Uncanny Realm – The Extension of the Natural
Laura Beloff

IT University Copenhagen
Denmark lbel@itu.dk

Abstract

One of the typical binaries existing in western society is the division between natural and artificial. But similarly biological and technological are often seen as oppositions. In today's world, it is increasingly difficult to tell the difference between natural-biological entities from artificially constructed ones with human cognitive abilities. This is due to the development of biotechnological methods to manipulate or construct new kinds of living organisms that are purposely designed by humans. Likewise, artificial intelligence-systems are being developed to become more autonomous and life-like with their sensing and learning abilities. These developments point out that our perceptions of the concepts of *natural* and *artificial* are radically changing. Traditionally *natural* is understood as something coming from nature and not made or caused by humans; and artificial is understood as the opposite – not natural, but produced, created or caused by humans.

Taking the *uncanny valley* concept by M. Mori (Mori 1970) as a starting point, the paper will investigate how this concept fits into experiments that are intertwining biological and technological matter. The *uncanny valley* idea was developed by Mori in relation to robots and their resemblance to humans. It is a concept that is strongly connected to our perception of truth and to the moment when we are confronted with a question to judge if something is '*real*'. In the paper the *uncanny valley* concept is extended to experiments in the arts and the sciences that address intertwining of biology, nature, technology, and which disarrange our traditional understanding of *natural*, *artificial* and *real*.

The talk will additionally present examples of the recent and on-going research by the author that is interlinked between biology and technology.

Keywords

Art & Science, Natural and Artificial, Biology and Technology, Uncanny Valley.

Introduction

The most of us are familiar with the concept of *uncan-ny*, which has been analyzed and described in length by Sigmund Freud in 1919. He writes that "an uncanny effect often arises when the boundary between fantasy and reality is blurred, when we are faced with the reality of something that we have until now considered imaginary, when a symbol takes on the full function and significance of what it symbolizes […]" (Freud 2003). Freud's examples are mainly literary novels and fictional texts, but he also mentions in his text wax figures, dolls and automata as sources of the *uncanny*.

One of the long-term dreams and fears of humans has been the ability to construct *life* from scratch. The figure of Frankenstein, which we know best from many movies that are based on the well-known story from 1818 by Mary Shelley, is one the most prominent examples where these dreams and fears culminate. Shelley's text produces an *uncanny* effect in us as it blurs the boundaries between fantasy and reality and the figure of Frankenstein brings forth a range of feelings in us – from amazement to revulsion.

Revulsion is also considered to be one of the feelings affiliated with the concept of the *uncanny valley,* a concept that is less widely known than the *uncanny*. The *uncanny valley* concept obviously refers to the Freudian *uncanny*, but it originates in the research field of robotics and their cultural aspects. The concept is based on a hypothesis by Masahiro Mori, who in 1970 envisioned people's reactions to robots that look and act almost like a human. In particular, Mori claimed that a person's response to a humanlike

Source: Bukimi no Tani (The Uncanny Valley) by Masahiro Mori, Energy, 1970
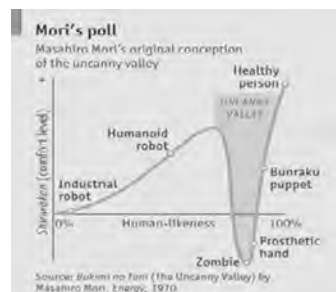
robot would abruptly shift from empathy to revulsion as it approached, but failed to attain, a lifelike

appearance. This descent into eeriness is known as the *uncanny valley*. In other words if one follows a

chart that represents people's reactions to human likeness in robots, in the first instance people seem to like robots that remind of themselves. The more likeness to human figure the higher the curve rises. But, suddenly, when the human likeness starts to be very close to 'real' human the curve abruptly drops down and rises again afterwards to its highest point that represents a real human. This sudden drop in the curve draws a kind of a valley in its shape; this dropping point Mori named as the *uncanny valley*. One of the examples by Mori is a prosthetic hand that resembles a real hand. Mori writes, "once we realize that the hand that looked real at first sight is actually artificial, we experience an eerie sensation. For example, we could be startled during a handshake by its limp boneless grip together with its texture and coldness. When this happens, we lose our sense of affinity, and the hand becomes uncanny." (Mori 2012)

