Co-creation Towards the Post-Anthropocene

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Abstract

Co-creative practices including non-human actors give rise to a series of challenges and critical issues. Ēngines of Ēternity is an ongoing artwork which seeks to attribute agency to microscopic animals called rotifers and to the unique environment of outer space. Scientific experiments involving these animals, as well as the evolving artwork that accompanies them, have gone through multiple iterations having been flown to space and consequently returned. This article reflects on how transdisciplinary approaches can provide a vehicle to connect knowledge and enquiries from art and sciences in the context of real-world problems. We then focus on the case study of Ēngines of Ēternity and how these interactions played out during this process. We conclude the article with a critical reflection on non-human agency, using the aforementioned project as a case study.

Keywords

nonhuman agency, post-Anthropocene, co-creation, transdisciplinarity, ArtScience.

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Introduction

The bidirectional exchange of knowledge, ideas and methodologies can foster co-creative practices and allow for a genuine blurring between disciplinary boundaries to occur.[1] Such holistic conditions may act as a catalyst for the synthesis of a deeper understanding with regard to the nature of the universe we inhabit and with it the emergence of a new post-Anthropocene era.[2] In order to achieve a sustainable future, we need to understand the mechanics and challenges of human and non-human interactions. This article explores and assesses the process of ArtScience co-creation, through a transdisciplinary project entitled Ēngines of Ēternity, acting as a case study. The work's narrative incorporates questions regarding manmade power structures and cultural immortality, through the use of non-human organisms, whilst highlighting the benefits and issues that can occur as a consequence. The author of this work and of this article is SEADS, a transdisciplinary and cross-cultural collective of artists, scientists, engineers and activists. The collective's mission statement notes that transdisciplinary approaches are key to unlocking collective intelligence, which is a prerequisite for generating more diversified and inclusive futures.[3] They incorporate co-creation methodologies in a range of their projects, amongst others are community art projects such as Bio-modd and Seeker.[4, 5] The Ēngines of Ēternity project explores new forms of co-creation between different entities: humans, biological organisms and algorithms within the context of outer space. Before introducing the project, we outline the concept of creativity in the post-Anthropocene, which has been key to functioning as an underlying theoretical framework for this case study.

Creativity and Agency in the post-Anthropocene

If the Anthropocene is understood to be the geological epoch in which human activities are the dominant influence on the environment, the post-Anthropocene can be understood to be the epoch that dawns when human activities and their effects are no longer the dominant influence on the environment.[6, 2] The exact nature that the post-Anthropocene will take is difficult to predict because it depends on many factors, including how humanity responds to the challenges currently faced in the Anthropocene itself. On a global scale, we are not able to predict when and how the post-Anthropocene concept will become a dominant global framework, or indeed if this in fact will take place. However, there may be triggers that are capable of driving societies (both human and non-human) towards it, such as the ongoing global warming crisis and deterioration of the environment, societal cultural shifts, or technological advancements that may even allow humanity to live in greater harmony with Earth's ecosystems, but this is currently speculative. Merging disciplines can contribute to identifying and solving complex problems through the collaborative exchange of ideas and methodologies.[7] Indeed, it has become apparent that many of the major problems facing the world today are hugely complex in nature and will not be solved by any one single discipline alone.[8] Addressing complex societal and scientific problems requires involving multiple disciplines. However, there is a danger of oversimplifying the collaborative benefits between these disciplines. We argue that commonalities or filling up gaps can ignore or overlook the need to find new creative ways of dialogue between the disciplines, thus creating new knowledge or lines of inquiry that can transform the conversation on various global and scientific issues.

Differing from alternative approaches to merging disciplines, transdisciplinarity concerns both what exists, and is between and beyond all disciplines, blending into an empirical and theoretical exploration of co-creation.[1, 9, 10] One form of transdisciplinarity involves combining art and science (ArtScience) to create new co-creation practices that utilize methods and methodologies from both fields. Such art interventions can take place in present and future shared spaces and may contribute to the constitution of new symbolic orders and organisations of human and non-human connections, staging the mise en forme of post-Anthropocene co-existence. Seen in this way, ArtScience co-creation can be seen as an integral part of rethinking humanity's relations to nature.

