieve. One reason may be that networking puts you, in a sense, out of body, linking your mind into a kind of timeless sea. It is a more precise condition than the oceanic feeling that Jung describes in proposing a collective unconscious, and that is because it deals with more than feeling—with particular ideas and associations, too. These ideas, being generated from a diversity of scattered locations, set in widely different cultural contexts and channeled, of course, through uniquely different individuals, may become densely layered in meaning and implication. Networking produces an interweaving of imaginations that gives the term “associative thinking” the most amplified interpretation. (Ascott, 1984, p. 26).

In contradiction to Ascott, who early on wrote and imagined that networking puts one out of body and links the mind into a timeless sea, the *Seven Mile Boots* work addressed one of my consistent long-term efforts: to gain the body back without losing connectedness. In many of my later works, I have deliberately aimed at bringing the physicality of the whole body—and also other biological matter—to the networked realm of computational media.

3. Systems and Ecologies

Cybernetics has been central to Ascott’s work, including thinking on structures that can be seen as systems. Systems are also in the center of my own works. These kinds of approaches abandon the idea of art as a static object that is commonly isolated from the rest of the world, in favor of evolving systems and processes. This is evident in the Ascott’s early experiments with art works that are grounded on networked structures, and similarly in my own approaches that depend on networking, even if the works have different underlying motivations.

Critic and theorist Jack Burnham articulated in the 1960s and 1970s a change in the artistic production, which has clear ramifications up to our time—especially for the experimental art scene. Burnham saw a change from fixed objects to dynamic systems shaped by science and technology. For example, he emphasized communication between a system and its environment and proposed the term *Systems Art*. “It becomes clear that with Object Art, physical presence is everything, while for Systems Art, ‘information’ is the key factor” (Burnham, 1968, p. 365). For Burnham, a system was a fundamental concept of cybernetics; he considered art objects only as the material basis for the concept, and he theorized about art that functions as a system and art that is information processed in real time. This development culminated into the exhibition in 1970, titled *Software*, curated by Jack Burnham (1970). The major difference of the *Software* exhibition in comparison to other art & technology exhibitions at the time was its focus on software and information technology as metaphors for art (Shanken, 1998). Although at the time this exhibition, which focused mainly on American artists, was considered as a failure due to technical problems—works not functioning at all or not the way they were meant to—one can today detect many ideas presented in the show that have later become fundamental concepts in experimental artistic practices that deal with technology, systems and participation. Similar aspects have also been present as the core of Ascott’s art works and thinking.

One of the works in the *Software* show, which is presented in the exhibition catalogue in a section titled “Life in a Computerized Environment,” was *Seek* by The Architecture Machine Group from MIT, led by Nicolas Negroponte. This work consisted of living gerbils in a glass-walled house and a computer controlled robot that picked up, stacked and sorted small metal cubes in the gerbils’ habitat. At the same time as the computer relied on its memory concerning the locations of the cubes, gerbils bumped into them and toppled constructed towers. This is an early example of a work that addressed concepts such as life, control and evolution within hybrid systems that included both technological and biological actors. The art in this work does not reside in a specific object but in a system that has connections to real life.

In 1994 Ascott wrote that the old debate about artificial and natural is no longer relevant; we are focused on what can be made of ourselves instead of what has made us.

We are all interface. We are computer-mediated and computer-enhanced. These new ways of conceptualizing and perceiving reality involve more than simply some sort of quantitative change in how we see, think and act in the world. They constitute a qualitative change in our being, a whole new faculty, the post-biological faculty of “cyberception.” (Ascott, 1995/2003b, p. 319)

During 2010–2011 I worked on a piece called *Appendix*, in which I literally addressed the idea of a missing body part. In this work the underlying idea was to address the body and the connected environment as a unified hybrid system. In the *Seven Mile Boots* the aim was to enable the body to physically walk simultaneously in the virtual and in the physical space—in other words a human was equipped for this,

whereas in the *Appendix* the environment enters the body as a data stream. This is based on the prerequisite that the environment is wired and connected. The *Appendix* is a networked tail constructed for a human. I have previously written about it:

