



Introduction: Bio-Mobilities Issue

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Jennifer Willet

Our daily interactions with the biological world are more mediated, modulated, and mobile than ever before. Some argue that these forms of mediation are further removing human experience from direct encounters with the biological domain, while others suggest that mobile media is enhancing human/nature encounters in an increasingly urban society. Regardless, mobile media is transforming interspecies interrelations in outdoor ecological environments, in cities, in hospitals, in laboratories, in kitchens, and within both human and animal bodies.

The Winter 2015 issue of *Wi: Journal of Mobile Media* will address issues of bio-mobility from a variety of perspectives. With contributions from artists, theorists, programmers and tinkerers, this issue serves to address bio-mobility in relation to biomedicine, bioart, biotechnology, biomedicine, ecology, phenomenology, embodiment, performance, and even re-animation of biomaterials.

As mobile technologies transform the biological domain, hospitals are populated with mobile health technologies, laboratories ship and receive cryogenically preserved bioproducts, and patient records are digitized and available to practitioners at the bedsides of patients and in online consultations. In wildlife spaces, webcams document

wildlife, sensors measure both precipitation and temperature in remote locations, and ornithologists play birdcalls on their cell phones to attract species in the wild. At the consumer level, a myriad of mobile bio/technologies are available for purchase. These products include Botanicalls, a DIY biokit that measures moisture in potted plant soil and then instigates communication via online Twitter status updates on the mobile phone and the 'Virtual Frog Dissection Educational App', where users of all ages can download and dissect a virtual frog from the iTunes store.

Conversely, ongoing ecological, biomedical and biotechnological research is transforming our notions of mobility. If we look to examples like performance enhancing drugs, molecular machines, bacteria data storage devices, life itself can be conceived of as a form of mobile media. Biological media is able to store, transport, and transform data and experience within the living world. Eugene Thacker popularized the term Biomedia to describe the informatic inscription of data into living media, vis-à-vis molecular biology. Moving beyond this definition, I would suggest that we re-consider notions of biomedica through the lens of evolutionary biology, where animal migration patterns, chemical pheromone communication, and inherited genetic traits can all be interpreted as possessing bio-mobile properties essential to the robust function of our planetary ecology. In other words, in the lab, in the wilderness, and in the dog park down the street, biological entities are not only the subject or object of mobile technologies, they are in and of themselves engaging in systems of mobile communication and inter-connectedness.

The vitality of biomedial poses a variety of quandaries for the user / programmer / technician / body. What ethical considerations are necessary when harnessing biomedial? How are we, our communities, and our ecology transformed by ever growing bio-mobile technologies? What new relations and aesthetics are produced when we re-imagine the biological world as reproducible, transportable, and programmable? And, alternatively, are we possibly over imagining our human position in biomedical exchange as one of autonomous authorship? Is it possible that our actions are in fact an extended outcropping of ecological functions exhibited by all species involved in the simultaneous construction and destruction of the larger ecology we inhabit?

The contributors to this issue of *Wi* have engaged creatively and theoretically with a broad range of concepts and questions connected to biomobilities.

Contributions include:

Dr. Roberta Buiani traces a short history of her struggles with the social / political / economic barriers to building a DIYbio Laboratory as a non-specialist in metropolitan Toronto. In response to these circumstances she teams up with with Lisa Carrie Goldberg to develop a project called Biolab-on-Wheels.

David Dowhaniuk presents “Personal Nature,” an artist / programmer progress report on a project intended to better connect visually unresponsive patients with their families and caregivers through the projection of sound samples from the outdoors. The projections are mediated by live patient biodata in medical environments.

Antonia Hernández offers an online portfolio of photographs of microorganisms with which she shares her domestic space – specifically a delightful array of colorful and textured molds found in foods left unattended in her fridge.

Dr. Karl E. Jirgens provides readers with an analysis of contemporary artists Janet Cardiff and George Bures Miller's walking tours as mobilizing participant bodies in the production of art. He argues that they present participants / viewers with a site specific schizo-phenomenological experience of perceiving a site, while simultaneously perceiving a virtual sound scape of voices, audio recordings, histories and analysis generated by that site, both mirroring and deviating from the parallel experience of embodied perceiving.

Doo-Sung Yoo is an American artist who has developed a series of technological augmentations to the human body that involve the mechanical re-animation of inanimate biomaterials, particularly butchered animal organs. His paper traces earlier artistic practices utilizing human / robotics interfaces, as well as other cultural and scientific influences on his artwork. He provides readers with ample visual documentation of his uncannily lush, beautiful, and horrific Butoh Theatre style performances.

And lastly, in my own article (**Dr. Jennifer Willet**) I present research results from a large collaborative bioart project called BioARTCAMP, where I invited 20 artists, scientists, and students to build a portable bioart laboratory and conduct a variety of art/science projects in the Canadian Rocky Mountains.

I would like to extend my thanks to **Dr. Kim Sawchuk** and **Dr. Owen Chapman** for the opportunity and support in editing this edition of *Wi*. A very special thanks to **Kendra Besanger** for her coordination, communication, copyediting, and careful nudges throughout this process. Thank you to **Antonia Hernández** for her design work, and to all the team members of *Wi*. And lastly, a big thank you to all the contributors to the Bio-Mobilities Issue for their artistic and intellectual contributions and their patience and persistence in completing this edition together.

Lifelike Artificial Hybrids: Aesthetic and Practical Approaches to Combinations of Natural and Unnatural Technology

Doo-Sung Yoo

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[Yoo, Doo-Sung. "Lifelike Artificial Hybrids: Aesthetic and Practical Approaches to Combinations of Natural and Unnatural Technology." *Wi: Journal of Mobile Media*. 09. 01. (2015). Web.]

Lifelike Artificial Hybrids: Aesthetic and Practical Approaches to Combinations of Natural and Unnatural Technology

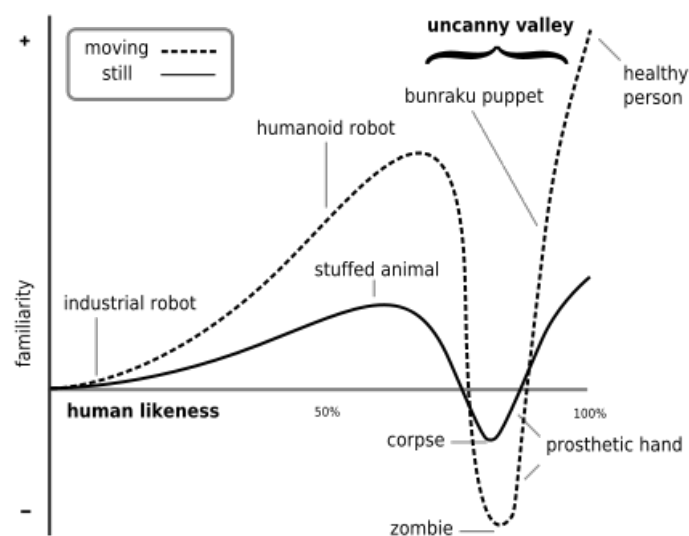
Doo-Sung Yoo

In this article, I explore the problematic issues that arise from synthesizing the ‘natural’ and ‘unnatural’ in bio-technical practices. In addition to specific examples from my *Organ-machine Hybrid* series, the article does this through three main arguments: how the ‘technologically-augmented body’ can be materialized in art and presented in criticism; what scientific and aesthetic issues are revealed when organic and mechanic entities are combined; and what possibilities artists could derive from combining biological and technical materials.