Bruno Latour argues that non-humans, such as animals, plants and objects, are active participants in social life and should receive equal attention in the study of society.[11] In this way of thinking non-humans should be seen as actors in their own right, rather than simply as objects that humans act upon; non-humans can have agency, and influence the course of events in the world. Latour's conceptualization of agency does not strictly correspond with notions of sentience nor free will; neither does it have to be confined within physical boundaries. Agency can be an emergent property of multi-actant configurations.[11] According to Latour, social-cultural practices are enunciative and performative actions through which the new "subjects" can test different semiotic, sociological and alterity modes of existence, that lie between "being-as-being

and being-as-others."[12] In a similar vein, we refer to the notion of a "multispecies roundtable" for co-creating systems. This involves bringing together plants, computers, and people in mutually beneficial ways and placing them in a situation where they must arrive at a consensus.[4, 13]

Speculative Realism, Posthumanism, New Materialism, and the non-human are just a few examples of concepts that challenge the limits of what Donna Haraway calls the "fantasy of human exceptionalism." These ideas reject the notion that humans are somehow separate, beyond, or more advanced than our earthly co-habitants.[14] The theorists working within these fields help to illuminate the limits of human experience and thought, highlighting the capacities, experiences, and potentials of other living, non-living, and non-human entities. Their examples embrace a radically holistic and inclusive approach to the future of humanity and are established concepts in critical cultural thinking.

The Engines of Eternity project puts these ideas into practice by directly interacting with microscopic organisms, computational algorithms, and the physicality of outer space. These practical engagements hint at new opportunities and insights but also confront the limitations of an extended co-creation practice. Continuous hands-on approaches and their analysis allow us to move beyond established thinking and gain new critical insights through hands-on artistic research.

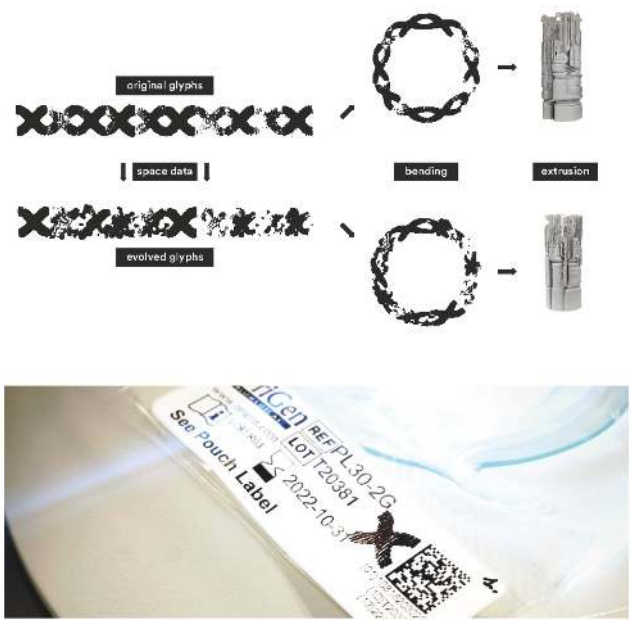

Figure 1. Evolution and translation of the "code" and the application on the experiment label. © SEADS

Ėngines of Ėternity

Ēngines of Ēternity is a transdisciplinary project that explores how creativity and agency might function in a post-Anthropocene context. It is a work in progress and is intended to be a series of mixed-media installations. The project is a joint effort between SEADS and scientists from Karine Van Doninck's laboratory at UNamur. The foundational idea of the project is to take the biological phenomena of cloning and DNA repair as metaphorical departure points for an art installation about humanity's obsession with cultural immortality.[15] By metaphorical departure point, we mean that we use the fascinating biological characteristics of the rotifer animal to question creating a perfect society. At the core of the project is an artwork that evolves through complex systems of interplay and co-creation between biological organisms, humans, and technology. The project explores dominating ideologies about evolution and cultural identity within the space environment. The discussion on cultural immortality is discussed in a separate article[3], as this one focuses on the methods and their implications that were crucial to developing the artwork. Here, we instead describe the background of our ArtScience co-creation activities: space biology experiments with the Bdelloid rotifer.

The Bdelloid rotifer or 'wheel animal' typically lives in freshwater environments and is part of the greater ecosystem that exists there. On the surface, rotifers seem to represent a biological culture perfected through evolution, cloning themselves in endless repetition. However, during this cloning process, genetic material actually gets reshuffled and diversity is generated through the process of horizontal gene transfer. This method of generating diversity can be defined as the non-sexual movement of genetic information between organisms, and genetic material from organisms as diverse as fungi, bacteria and plants have been discovered lurking inside the rotifer's genome.[15]

Through a series of space biology experiments, scientists from UNamur sent rotifers to the International Space Station (ISS) in both 2019 and 2020. The goal of these experiments is to investigate rotifer DNA repair mechanisms and cloning in the conditions of outer space. In December 2019, the rotifers going to ISS were accompanied by an artistic "seed" in the form of a specially designed visual code that accompanied the rotifers. The code was developed by the Ēngines of Ēternity team and serves as a seed for a series of 3D-printed sculptures. These sculptures show the physical changes to the rotifers in response to environmental conditions and experimental techniques. The sculptures are based on a mapping of recorded experimental data 3D sculptures.