There has been a fair amount of speculation concerning the *uncanny valley* concept; if Mori's claims are true, and why do we react in this way? Several scholars have aimed at explaining this kind of behavior present in the *uncanny valley* concept. One of the explanations, which seems plausible, stems from an evolutionary tendency to be repulsed by anyone who looks sick, unhealthy, or *wrong*. In other words, it is humans' innate instincts for pathogen avoidance that causes the revulsion (Rhodes & Zebrowitz 2002). Another explanation is closer to Freud's description of uncanny and particularly in regards to humanoid robots, which have been claimed to trigger an innate fear of death as they typically move like lifeless puppets, reminding us of our own mortality (MacDorman & Ishiguro, 2006)

Uncanny Nature

Author Yuval Noah Harari writes in his book Sapiens about bionic life and gives an example of research (at Duke University, North Carolina) where scientists were planting an electrode to a brain of a rhesus monkey. The electrode received signals from the monkey's brain and transmitted them further to external devices. One of the monkeys, Aurora, learned to thought-control a detached bionic arm at the same time as she was using her two biological arms to other tasks. Aurora now has

three arms, two biological ones attached to her body and one that is wirelessly connected to her and which can be located anywhere in the world (Harari 2015). This example concerns non-human species, while both Freud and Mori connected the *uncanny* and *uncanny valley* concepts mainly to a human figure, shape and experience.

The world has changed since the time of Freud, which becomes obvious from examples of advanced developments in biotechnology, technology, artificial life (AL), and artificial intelligence (AI). However, I argue that the Freud's concept of *uncanny* and Mori's *uncanny valley* are still relevant today even if coined many decades ago. Nevertheless these concepts no longer concern only human figure and experience, but find resonance in our relation to nature. As already pointed out in the previous example, certain kind of *uncanny*-ness can be found in the human manipulation of nature and other organisms.

The paper proposes that an *uncanny* sense of nature is currently emerging around us, which is caused by the fact that today, increasing amounts of biological organisms are based on man-made design. These developments change our relation and perception of nature and lead to a construction of *uncanny nature*; a concept grounded on Mori's idea of *uncanny valley*. Where Mori was investigating robots and their human-likeness in relation to human sensations, the author points towards comparable sensations and experience when concerning biological organisms that are either manipulated or designed by humans.

Natural and Artificial

The *uncanny* by Freud and the *uncanny valley* concept by Mori have a direct relation to the concept of *real* - or what we perceive as *real* and what we understand as artificial. During the last decades we have witnessed an increasing blurring of categories between biologically evolved and artificially created or manipulated organisms. For example, until now humans' cognitive abilities have been apt for quick judgments in dividing things into ones that are artificially made by humans and those that have evolved with minimal human impact. Today, this is no longer obvious due to the development of e.g. biotechnology and methods to construct new kinds of living organisms that are designed by humans. These types of developments that concern of manipulation of life, radically impact our understanding of the term *natural* and what has been considered its counterpart

- the *artificial*. Traditionally *natural* is understood as something coming from nature and not made or caused by humans; and artificial is understood as the opposite – not natural, but produced, created or manipulated by humans.

The possibilities for manipulation of biological matter via technological methods, and also extension of technological by biological, will increase in the near future. What kind of division between biological and technological will form in the future, and to what degree will our concepts of *real*, *non-real* and *artificial* blur with the development of various kinds of hybrid entities? Artists are already addressing these questions and opening up the field for experimentation, as well as pointing to many ethical and moral questions these science- and technology-based practices bring.

Art and Uncanny

In the recent years there has been a large increase in artistic works and interests that are affiliated with science and technology and which use living matter - such as microorganisms, bacteria, yeast cells, plants, mushrooms and animals - as an integral part of the art work. In some of the artistic experiments, the organisms are being technologically manipulated whereas in others the living organisms are cultured and mainly observed. At the same time technological development concerning robots and especially artificial intelligence-systems is directed towards creation of life-like autonomous entities with learning capabilities through imitation of biological organisms. There is a growing body of artistic works that are exploring the intelligent systems – applying machine learning and artificial intelligence algorithms to create autonomous and semi-autonomous entities capable of evolution through their learning abilities. These both approaches in biology and technology experiment with matter and ideas concerning life.