Introduction

I remember both positive and negative comments from the online world when my first organ-machine hybrid sculpture, *Lie: Robotic Cow Tongues* (2007) was exhibited and spread like wildfire on the web. People were shocked by the creepy cow tongues installed on the wall, which wiggled with the help of electronic devices. On the other hand, some people were captivated by the strange lifelike artistic-hybrid. This experience motivated me to embark on my *Organ-machine Hybrid* project series and probe further articulations for creating a spectacle that could be both ‘repulsive and beautiful’ and ‘natural and unnatural’ at the same time within my artwork.

These dual oppositions, such as human/machine and living/dead, have been the core issues concerning the psychological feelings about automata since the appearance of mechanical characters in literary fiction and the early robot industry of 19th-century Western culture. The field of contemporary art and technology resurrected the dualistic thinking between natural and unnatural, which can evoke the feeling of strangeness or eeriness by resembling natural forms in artificial facsimiles. Japanese roboticist Masahiro Mori noticed this strangeness and his essay '*Uncanny Valley*' (1970) discusses human affinity to humanlike machines and nonhuman entities (such as puppets and zombies). Mori believes that the humanlike entities become strange and eerie when they exhibit lifelike movements and behaviours. Upon encountering lifelike appearances and behaviour, human observers respond with revulsion and their familiarity suddenly drops into negative territory. In other words, the feeling of unfamiliarity creeps within the viewer. This is what Mori called the uncanny valley (see Fig. 1).¹



¹. Masahiro Mori, "The Uncanny Valley," *IEEE robotics & Automation Magazine* 19, no. 2 (2012): 99, doi: 10.1109/MRA.2012.2192811.

Fig. 1: Mashiro Mori, Uncanny Valley, (©2005 Karl F. MacDorman and Takashi Minato, under the terms of the GNU Free Documentation License, Version 1.2)

To be sure, Mori's assertion is short and speculative and, according to a robotic researcher Karl MacDorman and roboticist Hiroshi Ishiguro, is based on "extrapolation from anecdotal experiences,"² However, Jennifer Rhee notes that Mori's idea is significant and has increasingly attracted attention in "discussions of human realism" in robotics, computer graphics, animation, and the game industry since Karl MacDorman and Takashi Minato published the first English translation of Mori's original article in 2005.³ Mori's notion of 'uncanny' as the sensation of eeriness is similar to the psychological concept of 'uncanny' identified in Sigmund Freud's essay, *The 'Uncanny'* (1919), which was based on Ernst Jentsch's essay, *On the Psychology of the Uncanny* (1909). Noah Cooperstein reports that Jentsch launches "the uncanniness of the mechanical nature of life" and Freud investigates "a theory of the uncanny based, in large part, on the dichotomy of the strange and the familiar," but "uncanny has yet to be fully fathomed" in both of the examinations.⁴ From Jentsch and Freud's psychological

². Karl F. MacDorman and Hiroshi Ishiguro, "The uncanny advantage of using androids in social and cognitive science research," *Interaction Studies* 7, no. 3 (2006): 304, doi: 10.1075/is.7.3.03mac.

³. Jennifer Rhee, "Beyond the Uncanny Valley: Masahiro Mori and Philip K. Dick's Do Androids Dream of Electric Sheep?," *Configurations* 21, no. 3 (2013): 302, doi: 10.1353/con.2013.0022.

⁴. Noah Cooperstein, "The 'Uncanny' and The Android," (MA Dissertation., The University of New Mexico Albuquerque, 2009), 1-2.

investigations to Mori's robotic hypothesis, we still do not have an all-inclusive theory that explains the uncanny reaction to lifelikeness.

Although no one has pinpointed the degree of lifelikeness that elicits negative responses, the uncanny valley theory is a worthwhile discussion for new media art. This paper will not argue with scientific issues of the uncanny valley theory, but will instead discuss the valuable points that could be applied to the artistic synthesis of the natural and unnatural. These points will be compared to the ongoing controversy around the uncanny valley, incorporating some examples from both the art and science fields. Since biological materials and living creatures, including the human body, are continuing to be used in techno-biological art, new media art is still mired within a scientific debate. New media artists use this scientific controversy as leverage to attract attention to their work.

While the uncanny valley is very seductive in its ability to draw the audience in, artists need to find aesthetic values from the harmony and combination of contrary and binary characteristics, such as between 'natural/unnatural', 'human/machine', and 'normal/abnormal'. What are the consequences when we physically or biologically switch our bodies from natural into unnatural entities, like robots, or merge them with cyborgs? What are the aesthetic rewards of creating new combinations of natural beings and technology? How do artists solve the disjunction between 'natural and unnatural' and harmonize them within artistic discourse?

My *Organ-machine Hybrid* project series has been exploring those artistic paths and their scientific considerations. For example, interactive communications within a conceptual human-machine-animal hybrid system and collaborations between the

hybrid and human performers and/or living animals within performances and installations. These attempts form strategies, beyond the negative familiarity of lifelikeness, to smoothly resolve the confrontations and conflicting relationships between the differing sets of biological materials and mechanical systems in bio-techno-art.

This paper will discuss specific moments of uncanniness within my artificial hybrid character series, how I have attempted to refine the unfamiliarities with the disembodied biological materials within my artwork, and how I have conceptually converted audience reactions from discomfort into fascination and amusement. The goal of this paper is to share my bio-art experience and bring forward my views regarding the trend of techno-biological art that reinterprets, transforms, simulates, hosts, and synthesizes biological materials and living creatures as art objects and markers in an aesthetic exploration.

Video 1: Doo-Sung Yoo, *Robotic Pig Heart-Jellyfish* – *Video Documentation*, 2009, (©2009 Doo-Sung Yoo) <http://www.youtube.com/watch?v=2SsZdElyNJQ>



Fig. 2: Doo-Sung Yoo, *Vishtauroborg Version 2.6*, 2012, robotic devices and cow tongues, (photograph ©2012 Cameron Sharp)

Synthesization, cooperation, or collaboration

Human beings have already successfully transplanted animal internal organs and implanted artificial organs into the human body. From the first corneal xenotransplantation of pig-to-human in 1838 to current medical robotic prosthetic use,

we are no longer unfamiliar with the human-animal and human-machine hybrids. We somehow feel the reality of the technological evolution towards hybrid entities.

However, beyond functional recovery, we are still uncomfortable with the features of intermediary forms of crossover and synthesis, which is similar to the psychological phenomenon of the uncanny valley.

My *Organ-machine hybrid* series reuses discarded animal organs and applies robotic devices to the human body into hybrid entities. This concept was based on my questions about how biological materials could be artistically contextualized within art or “how the agenda of extending the human body could be explored with aesthetic statements.”⁵ Those partial disembodied organs are transformed and re-embodied into different mechanical bodies, which conceptually change the organism as a whole. The cow tongues in *Lie: Robotic Cow Tongues* (2007) & *Vishtauroborg* (2011-2012), are visually repositioned from internal to external states. *Vishtauroborg*’s cow tongues are mounted on a performing dancer’s chest and back, which generates computational human voice sounds, modulates the live background music, and manipulates a dancer’s own voice sounds as well. Many digital sensors on the dancer’s arms and the cow tongues trigger a system that controls the cow tongues’ wiggling motions. The entire hybrid’s movements harmonize both a dancer’s improvisatory choreography and a sound designer’s sound effects, in real time.

⁵ Doo-Sung Yoo, "Organ-machine Hybrids (Artificial Animals)," (MFA diss., The Ohio State University, 2010): 6.