The work is driven by two main objectives: the evolution of the "code" throughout different missions and the translation of these seeds into three-dimensional sculptures. Analysis was conducted on both the bags that went up into space and the bags that served as a control group on Earth in order to reveal the differences between protein expressions. Each individual bag that was sequenced was assessed against the average from the control group bags, resulting in discrete sets per bag of large quantities of raw data. These sets were then grouped and ordered per function, accumulating the differences compared to the control group. The result was a visualization per bag showing the impact of the space environment on rotifer animals. These visualizations were then used to evolve the original visual "code" that accompanied these bags by using it as an attractor to manipulate the pixels of the original seed.

The second objective was to translate these seeds, both the original and the evolved version, into a three-dimensional sculpture. The glyphs that make up the seeds were transformed into a circle and a linear regression algorithm was applied to layer multiple versions of the original visual on top of each other and connect them. This resulted in a three-dimensional sculpture where the base visualises the overall shape and every layer shifts towards a higher level of detail. In this way, the final sculpture shows both the impact of the environment on the rotifer animals at a higher order and on the smaller, individual protein clusters.

The “code” and sculptures will gradually evolve into the final artwork over several missions based on the changes in the rotifers. Hence, the context of outer space is not merely treated as a passive gallery space to exhibit art in, but rather as a dynamic environment that can actively shape the evolution of the work.

Co-creation revisited Co-creation in Art and Science

The historical development of scientific and artistic disciplines has resulted in the development of organisations and structures in which these two areas do not organically engage or have dialogue. The organisational and procedural infrastructure that exists within these two fields is therefore sometimes seen as opposites. Science is often associated with the use of strict methodologies and systems to produce empirical data, unbiased information, and facts that help us better understand the physical and natural world around us. On the other hand, art is often viewed as a more subjective practice that allows individuals or groups to express their creativity and imagination.[16] While these definitions are not entirely inaccurate, such reductionist viewpoints are unhelpful when beginning to ask deeper questions. [23] Indeed, in recent times a variety of Art-Science networks have emerged that act as places where such communities can interact, and begin to create imaginaries for developing questions regarding our place in the wider world, whilst reaching large audiences. Interactions between the fields of science and art can be regarded as a one, or two-way, form of communication between the two. When considered as a one-way form of interaction, there are two possibilities for one to influence the other, either art provides science with some form of benefit, or vice versa.

The SEADS team developed tools using techniques and knowledge that differ from those of the pure scientific team. The goal was to gain insights into the impact of the alien environment of space on living creatures in an exploratory context. Initially met with skepticism, the collaboration with the pure science team evolved throughout the project. By communicating about our results, the team was able to establish new ways of trust and collaboration. The SEADS collective comprises members with backgrounds in both art and science tapping into collective intelligence. This allows them to push boundaries when collaborating within and outside of the network. For instance, in the Ēngines of Ēternity project, the artists received hard drives containing all the raw transcriptomic data to explore. This not only resulted in the aforementioned sculptures but also allowed the team to analyze their findings and compare them to those of the pure science team. It appears that new insights emerged from this transdisciplinary approach, which has yet to be validated and might lead to a future publication. In some ways, it is also possible to view the process of horizontal gene transfer as a biological counterpart to transdisciplinarity itself. The generation of novel genetic material through the incorporation of foreign DNA into the rotifers, from such phylogenetically distant organisms, echoes the process of numerous distinct disciplines joining together to create a more efficient system. Much like transdisciplinarity itself, it is not merely the merging of disciplines (or in this case genetic material) that makes this comparison applicable, but the fact that the process has wider implications on a much deeper level as well.

If transdisciplinary practices are considered to be a combination of, translational and methodological approaches from various disciplines, utilised to address a problem, then the horizontal integration of genomic elements from cross-species sources can be said to

function in a similar manner. DNA segments once integrated into the rotifer's genome can be translated into new useful proteins, that are capable of carrying out a variety of functions, and in turn, contribute to the evolutionary adaptation of the organism. The whole is greater than the sum of its parts, in both the case of transdisciplinary inquiry and biological evolution.