Education of artists in the field of art & science involves learning laboratory techniques for maintenance and manipulation of living organisms. One of the typical educational experiments is to grow a green fluorescent glowing e.coli-strain on a petri dish. In the experiment a GFP gene from bioluminescent jellyfish *Aequorea victoria* is introduced into the e.coli-strain. This results in e.coli colonies in a petri dish that glow bright green under a UV light.
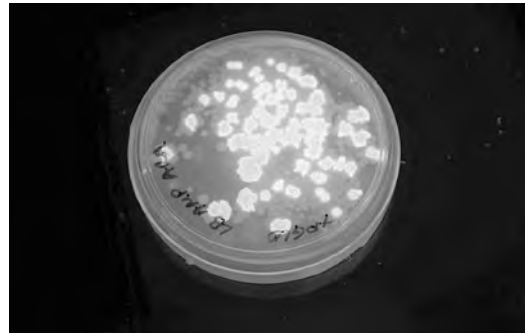

Figure 1: GFP e.coli created in a workshop by Finnish Bioart Society

Artist and biologist Brandon Ballengee has been investigating for years the declines and potential causes of deformities among amphibian populations. His image series Malamp: Reliquaries consists of images of deformed frogs found in nature, in which one can see the inner structures of the frogs and their bones. Many of them have several pairs of back-legs that are deformed in different degrees.

Here, we have two examples of biological art: One is a bacteria that has been gene manipulated to glow green and the other is an image of a deformed frog that is found in its natural habitat. One would easily expect that the manipulated bacteria glowing in green fluorescent color would feel more *uncanny* than the deformed frogs that are simply collected from natural environment. However, the bacteria seems to mainly fascinate us in its harmless beauty and existence that is strictly confined to a petri dish, whereas looking at the deformed frogs immediately creates an eerie or *uncanny* feeling in us.

However in the case of artist Guy Ben Ary's experiment with in vitro grown nerve cells that are connected in real-time to a robotic drawing arm in another location - this work without doubt produces an immediate and strong feeling of *uncanny* in us. The work is a hybrid entity made of hardware, software, and wetware that are connected via the Internet. In a similar sense as Harari's previously mentioned example of the technological third hand controlled by a monkey through brainwaves, also this work creates a novel idea for the constellation of a body, in which the brain and the body are distributed to different locations. They seem exemplary cases for Freud's claim that severed limbs,

or a hand that is detached from the arm, or feet that dance by themselves, have something highly *uncanny* about them, especially when they are credited with independent activity (Freud 2003).

My own recent artistic experiments: with cloned Christmas trees that are existing under non-terrestrial microgravity conditions, with fruit flies that are observed by AI agency, and attempts to understand interspecies communication made as clicking sounds by the plant roots – they all are constellations of hybrid ecologies consisting of biological and technological agencies. This kind of hybridity of components also blurs the line of aliveness, as a hybrid entity may be alive in certain aspects even when it seems lifeless to us and vice versa.

Conclusion

These above described exemplary artistic works no longer simulate nor create representations of the world. They deal with the actual *real*. They use living organisms, technology, and earthly conditions as the base for the works, which are presented, investigated, and manipulated in order to create experiences and pose questions to the audience. This kind of art both observes and explores the possibilities of the *uncanny nature* – a nature or reality that used to be familiar but which has been modified in a laboratory, extended with newly designed features, or located in a new context with various agencies and components, which all together form a hybrid ecology.

I would like to propose that, what makes these above-mentioned works *uncanny,* is not solely their potential manipulation by humans but their inherent affiliation with the *real*. They tamper with our expectations of how things used to be. These kinds of experimental artworks present us moments when the boundary between fantasy and reality is broken and we are faced with the reality of something that we have until now considered imaginary.

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Author Biography

Laura Beloff (PhD) is an internationally acclaimed artist and a researcher. Research includes practice-based investigations into a combination of information, technology and organic matter, which is located in the cross section of art, technology and science. Additionally to articles and book-chapters, the outcomes of her artistic research are artworks and projects that deal with the merger of the technological and biological matter and intelligence. The research engages with the field of art–science– technology including areas such as human enhancement, biosemiotics, biological matter, artificial life (AL) and artificial intelligence (AI), robotics, and information technology in connection to art, humans and society. Currently, she is Associate Professor and the Head of PhD-school at IT University in Copenhagen.