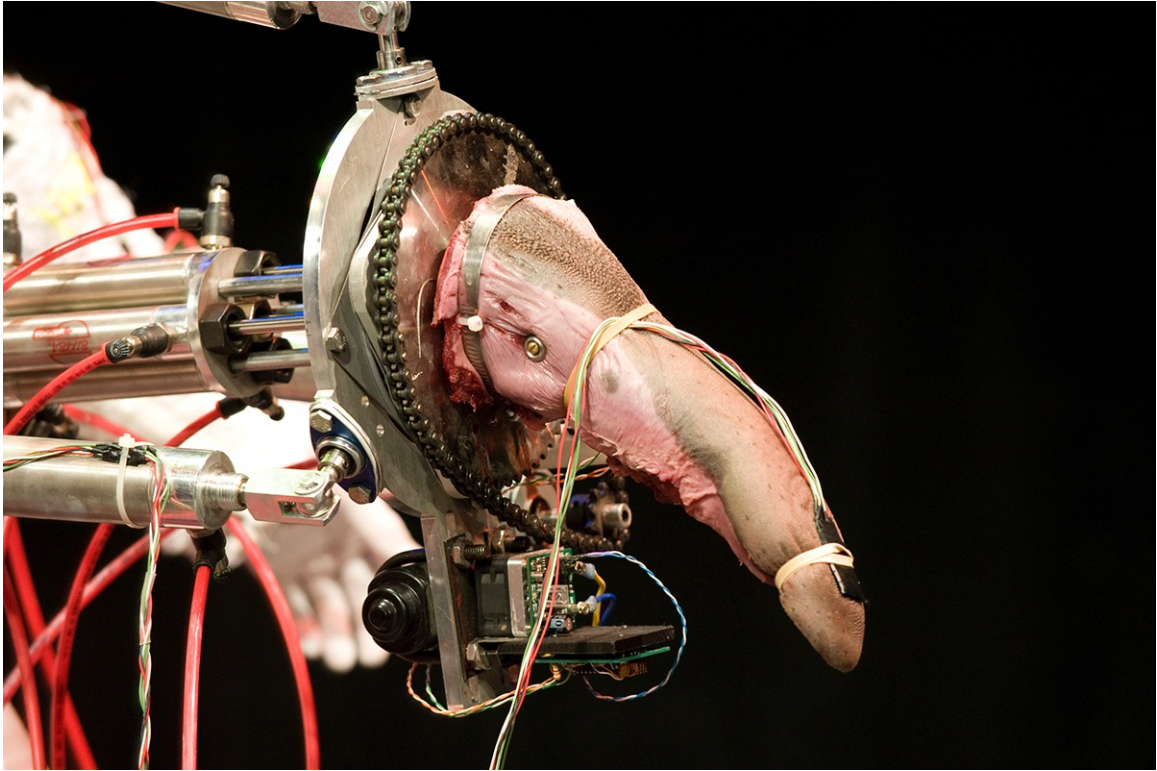


Fig. 3: Doo-Sung Yoo, *Vishtauroborg Version 2.0*, 2011, robotic devices and cow tongues, (photograph ©2011 Tony Shumski)

Pig internal organs are utilized in other *Organ-machine hybrid* projects. Pig bladders fly in the air of public places in the *Pig Bladder-clouds* (2009-2010) series. The flying pig bladders also collaborate with human performers to create synchronous movements and harmony in a parade, visual performance, and dancing performance.⁶ In another project, a pig heart is re-birthed into a robotic jellyfish with a submarine-mimicking diving system that creates submerging, floating, and beating actions as well

⁶. Doo-Sung Yoo, "Organ-machine Hybrid: Experiments in combinations of Animal Organs with Electronic Devices and Robotics for New Artistic Applications." *Media-N: Journal of the New Media Caucus* 9, no. 3 (2013): 21, <http://median.newmediacaucus.org/isea2012-machine-wilderness/organ-machine-hybrid-experiments-in-combinations-of-animal-organs-with-electronic-devices-and-robotics-for-new-artisticapplications/>.

emulates a heart and a jellyfish's movements in a fish tank.⁷ The lifelike, nonliving artificial creations play with real, living entities, such as humans and animal (fish), which illustrates the juxtaposition and the combination of 'natural' and 'unnatural'.

Video 2: Doo-Sung Yoo, *Pig Bladder-clouds in Rainforest* – Video

Documentation, 2010, (©2010 Doo-Sung Yoo)

https://www.youtube.com/watch?v=Oug3A4a_S_o



Fig. 4: Doo-Sung Yoo, *Pig Bladder-clouds in downtown Columbus*, 2009, electronic devices, helium-filled plastic trash bags, and cow tongues, (photograph ©2009 Cameron Sharp)

⁷. Ibid., 22.

The characteristics of the organ-machine hybrids follow notions of ‘cyborg’ and ‘augmented body’ have been theorized since the biotechnological trends in our culture at the end of the twenty-century. Donna Haraway’s cyborg is a classical connotation. In her essay, *The Cyborg Manifesto* (1985), she writes “a cyborg is a hybrid of machine and organism” as our bodies are nowadays, so, “we are all chimeras” and “we are cyborg,” which are “theorized and fabricated.”⁸ Margaret Seymour agrees with Haraway’s views: “the body is not seen as 'natural' but rather as simultaneously symbolically, biologically and socially produced.”⁹ The notion of Chris Hables Gray’s cyborg is more specific and categorizes the types of cyborgs. Gray points out the process of cyborg as “any self-regulating (homeostatic) system,” which consists of “organic (living, natural, evolved) and mechanic (unloving, artificial, invented) subsystem.”¹⁰ Gray also asserts the levels of being cyborgs:

The effect of modification: restorative or augmentation. The incorporated living elements (viral, bacterial, plant, insect, reptile, avian, mammal), the technological interventions (machine prosthesis genetic engineering, nanobot infection, vaccination, xenotransplant) and the level of integration (mini, mega, meta, mundane) can all vary, meaning that basically an infinite number of possible cyborgs exist, life multiplied by human invention and intervention.¹¹

⁸. Bruce Grenville, ed. *The uncanny: experiments in cyborg culture*. (Vancouver, B.C.: Vancouver Art Gallery, 2001), 140.

⁹. Margaret Seymour, “I, Robot: Rethinking Jack Burnham’s Systems Esthetics,” ISEA 2011 Istanbul, Last modified 2011, <https://isea2011.sabanciuniv.edu/paper/i-robot-rethinking-jack-burnham%E2%80%99s-systems-esthetics>.

¹⁰. Chris H. Gray, “The Uncanny Evolution of Homo Cyborg,” in *Evolution Haute Couture*, ed. by Dmitry Bulatov (Kaliningrad: The National Centre for Contemporary Arts, 2013), 235.