The *Appendix* is conceived to be a tail, which has various human and non-human connections. These connections are developed to have no purposeful intention or self-evident meaning for the user. The horizontal direction of the tail movement is determined by the direction of the Helsinki city transport tramway, and the vertical movements are triggered by the wave height of the Baltic Sea, both in real time. This specific non-intentionality of the connections rejects the rational approach to technology as a purposeful tool and treats technology as an environment and material for the creation of new, networked organs for human. The work presents an aesthetic experiment in which it is not known beforehand what might be the benefit of it or what kind of experience it will create. Even though the structure of the work is based on technology, it purposely lacks an instrumental technological use as a means for achieving a predefined goal. (Beloff, 2014, pp. 62–63)

Very fitting for the aims of the *Appendix* work, Ascott has written in his cyberception article:

Cyberception involves a convergence of conceptual and perceptual processes in which the connectivity of telematic networks plays a formative role. Perception is the awareness of the elements of environment through physical sensation. The cybernet, the sum of all the interactive computer-mediated systems and telematic networks in the world, is part of our sensory apparatus. It redefines our individual body just as it connects all our bodies into a planetary whole. (Ascott, 1995/2003b, p. 319–320)

The *Appendix* work was born into a continuously connected world, which it also depended on. It proposed a viewpoint on humans having (new) body parts, which are connected to environment, either natural or constructed societal infrastructures, that are beyond our individual control. In other words, even if these body parts have become part of our body, their functions and actions may be controlled by data events from external sources. My focus in this work was shifting from the mere experience of connectivity towards questions like: What kind of data are we connected to and who is in charge of the connections? Do these data streams define our relation to other humans and nonhumans? In the *Appendix* work the (new) body part is the connection point through which the surrounding world and our physical bodies become one unified system.

A card on telepresence from Ascott's stack reads: "We are out of our bodies as often as we are in them. More and more we merge with the environment, which is in turn becoming increasingly intelligent and entering into us" (Ascott, 1992, p. 24).

For me the *Appendix* also marks a clear transition in my works towards thinking about larger systems and hybrid ecology that consist of biological and technological actors and agencies.

4. Connections and Organisms

Ascott is an example of an artist who stepped beyond the art commodity. First, his works started including an active viewer-participant, and secondly, some of them were initiated and based on information technology and networks. It was art that addressed the interactive, responsive, and technologically connected world.

The third card drawn from Ascott's stack states:

THE OBJECT. After a decade of the immaterial we are about to see a return to the object. But this is not the art object of old with its distancing, its separateness, its immobility. This is an object of nature, of the new nature, of artificial life. Our alliance with complex systems, effected by a richly networked telematic connectivity, is yielding insights into the principles of living process which encourage us to want intervene directly in natural evolution. Then the Life Class will come into its own. We'll make our own life, our own intelligent, growing, interactive, responsive, transformative bodies. (Ascott, 1992, p. 22)

Ascott envisions here a future of a human that is designed by humans enabled by advancements in science and technology. I am adding to this an idea that goes beyond human intelligence and human enhancement; questions concerning the relation between humans and non-humans, in this case fruit flies, information technology and AI. Not only are we aiming at enhancing our abilities through these practices, but we have occasionally also captured non-humans into our efforts. This is, for example, the case concerning two art works by me, which investigate relation between a human and *Drosophila*: *The Fruit Fly Farm*, 2005–2006, and *The Fly Printer—Extended*, 2016.

The earlier work, *The Fruit Fly Farm*,⁵ was constructed as a sphere that functioned as a habitat for fruit flies. It was a wearable device with a thought to have the fruit fly nest as a pet, instead of the typical attitude of treating them as a nuisance and a pest. For the fruit flies this habitat functioned as a kind of a moving space station; the flies were free to fly in and out of the station, but they had no control of its location. The human public could access the work and the station via technology. At the time it was challenging to use and modify mobile technologies as the most of the mobile devices were operating on closed proprietary systems. *The Fruit Fly Farm* incorporated a hacked mobile phone with a small custom software script. The general public could send an SMS to the work, which triggered the hacked phone camera to capture a close-up image of the nest. This image was sent back to the person sending the SMS, as well as it was automatically uploaded online to the website. The work investigated the human technologically-connected society and an organic insect community that was observed by technology.