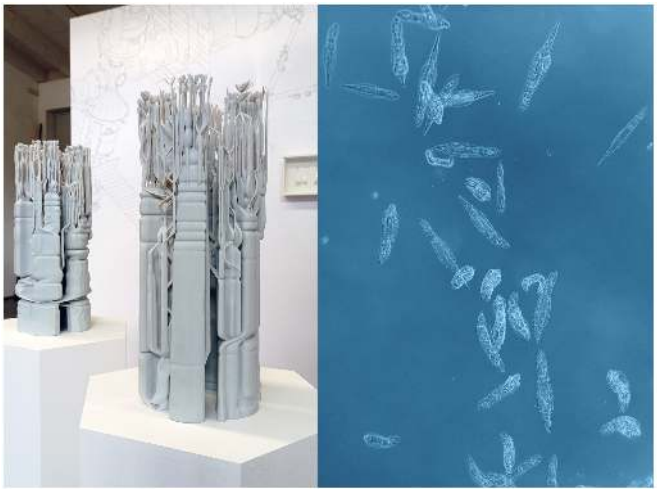

Figure 2. Sculptures and Bdelloid Rotifer organisms © SEADS and Boris Hespeels

Posthuman co-creation

A fundamental question in this project is whether true co-creation between humans and non-humans has been established, more specifically between the art-science team and the rotifers. How much agency did the rotifers actually have in participating and contributing to the artwork? In addition to exploring human-human interactions, we also investigate the agency of non-human entities, specifically the Rotifer animal. The evolution of the artwork is driven by changes in protein expression. However, this approach raises the question: are these non-human entities truly being given agency?

There are two ways to approach this question. One way is instrumentalist, which would argue that regardless of the artists' intentions, the rotifer animals are being exploited for both science and art. In fact, there is even an element of cruelty, as the animals are taken from their natural habitat and subjected to experimentation in an extreme environment without any choice in the matter. From a pragmatic standpoint, it is difficult to refute this way of framing the issue.

We present a second approach as follows: The artist team explores the intrinsic attributes of the rotifer animal and co-creates the artwork based on their findings. In this instance, horizontal gene transfer is viewed as a form of creation. By incorporating the protein expressions from these animals as the main driving force, and using complex bio-informatics algorithms, some level of agency over the artwork is given to these non-human entities. Extreme environments have been fundamental driving forces for the evolution of rotifers. However, in the case of the artwork discussed here, the driving force of its evolution is not solely an attempt to depict the intrinsic attributes of these animals. Instead, it also considers the impact of the alien environment of near-zero gravity in space on these extremophiles. This marks the first time in the history of the species that they have been exposed to the environment of space.

In this sense, the two levels of co-creation within this case study can be extended to include "The alien" as an environmental contributing factor. Additionally, the extensive use of algorithms and predictive computational methods has played a significant role in the visual outcome of the project. As a result, this project explores new forms and levels of co-creation between humans, biological organisms, algorithms, and outer space. Horizontal gene transfer and parthenogenesis are used not only as a metaphor, as was discussed in the previous section, but as an act of self-creation and self-transformation which instruments served as contributing factors in the formation of the artwork.

Conclusion

Co-creative practices including those involving non-human actors were explored through the creation of an ongoing artwork project entitled Ēngines of Ēternity. The nature of such transdisciplinary methodologies was investigated by a small community of artists and scientists involved in the project, whose evolving discourse during the process of developing and reflecting on the project has helped to provide a framework to inform conversations regarding the future of humanity, and whether and how we might move towards a more post-Anthropocene stage in the future. Establishing an ethical post-Anthropocene requires approaching the Other from a humble and empathic perspective. This case study provides insight into a practical approach towards this objective. For example, by focusing on the intrinsic qualities of creation present in the non-human agents. Nonetheless, it is evident that there are challenges that need to be addressed to successfully accomplish this goal.

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Author Biography

SEADS (Space Ecologies Art and Design) is a transdisciplinary and cross-cultural collective of artists, scientists, engineers and activists. Its members come from all corners of the world. SEADS is actively engaged in deconstructing dominant paradigms about the future and develops alternative models through a combination of critical inquiry and hands-on experimentation.

SEADS employs its own signature methodology which is centered around community building, co-creation and bottom-up design. SEADS believes that these approaches are key to unlocking collective intelligence, a prerequisite for generating more diversified and inclusive futures. Furthermore, SEADS also embraces a hacking and open-source ethos, with the goal of engaging as many people as possible in the activities and ideas that they initiate. Since 2009, the collective has co-created more than 40 art projects, together with local communities all over the world.