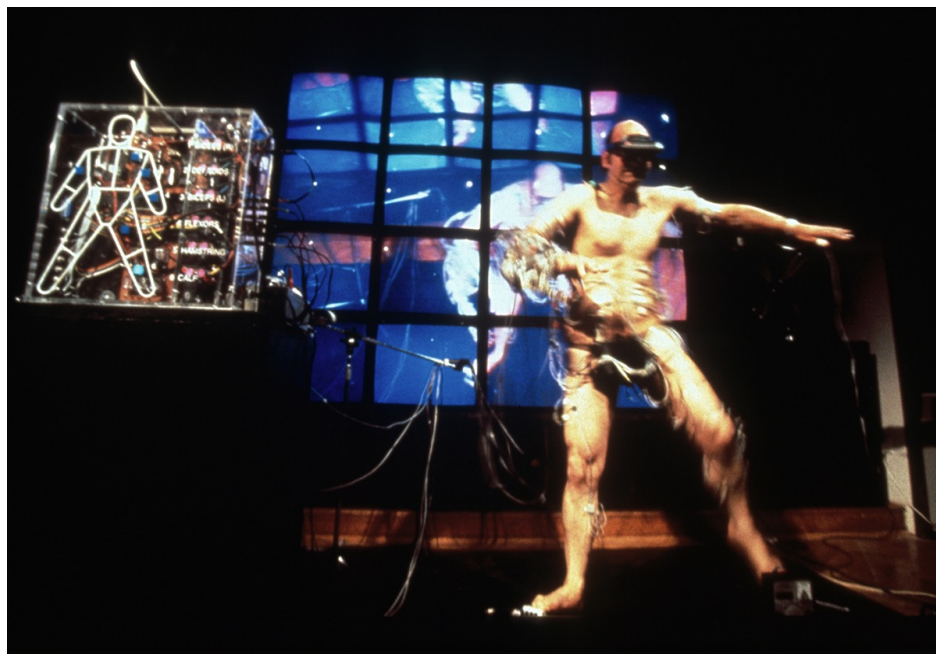
¹¹. Ibid., 235-37.

My *Organ-machine Hybrids* not only materialize the artistic metaphor of ‘re-embodiment’ but also visualize ‘re-animations’. In other words, as in Haraway’s cyborg, the parts of dead organic bodies integrate with inorganic mechanical bodies, which are activated and simulated by computational controls. Acknowledging Gray’s argument, the robotic pig heart-jellyfish, which consists of organic and artificial systems, reanimates the motions of a beating heart and a swimming jellyfish, seem to be very lifelike, restorative, or augmentative with the help of computer programming and a mechanical motion system.



Fig. 5: Doo-Sung Yoo, *Robotic Pig Heart-Jellyfish*, 2009, robotic devices and pig hearts, (photograph © 2009 Cameron Sharp)

Through many performances, Australian new media artist Stelarc led the way to probe the concepts of ‘augmented body’ alongside robotic prosthetics. Stelarc believes that “the body is obsolete” and that it could “host for all its instruments and machines,”¹² and could be “recoded and reconfigured and re-imbued with multiple and diverse meanings and forms.”¹³ Stelarc’s own body has been augmented with robotic exoskeletons that were applied in various robotic performance projects, such as *Split Body: Voltage In/Voltage Out* (1995), *Ping Body* (1996), and *PARASITE* (1997). His radical and provocative performances examine how prostheses relate to his own body: robotic limbs that react to his muscles and stimulations of electrodes on skin.



¹². Stelarc, “Fractal Flesh/Liminal Desire: The Cadaver, The Comatose and The Chimera,” in *Evolution Haute Couture*, ed. by Dmitry Bulatov (Kaliningrad: The National Centre for Contemporary Arts, 2013), 270.

¹³. Ibid., 275.

Fig. 6: Stelarc, *Split Body: Voltage-In / Voltage-Out*, 1995, Galeria Kapelica, Ljubljana. (photograph © 1995 Igor Andjelic)

Linda F. Hogle points out, “bodies are imperfect . . . the ability exists to redesign the human body according to particular needs and desires, altering or building in new features.”¹⁴ Redesigning the body is therefore a tactical agenda in both Stelarc’s and my *Vishtauroborg*’s robotic exoskeletons for rebuilding the body form with new features. Stelarc’s robotic limbs and *Vishtauroborg*’s robotic arms not only visually redesign human forms, but also functionally rebuild human-machine cooperation and submission to artistic control. Both Stelarc and my *Vishtauroborg* demonstrate that the body is a good intervention to host mechanical entities.

The articulations for the body intervention and human-machine collaboration have been refined through historic robotic performances: as contexts of artificial life and artificial behaviours in Bill Vorn’s *Grace State Machines* (2007) and as theatrical narratives in Louis-Philippe Demers’ *Devolution* (2006). *Grace State Machines* shows the real-time interactive performance between a human performer and robotic installation linked via a motion capture system that creates human-automation relationship and communication. Vorn describes the reasons behind the robot and human collaboration: “This encounter between the living and the non-living evokes the

¹⁴. Linda F. Hogle, “Enhancement Technologies and the Body,” *Annual Review of Anthropology* 34, (2005): 696, doi: 10.1146/annurev.anthro.33.070203.144020.

dichotomic correlation between the mind and the body, between the self and the other, between the real and the imaginary.”¹⁵

Devolution, Demers’ dance and technology collaboration with the Australian Dance Theatre and choreographer Garry Stewart, involved human dancers and robotic installations to explore fusing choreographic relationships, such as between prostheses’ motions on dancers’ bodies and combinations of humans dancing with robotics.

Devolution illustrates the evolution/mutation of humanity and technology through theatrical narrative. Demers created automated props installed on the stage and on the performers, such as robotically controlled lights on the ceiling; moving robot bugs and large mobile claws on the stage; and prostheses on dancers chests, backs, and legs. The motions of those robotics interact with the dancers’ choreography.

¹⁵. Bill Vorn, “Grace State Machines,” Bill Vorn – Robotic Art. Last modified 2014, <http://billvorn.concordia.ca/menuall.html>.



Fig. 7: Louis-Philippe Demers, *Devolution*, 2006, (photograph © 2006 Chris Herzfeld Camlight Productions)

However, the integration of human and technology received harsh reviews from some critics. Australian arts writer and critic Chris Boyd was in outright opposition to Demers' challenge in *Devolution*. Boyd writes, "Devolution is a show that sets itself up as having something important to say about cyborg technology -- about the interface

between human and inhuman -- then delivers a kind of circus act.”¹⁶ Likewise, the cyberpunk novelist William Gibson’s negative comment about Stelarc’s performance is interesting. Writer Geeta Dayal reports Gibson’s comment:

Stelarc’s art never seemed futuristic to me. If it were, I doubt I would respond to it. Rather, I experience it in a context that includes circuses, freak shows, medical museums, the passions of solitary inventors. I associate it with da Vinci’s ornithopter, eccentric nineteenth-century velocipedes, and Victorian schemes for electroplating the dead — though not retrograde in any way.¹⁷

Boyd and Gibson’s comments might be based on the feeling of unfamiliarity with Demers’ and Stelarc’s human-machine characteristics and the hybrids’ abnormal behaviours. Or Boyd and Gibson might be conservative regarding new definitions of what it is to be human within the art and technology nexus. However, Boyd and Gibson’s views are not merely negative criticisms; they also produce contrary suggestions for theatric requirements regarding how humans (natural) can functionally harmonize with robotics (unnatural) within a theatrical semblance of truth for requiring our suspension of disbelief.

Stelarc’s hybrid characteristic and cyborg feature are remarkable and worthwhile experiments in the context of objectifying the human body, which is a part of core trends in physical and transgenic modifications in contemporary art and technology. His

¹⁶. Chris Boyd, “Adelaide Festival: Parallelo’s Lontano Blu, Australian Dance Theatre’s Devolution & Wanted Posse in Breakin’ Ground,” *The Morning After: Performing arts in Australia Blog*, <http://chrisboyd.blogspot.com/2006/03/adelaide-festival-parallelos-lontano.html>.