The more recent work with *Drosophila*, *The Fly Printer—Extended*.⁶ is a third iteration of an apparatus, which points out how technology enters our thinking even

5. The original version of the work (2014) was a collaboration between Beloff and Maria Antonia Gonzalez Valerio. <http://www.realitydisfunction.org/?p=392>

6. <https://investigations.hybridmatters.net/posts/fly-printer-extended-an-artwork-with-fruit-flies-artificial-intelligence-and-humans>

when dealing with living matter. *The Fly Printer* is a printing apparatus in a form of a closed environment that contains fruit flies. The flies eat food that is specially prepared for them that is mixed with printer inks. The flies digest the food and gradually print colored dots onto the paper. These dots are traces of biological life rather than representations of life. When developing the first version of this project, we (Beloff & González Valerio, 2016) wrote about how standardization of images, paper and inks in contemporary societies has produced a certain way of seeing. A comparable standardization in biological research can be seen through epistemic artifacts such as model organisms. For example, the fruit fly, *Drosophila*, is a model organism used in genetic research. The general expectation is that discoveries and knowledge gained from a model organism will provide insight into the workings of other organisms. In this work, standard biological model organisms replace a standard part of our common printer technology (Beloff, 2014). The latest version of the work, *The Fly Printer—Extended*, connects the printer and the produced images to recent developments in artificial intelligence. This version includes a camera and software with neuronal network learning system. While the human stands by the spherical habitat observing the traces of biological life produced by the fruit flies, an artificial intelligence tries to interpret these traces to us as meaningful images through the neural network learning system. As the image develops with more dots appearing on the paper, the neural network refreshes its interpretation every few minutes. The work ironically plays on a known technological problem; the over-interpretation of intelligent image recognition systems. The work highlights the differences in how neural networks and humans recognize and project meaning onto images and objects.

Already in 1992 Ascott thought about drawing in a very similar sense: “DRAWING. Neural nets will mediate in the artistic processes of drawing and modeling. Our contribution to the art will be to invent the procedural rules. Drawing in virtual space will give new meaning to Klee’s concept of ‘taking a line for a walk’” (Ascott, 1992, p. 23).

In both of these above-described works, *The Fruit Fly Farm* and *The Fly Printer—Extended*, nature is being swallowed by technology on the level of material aspects, but also concerning our expectations and perceptions of nature.

In the 1990’s Ascott was envisioning the future and human alliances with complex systems and connectivity, and how these developments encourage us to intervene directly in natural evolution and design ourselves. Ascott primarily referenced human evolution and the design of a human; a topic that has been much debated in public for the last half a century. In many of these debates humans are typically seen as a species ready for experimentation that is performed in isolation from the rest of the world. However, during the recent discussions on climate change and debates about the era of the anthropocene, we have become aware of the fact that everything is connected. Any changes to an organism or aspects of it will cause reciprocal changes in its ecosystem, and changes to a habitat will cause changes in the organisms.

One can ask what kind of visions of the future of the planet and humans are today politically correct and acceptable? And, which ones of them have actual potential?

How can we learn to think more holistically in a way that includes the whole planet and drive new types of developments in science and technology? Ascott writes about the connectivist paradigm as a model, which holds that everything is connected; everything interacts with and affects everything else. According to him this is reflected in the telematic environment of computer-mediated networks of data transfer, interactive video conferencing, remote sensing, and telerobotics, where communication can also in a sense be non-local and asynchronous, although in different ways and with different outcomes (Ascott, 1995).

Based on this, one can claim that artists that work with networked structures and with ecological perspectives—which include the idea that everything is connected and affects everything else—present us with models for understanding and perceiving the world. They may also be training us for a new cultural consciousness.