¹⁷. Geeta Dayal, “For Extreme Artist Stelarc, Body Mods Hint at Humans’ Possible Future,” *Wired*, May 2, 2012, <http://www.wired.com/2012/05/stelarc-performance-art/?pid=6758#slideid-6758>.

futuristic and aggressive body performances, such as harnessing mechanical devices for inventing the third robotic arm in *Third Hand (1981-1994)* and surgically inserting a biocompatible scaffold for creating an artificial ear on his left forearm in his ongoing project *Ear on Arm (Since 2006)*, represent contradictions of both human bodies in argumentation and deconstruction of the human form caused by technology. Susanne Hildegard van Zyl notes:

Stelarc challenges the boundaries of the body by changing the body through redesigning its interface (with its environment) through the use of the body/technology symbiosis in the form of medical instruments, prosthetics, robotics, virtual reality systems and the Internet.¹⁸

Video 3: Stelarc, *Extended Arm* - Video Documentation, 2000, (©2000 Stelarc)

<https://www.youtube.com/watch?v=PWSYkplTG2s>

¹⁸ Susanne Hildegard van Zyl, "Crossing The Boundaries: Stelarc's Artworks And The Reclaiming Of The Obsolete Body," (MA diss., University of the Witwatersrand, 2008), 24.

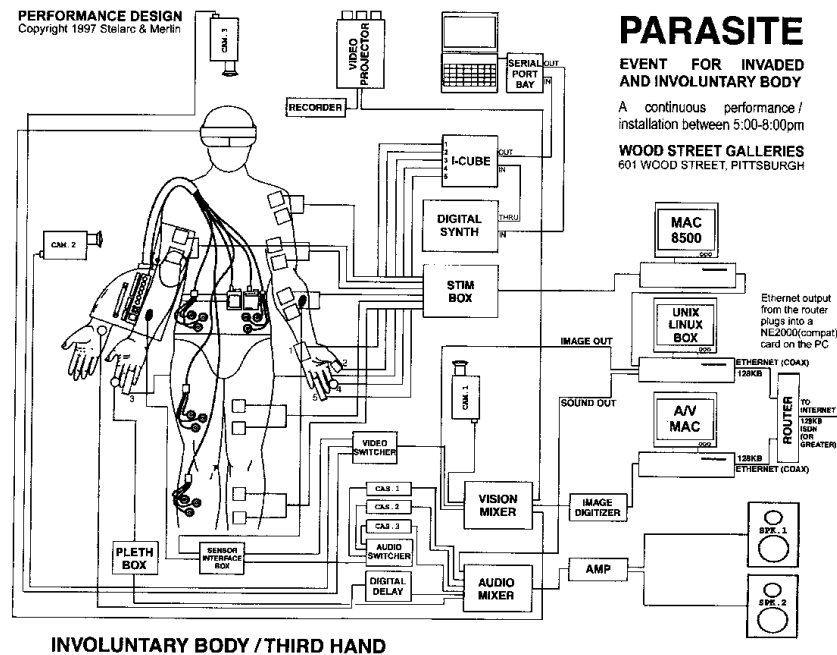


Fig. 8: Stelarc, *Parasite*, 1997, Diagram, Wood Street Galleries, Pittsburgh.

(©1997 Stelarc)

Despite both Demers' and Stelarc's noteworthy art concepts and their artistic spectrums could unintentionally illustrate a different nuance in subtleties of the real human as a seeming freak (in a freak show), which elicits negative responses to the less-humanlike features and behaviours in the uncanny valley nature. Moreover, the feeling of unfamiliarity with the human-machine hybrids and reorganized human body form could shatter the theatrical suspension of disbelief. Demers and Stelarc's combinations of natural and unnatural illustrate a divide between technological realism and artistic idealization with the uncanny valley discourse. My goal as a new media artist is to figure out strategies to materialize the fusion or conjunction between natural organisms and unnatural technologies. I also seek to evaluate the uncanny phenomenon that may help follow or develop Stelarc and Vorn's art contexts, the dihcotomic correlation in art.

Roadblock: disturbances of natural–artificial hybrids

New media art theorist Dmitry Bulatov points out the tendency of “artificiality” with emerging technology, where artists have applied a “living or lifelike matter” that “serves as a medium” for the techno-biological art in the last decade.¹⁹ ‘Living or lifelike’ is a conflict between different characteristics in contemporary art that describe whether to create an artistic conjunction or avoid a disjunction. Seymour notes that “the binary oppositions,” such as “human/machine, intelligent/programmed,” have “traditionally structured ideas of the self in western societies.”²⁰ Minsoo Kang believes that the binary oppositions could generate “a structure of reality,” which makes our “sense of the world.”²¹

The sense of the world or unreality from both Demers and Stelarc’s performances created the disconcerting reactions normally elicited by freak shows. Digital culture writer Kathy Cleland reasons about human perception of lifelike characteristics: audiences tend to focus more on the disparities and what is not working about the simulation. The human brain perceives these imperfect simulations as defective versions of the real thing.²² Therefore, our perception of the lifelike characteristic and abnormal features is an immediate visceral reaction. New media artists cannot avoid this

¹⁹ Dmitry Bulatov, “Techno-Biological Art: The new state of the living,” Art + Science Meeting, Last modified 2012, http://laznia.nazwa.pl/artandscience_wp/?p=998&lang=en.

²⁰ Margaret, “I, Robot.”

²¹ Minsoo Kang, “The Ambivalent Power of The Robot,” *ANTENNAE* 9, (2009): 49.

²² Kathy Cleland, “Robots as social actors: audience perception of agency, emotion and intentionality in robotic performers,” ISEA 2011 Istanbul, Last modified 2011, <https://isea2011.sabanciuniv.edu/paper/robots-social-actors-audience-perception-agency-emotion-and-intentionality-robotic-performers>.

instinctive feedback of emotional reaction or psychological reception from audiences, who closely observe the disparities between a facsimile and the ‘real thing’.

We have already experienced the uncanny responses aroused by android robots and digital animated characters, such as virtual actors in *Final Fantasy: The Spirits Within* (2001) and *The Polar Express* (2004). Sony Corporation’s QRIO robot (2003) was invented to avoid the uncanny valley. Matt Slagle reports that the QRIO was designed to look like a little boy astronaut, but Sony researchers “didn’t want to make it too similar to a human.”²³ Actually, Mashiro Mori has encouraged robot makers to create a perfect state that occupies the first peak of the curve, “a moderate degree of human likeness and a considerable sense of affinity,” which is “a safe level of affinity” for a nonhuman design.²⁴ Many social robot researchers, who take the significance of Mori’s uncanny valley into consideration, have a negotiable strategy in designing lifelike robots: they design in such away that the design does not go beyond the maximum safe level of affinity. Slagle reports an interview with Reid Simmons, a researcher in the Robotics Institute at Carnegie Mellon University:

Our experience has shown that people quickly lose the suspension of disbelief needed to interact with these creations once they start interacting with them for any length of time, because the artificial intelligence is not capable of producing human-level behaviour... I strongly believe that this problem would be exacerbated by having a more humanly realistic robot.²⁵

In contrast, some scientists strongly believe that a perfectly life-like design could

²³. Matt Slagle, “Can Robots Look All Too Human?,” *NBCNEWS*, February 2, 2004, <http://www.nbcnews.com/id/4137259/#.VJHIWSqnqpc>.

²⁴. Mori, “The Uncanny Valley,” 100.