5. Future Nature

In the article “Back to Nature II” Ascott writes that nature is a metaphor, which has never really existed, or has existed in different ways for different societies:

We have always placed it in opposition—to culture, the city, technology. Its strength has lain in this opposition, as much a refuge as a force. But now the binary opposition of town and country, for example, is disappearing. With the ubiquity of telematic networks, the city is no longer the necessary site of commerce, learning, or entertainment, while the advance of artificial systems of synthesis and replication in the biological sciences means that the country can no longer claim a hegemony of pure and authentic natural processes. (Ascott, 1994/2003a, p. 327)

Ascott calls for the development of new metaphors that fit for conditions of complex systems that include biological, technological and social life. This is close to what I have called a hybrid ecology that is developing between digital and biological matter and within which “a new perception is emerging concerning technology, but also biology” (Beloff, in press). The practices, specifically within the arts that deal with these kinds of hybrid ecologies and consider the merger of technology and organic matter, are *techno-organic*. Techno-organic practices refer to developments that increasingly reshape the boundaries between the technological and the biological, and which are visible in experimental arts. This term allows one to think about single entities that are a conglomerate of biological, technological, social, and possible other aspects and actors. “From these practices it becomes utterly clear that the idea of nature is not what it used to be” (Beloff, in press).

In recent years various scholars have critically addressed the concepts of nature and ecology. One of them, Timothy Morton (cited by Broeckmann, 2016), wrote in 2007 in his *Ecology without Nature: Rethinking Environmental Aesthetics* that the construction of contemporary notions of nature, the environment, and ecology can be considered as a parallel development to industrialization, and that ecology, for example, is something that cannot be restored, since it is itself a product of modernity. Art historian Andreas Broeckmann has pointed out that in the middle of the 20th

century, cybernetics and systems theory transformed the conception of human, environment and of technology. “The main marker of this development is the concept of ‘ecology,’ which designates the dissolution of conceptual boundaries between nature, technology, society, and the individual, and the dual movement of the world becoming technological and technology becoming ecological” (Broeckmann, 2016, p. 224).

All these different notions stem from questions that concern a shift in our perception of nature and environment, which are impacted by developments in science and technology, and often reflected in artistic practices. “The transformations in our models of the world and the accelerated increase on our technological powers of manipulation in recent years suggest that a cardinal question for artists in the twenty-first century will ... be, ‘What might nature become?’” (Ascott, 2003a, p. 329).

This is one of the questions present in my artistic works within recent years. For example the work *The Condition*⁷ from 2016 investigates with an artistic approach an organism that is in its base biological, but which has both cultural meaning and economical importance. The organism in question is a cloned Christmas tree that has been developed within scientific research that is driven by economic interests in Denmark. Denmark is one of the largest producers of Christmas trees in Europe and the scale of production has economic importance for the country. The cloning of trees is being developed for improved profit through efficient mass production of high-quality Christmas trees. The cloning of the Christmas trees is a technological practice, and in this case, within cultural and economic context.

I came across the Danish Christmas tree production while driving around Denmark and being puzzled by seeing fields full of same height fir trees, which immediately signaled that the trees were planted and grown purposefully. The Christmas tree type grown on the fields is an immigrant species, which originates from the Caucasus. The Nordmann fir (*Abies nordmanniana*) has become a representative of the perfect Christmas tree for Danes through its suitability for the Danish climate. “One of the first questions emerging while investigating the ongoing development of the cloning process in Denmark was: How does one define criteria for a perfect Christmas tree? This crux of the cloning attempts is obviously a point where the cultural aspects start taking over the technological and biological ones” (Beloff & Jørgensen, 2016). The choice for selecting the species and the individual tree for cloning practice is guided almost solely by visual, aesthetic selection based on human desires. The concept of cloned Christmas trees culminates in biological evolution, technological development, and human culture.

The Condition installation consists of 12 cloned Nordmann firs in rotating boxes, which references the concept of artificial forest where everything is constructed and controlled, and in this case connected. Like in a natural forest in which the individual trees are part of a whole that structures their living situation; the living conditions of

7. *The Condition* is a collaboration between Beloff & Jørgensen, 2016 [blog posting].
<https://investigations.hybridmatters.net/posts/the-condition-cloned-christmas-trees>

these 12 trees are continuously evolving based on real-time data from the solar system broadcast by the space weather satellite.⁸ This data uses a SOM (self-organizing map) algorithm that is being able to learn how to classify information without supervision.⁹ It receives input from online space weather data and maps this data set as rotation speeds onto the different boxes. The system has the ability to sense changes that occur at a planetary scale (Beloff & Jørgensen 2016). The installation is an exemplary constellation of hybrid ecology, in which a culturally defined biological organism merges with robotic elements and information and communications technology. All affected by human intervention.