²⁵. Slagle, “Can Robots Look.”

lift observers out of the uncanny valley, without creating the ‘heebie-jeebies’ or repulsive responses created from less-humanlike machines. Robotist David Hanson claims, “Abstract robots can be uncanny if the aesthetic is off,” but also insists, “The level of realism may not matter” if robots are “friendly, attractive, and seemingly alive.”²⁶ He believes, “the human face is perhaps the most natural paradigm for us to interact with,”²⁷ therefore, “more realistic faces [of robots] trigger more demanding expectations for anthropomorphic depictions.”²⁸ Robotist Hiroshi Ishiguro has attempted to produce as closely as humanlike behavior and emotion in *Geminoid* (2005-2011) robot series. Ishiguro’s use of advanced robot technology for the lifelike face motions and tele-operating system, would cover some of the imperfections in the liminal artificiality, but *Geminoid* robots are still disturbingly fake.

In the new media art field, however, do artists have to significantly consider scientific phenomenon when creating their work? Demers points out, “Mostly in the fields of Human-Machine Interfaces, Psychology, Artificial Intelligence and Engineering, scientists do not consider the potentials from the context of Art and Theatre.”²⁹ In other words, scientists prefer reality, practicality, and functionality rather than art elements, such as idealism, metaphors, and aesthetic context. Due to more elaborate lifelikeness through technology, the confrontation between realism and conceptualism creates more conflicts and more sensitivity between the binaries, such as

²⁶ David Hanson, “Exploring the Aesthetic Range for Humanoid Robots, Proceedings of Cognitive Science.” (paper presented at the annual conference for the Proceedings of Cognitive Science, Vancouver, Canada, July 26-29, 2006).

²⁷ Slagle, “Can Robots Look.”

²⁸ Hanson, “Exploring the Aesthetic.”

²⁹ Louis-Philippe Demers, “The Uncanny Evolution of Homo Cyborg,” in *Evolution Haute Couture*, ed. by Dmitry Bulatov (Kaliningrad: The National Centre for Contemporary Arts, 2013), 211.

natural/unnatural, living/artificial, and human/machine, which are inevitable roadblocks at the front of the contemporary bio-art creation.

The uncanny valley is a good road map for creating seductive artificial creatures in the humanoid robot industry, digital animation, and the virtual game industry. The Uncanny Valley should not be the main concern with conceptual fine art. However, new media artists should not ignore or belittle its influence on technical realism and plausibility. For that reason, new media artists have to consider the potential confrontation of the uncanny valley effect when using scientific realism as a media within their practice.

Audiences' willing suspension of disbelief and cognitive empathy is required in art performance or other theatrical narratives. However, a phenomenon like the uncanny valley works against this suspension of disbelief. A suspension of disbelief or a level of emotional acceptability requires that the work stay within an audience's semblance of truth. In other words, implausible physical characteristics create nonsense or absurdity, which intentionally disrupts an audience's suspension of disbelief. Here is an interesting critical comment about Demers' robotic performance that shows why conceptualization and contextualization of lifelike characters need to be balanced with the realistic/ontological appearance, behaviour, or ability. Writer and dramaturge Keith Gallasch and Virginia Baxter note *Devolution's* conceptual faults:

Obviously, director and choreographer Garry Stewart worries that what we are setting in train with technological development is regressive, a de-evolution, a departure from what it means to be human. However, with roboticist Louis-Philippe Demers, he does it with passion, precision and an escalating

inventiveness that, ironically, pushes the robot cause forward with a kind of Robocop, Terminator, Mad Max fascination.³⁰

Perhaps Demers' actors, robots, and human-machine hybrids are too absurd, too literal, or too conceptual to match the viewer's expectations and creators' intentions. Likewise, Stelarc's performances may also cross the line of 'semblance of truth' to create a spectacle reminiscent of circuses and freak shows, or sci-fi films. However, Cleland's point of view about the robot role would be useful for designing robotic artifacts in art: "What the robot does, how it does it, and how it responds to its environment and other entities including audience members are key factors in how it is perceived."³¹



³⁰. Keith Gallasch and Virginia Baxter, "All in Good Time," *RealTime* 77, February-March 2007, <http://www.realtimearts.net/article/77/8328>.

³¹. Cleland, "Robots as social actors."

Fig. 9: Louis-Philippe Demers, *Devolution*, 2006, (photograph © 2006 Chris Herzfeld Camlight Productions)

In order to suspend disbelief, I suggest a balance of technical function with conceptualization (if, of course, suspension of disbelief is your goal). This issue is not only a key role for the scientific plausibility of the robot or human-machine character's functions, but is also conceptually significant for why the characters do what they do. Art critic Diana Simmonds' points out the choreographic issue of *Devolution's* inharmonic performance, that interactive confluence is a key play in the narrative of robotic performance. Simmonds notes, "[in *Devolution*] Each inhabits a discrete space and time within the performing area and the choreography itself. Take the machines out of the equation and nothing would happen or not happen to the dancers."³² Therefore, the communication and interaction between robot and cyborg actors in performance are necessary to maintain suspension of disbelief.

All of those scientific, artistic, and theatrical discourses have greatly influenced my *Organ-machine hybrid* project series. My hybrids also elicit a feeling of unfamiliarity from the audience due to the real animal organs' artificial movements. My work strives to convert those negative feelings of unfamiliarity into positive feelings of enjoyment and, also, to spark curiosity about hybridization and cyborgs.

Regarding the technical issues of realistic and functional duties for keeping semblance of truth of the machine's roles, my hybrids focus on functional duties in

³². Diana Simmonds, "Devolution," *STAGENOISE*, January 25, 2007, <http://www.stagenoise.com/review/1086>.

performances. The *Robotic Pig Heart-jellyfish*, for example, simulates a beating heart and swimming artificial body, underwater with live fish. In the case of *Vishtauroborg*, the hybrid enhances interaction, collaboration, and rhythmic harmony in the robotic performances. *Vishtauroborg* systematizes four main physical real-time interactions, which are programmable and transformable through sending and receiving data in real time: ‘human-to-machine’ for creating choreography; ‘human-to-animal body (cow tongues)’ for generating resemblance-motions; ‘animal body-to-machine’ for emitting synthesized artificial human speech; ‘human-to-human’ for manipulating background music.

Regarding the conceptual issues of hybrids’ characteristics and roles for keeping the suspension of disbelief in the performance, the *Vishtauroborg* character shows the correlation between human performers’ intentions and machine reactions. This interaction with counterparts demonstrates enhancing rhythmic correlation between the dancer’s improvised gestures and the mechanical body’s programmable reactions. Simultaneously, and in participation with the sound designer, the rhythmic motions alter sound effects and music, to create an all-encompassing theatrical narrative. Looking back to Simmonds’ point of view about *Devolution*’s inharmonic performance, interactive confluence is essential to the plausibility narrative of robotic performance. Therefore, *Vishtauroborg* demonstrates that cohesive and interwoven function is practically and conceptually necessary to the role of robotic performance, rather than merely showing visual effects of the mechanical entities.

Video 4: Doo-Sung Yoo, *Vishtauroborg Documentary 3 - Sound Design Process*, 2012, (©2012 Doo-Sung Yoo) <http://www.youtube.com/watch?v=smBTK5d7DQQ>

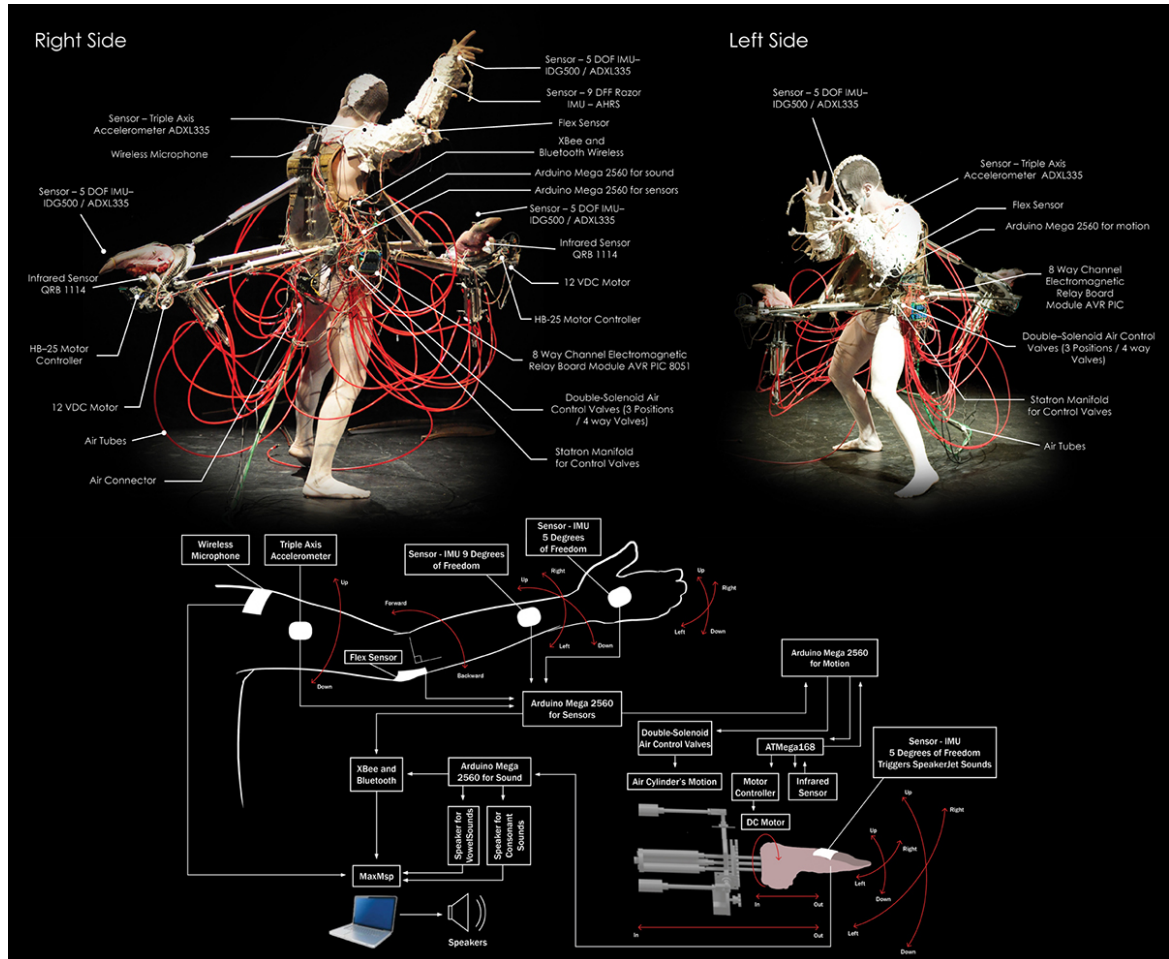


Fig. 10: Doo-Sung Yoo, *Vishtauroborg Version 2.6's Motion & Sound System*, 2012, robotic devices and cow tongues, (©2012 Doo-Sung Yoo)

As I suggest regarding the balanced combination of scientific plausibility and artistic conceptualization, *Vishtauroborg's* robotic performance also uses theatrical

enhancements for suspending disbelief. *Vishtauroborg* involves exaggerative face acts and extreme gestures in choreography and idiosyncratic makeup and style design, similar to 'butoh' style of Japanese contemporary dance. The 'theatrical environments and moods' are "for maximizing the range of *Vishtauroborg*'s natural body-expressions (from the dancer's body) to reflect the technologically augmented body's expanded expressions (from the robotic prostheses and the cow tongues)."³³ I believe that those theatrical contexts and visual enhancements mingle together with the machine's appearance and its ability to correspond with the human performer's choreography and sound effects. These will help audiences accept the purpose of the machines' performing role and realistic functions of human-machine in the 'implausible' narrative of *Vishtauroborg* performances.

The features of *Vishtauroborg*'s character arouse the feeling of an uncanny atmosphere due to several overlapping aesthetic strategies: the peculiar appearance and environment, the interwoven disgusting animal organs' wiggling motion, the extremely suggestive body gestures and behaviours, the dynamic and powerful mechanical motions, the synthesized artificial human voice sound, the amplified dancer's own voice sound, and the ambient music with bizarre sound effects. Likewise, the *Robotic Pig Heart-jellyfish*'s realistic beating heart motions and the Pig Bladder-clouds' flying pig bladders and intestines also elicit revulsive responses. However, those uncouth performances could also create amusing or captivating circumstances. Kang asserts, "Even if we feel the creepiness [from a lifelike machine] before the moving, talking thing, we are captivated by it through the sublime awe at its mimetic effectiveness."³⁴

³³ Yoo, "Organ-machine Hybrid," 24.

³⁴ Kang, "The Ambivalent Power," 48.

Vishtauroborg and *Robotic Pig Heart-jellyfish* create the mimetic effectiveness through the creepy internal organs. Also, *Vishtauroborg*'s robotic arms mimic the dancer's arms and hands motions in real-time, which encourage mimetic and technical captivation. Furthermore, audiences' maintain the suspension of disbelief, in which the audience accepts *Robotic Pig Heart-jellyfish*'s reproduced motions under water and *Vishtauroborg*'s exaggerative choreographic actions and behaviours with the 'unrealistic' human-machine hybrid characteristic design.