The card on connectivity from Ascott's stack:

CONNECTIVITY. "Connectionism is where the scientists have gone, connectivism is embracing the artist. Connectionists and connectivists converge at that place in culture where the artificial collaborates with the natural in a new synthesis of being. Neural networks are merging with planetary networks in a new space of consciousness" (Ascott, 1992, p. 23).

6. Conclusion

Throughout this article I have quoted Ascott's 'cards' from his article, which is titled *The Academy: receding or re-seeding? Notes towards an Electronic-Nanonic Discourse* (Ascott 1992). Today, 25 years after the publishing of Ascott's article, we can ask if the re-seeding has been fertile and what kinds of grown seeds are visible today? Ascott's seeds that were planted within the art field in the 1990's were grounded on his vision of a future that was under the influence of technological and scientific development.

Today one can easily observe that noticeably many of the Ascott's seeds have germinated. Increasing numbers of artists have been reacting to societal changes and reflecting on our evolving relationship with technological advancements. The seeds, which are specifically in my focus and which have germinated within the last two decades, are related to transformations concerning our living environment and our perception concerning the natural world. This includes the construction of the networked world, extensive developments in molecular and synthetic biology, and life sciences, as well as more general developments towards hybrid ecology, which blends seamlessly the technological, digital, biological and societal agencies. Ascott has claimed convincingly that the pioneering artistic experiments with networks and information technology are preparations for our further transformations concerning our bodies, organic matter and biological world. "Our work in electronic space today is properly preparing us to participate creatively in molecular time in the future, in the twenty-first-century return to nature" (Ascott, 2003a, p. 329). According to Ascott nature would become one of our focus points during the 21st century.

8. <http://www.spaceweatherlive.com/>

9. AI-JUNKIE, Kohonen's Self Organizing Feature Maps. <http://www.ai-junkie.com/ann/som/som1.html>

Today what we call nature and think of as natural is definitely changing due to the developments in science and technology. Our return to nature in the 21st century is colored by engineering approaches and similar terminology. For example, the long-term dream of humans of constructing life has been attempted and claimed to be achieved¹⁰ in the field of synthetic biology, which is considered as an engineering discipline. The various DIY and citizen science movements, which are currently increasingly popular especially in the fields of natural and medical sciences, are aiming at democratizing science. The DIY-bio field is strongly focusing on designing and engineering low-cost laboratory tools for biotechnological manipulation of living matter, which are accessible and affordable for anyone. The DIY-movements are presenting societal alternatives to centralized and proprietary models that are currently dominant in the western societies. We have also become aware of limitations of our planet's natural resources, which we have taken for granted and refined for our use. Many recent developments in the creative fields are centered around sustainable design or following its guidelines. Even if these resource limitations are visible for us today and many attempts are made for better usage of them, effective political actions and globally supported innovative solutions for these kinds of challenges are still lacking behind. The developments in technology and science have also triggered debates concerning ethics and morals of humans towards other species and critical questions concerning the assumed superiority of humans on the planet.

All these aspects also present evidence about our concerns and our return to nature. By the second decade of the 21st century, it has become clear to us that nature is not what it used to be. The romanticized notion of nature is long gone; our current nature is technologized, manipulated, constructed and evolving. This contemporary nature is one of the players in hybrid ecology that intertwines biological and technological agencies with human societal initiatives. Many artists are participating in these movements and initiatives, and addressing through their work these rapidly developing areas such as biotechnology, synthetic biology, environmental science, geology, climate change, and so forth. The artists working with these topics present us foresight into plausible futures. One can also claim that many art works prepare us for the future challenges by offering us plausible visions of the future and mental adaptation for the unavoidable changes.

LEARNING. We learn by navigating the turbulent data-seas. We ourselves construct the reality, which we seek to understand, this circularity produces a beat which is the pulse of life. It's the same beat that sends shamans and dervishes into spirals of ecstasy. Students are in touch with this sensibility. It may seem to be no more than a fascination with the mysterious and hermetic but it is in fact the coming into being of a new cultural consciousness" (Ascott 1992, p. 23).

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