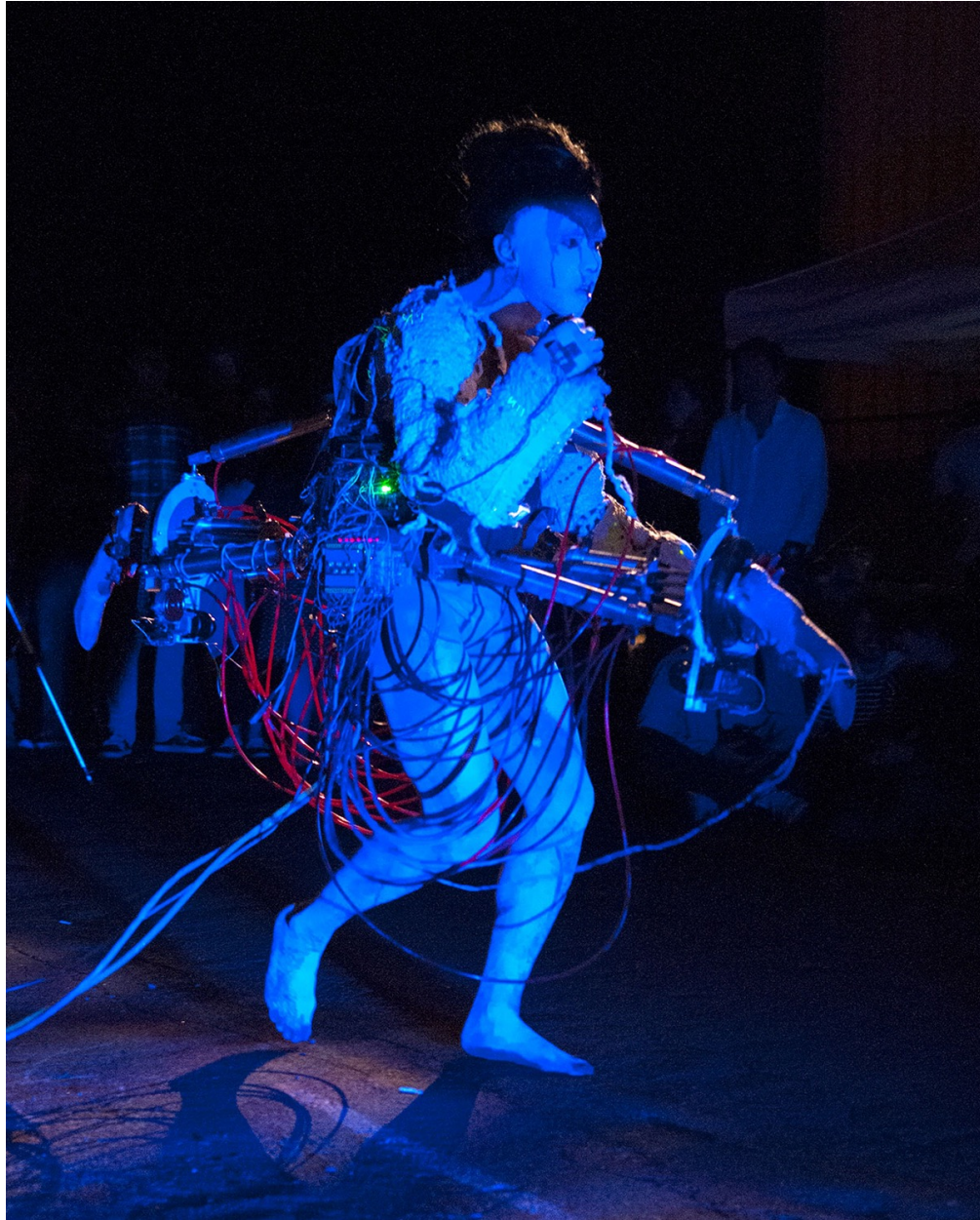


Fig. 11: Doo-Sung Yoo, *Vishtauroborg Version 3.1*, 2012, robotic devices and cow tongues, (photograph ©2012 Cameron Sharp)

The *Vishtauroborg* project has received positive feedback that shows how audiences were captivated and what they were interested in regarding the cyborg

character in robotic performances. The feedback could be useful for other new media artists who create robots, cyborgs, and lifelike zoomorphic sculptures, and other automatic artifacts. I would like to introduce some of the feedback.

Interdisciplinary artist Stacia Yeapanis responds, “Your performances are mesmerizing . . . and some of you robotic sculptures using animal part make me a little nauseous— in a really good way!”³⁵ Writer Christopher A. Yates reports: “Doo Sung Yoo’s *Vishtauroborg 3.1* relies on mystery, myth and the supernatural . . . The painted white human figure, filmed at night, wears elaborate robotic appendages. His dance is strange, uncomfortable, seductive and threatening.”³⁶ Catherine Harris, Professor of The University of New Mexico, notes:

Doo-Sung Yoo experiments with a cyborg reality reminiscent of both dystopia, such as the Farmer’s fictional House of the Scorpion where human clones are farmed to provide donor organs to the supremely wealthy, and utopia, such as MIT’s interactive robot design group where robots help humans stick to exercise routines or resolve conflicts during disasters. Yoo’s experimental reality “improves” on the human body, even as his creations collaborate with human performers and reference emergent complexities.³⁷

Ken Rinaldo, a world-class new media artist, compliments the *Vishtauroborg*’s version 1.2:

³⁵. Stacia Yeapanis, e-mail message to author, Aug 30, 2013.

³⁶. Christopher A. Yates, “Exhibit | Shot Tower Gallery: Show melds old and new technology,” *The Columbus Dispatch*, November 25, 2012, http://www.dispatch.com/content/stories/life_and_entertainment/2012/11/25/show-melds-old-and-new-technology.html.

³⁷. Catherine Harris, “Wildlife: Trans-Species Habitats.” *Media-N: Journal of the New Media Caucus* 9, no. 3 (2013): 14, <http://median.newmediacaucus.org/isea2012-machine-wilderness/wildlife-trans-species-habitats/>.

The robot tongues and the dancer the articulation of the flesh tongue and extension though especially the valve sounds along with the voice was critical to the rhythmic beauty of this work. The way the sculpture goes on the body is exquisite both balanced and unbalanced and the plastic tubes create such a wonderful abstract and techno abstract gesture, and have this immersive sculptural quality with the lighting. The rhythmic extension and individual articulation of the meat tongues was grotesque and balletic and I was completely amazed at how something can be both beautiful and so compelling and disgusting at the same time. Because the prosthetic object is so incredibly engineered and well functioning you have a star object. I was transfixed and many of your viewers were transfixed by the sculpture both with and without the dancer.³⁸

Rinaldo has also commented on version 3.1: “Your works are so powerful. Butto [Butoh] dance gone ballistic with the brilliance of your music and robotics. If a new work would indeed do something about this plight in a performative way, I am sure it would be well received by our community.”³⁹

Video 5: Doo-Sung Yoo, *Vishtauroborg version 3.1 Highlight - 1 minute*, 2012
(©2012 Doo-Sung Yoo) <http://www.youtube.com/watch?v=1mJQ2yRwkZw>

³⁸. Ken Rinaldo, e-mail message to author, June 2, 2011.

³⁹. Ken Rinaldo, Facebook post, March 2, 2013, 3:56 p.m.,
<https://www.facebook.com/ken.rinaldo.5>.

Conclusion

The notions and concepts of ‘cyborg’, ‘augmented body’, ‘lifelikeness’, and ‘hybrid’ have been central agendas in contemporary bio-art and biotechnology in science. Scientific realism and artistic conceptualism always conflict with each other in the traditional binary opposition, but this confrontation continues to accelerate within the larger range of aesthetic issues for current new media agendas. I would suggest that new media artists consider the continuum of artistic strategies within oppositions such as natural/unnatural, organic/inorganic, and human/machine.

When artists create lifelike artificial hybrids and contextualize scientific content within art, contemporary bio-art is confronted with inevitable scientific and artistic problems. Lifelike creations trigger the audiences’ instinctive (and mostly negative) psychological reactions. To solve that issue, technology could eventually reduce an absolute minimum gap between perfection and imperfection for materializing lifelikeness, which is a common belief in the science field. However, when interweaving art and technology, the artist will always struggle to harmonize the two different worlds of ‘natural’ biology and ‘unnatural’ technology.

My art project bridges the gap of those two different perspectives and achieves a state of equilibrium between scientific plausibility and artistic conceptualization. Through my *Organ-machine Hybrids* series, my work demonstrates artistic strategies for the correlation between natural and unnatural contents in art: technical augmentation of biological materials, expanded collaborations between the natural body and mechanical body through digital communication, and enhanced viewer experience by way of the mechanical entity’s mimetic ability.

The combination of natural and unnatural technology arouses numerous artistic issues and discourses made possible by developing technology. As new media artists, these technological developments have given us access to a wide range of possibilities and allowed us to change the conventional parameters of our natural world. Machines and our fellow living creatures are good companions in our artistic explorations of this new hybrid world. We should keep thinking about enhancing our relationships with all the combinations born of these explorations so we can continue to expand the possibilities of new media art.

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