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REVISED 25 February 2015

For chapter in *Robots and Art: Exploring an Unlikely Symbiosis*
 Editors Damith Herath, Christian Kroos, Stelarc. Springer. 2015.

Title:

“Cultivating the Uncanny: The Telegarden and Other Oddities”

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ABSTRACT

The concept of the uncanny has attracted the attention of art critics and scholars for nearly a century. Freud’s 1919 essay *Das Unheimliche*, translated as *The Uncanny*, considers objects and other phenomena that evoke a powerful psychological response of both fascination and fear. Freud explores how the human experience of the uncanny—essentially an *awareness of awareness*—that calls our attention to repressed fears and desires. A related but distinct concept is the Uncanny Valley, a theory proposed by Masahiro Mori in 1970 concerning the design of robots and prosthetics. Mori links the uncanny response to how realistic or lifelike a robot looks, suggesting a strong correlation between lifelike appearance and the uncanny. While the translation of Freud’s *Das Unheimliche* and Mori’s *Bukimi No Tani Genshō* into the English “uncanny” connotes a relationship between the two essays, the link between Freud and the Uncanny Valley was not recognized by Mori until 2013. Contemporary artists continue to draw on the uncanny, but unlike eighteenth century automatons or realistic humanoid robots, non-anthropomorphic robots also evoke strong psychological responses redolent of the uncanny.

This chapter considers the relationship between the Freudian uncanny and Mori’s Uncanny Valley and examines the influence on artists working with robots. We focus on non-anthropomorphic robot art works that create a heightened atmosphere of awareness. In our discussion we discern two types of uncanny: the *representational* uncanny is triggered by objects that look lifelike while the *experiential* uncanny occurs when objects behave in responsive or ways that signal awareness. Material artifacts become especially relevant in robot art works as means to establish the authenticity of the experience or establish the robot’s agency. Three contemporary art works—*The Telegarden* (1995-2004), *Six Robots Named Paul* (2012) and *The Blind Robot* (2013)—illustrate how the uncanny effect has shifted from representational issues towards user experience. This shift coincides with a larger historical shift concerning the human experience of robots in an increasingly computational and mediated world. These art works ask us to consider anew the distinction between the animate and the inanimate by transforming spectators into participants and challenging assumptions about what, precisely, constitutes the real.

Some of the grandest and most overwhelming creations of art are still unsolved riddles to understanding.

-Sigmund Freud

I.

How does the uncanny function in robotic art? Does the English word “uncanny” accurately convey the unique mixture of arousal and fear, familiarity and strangeness implied in the German *unheimlich*? And what is the relationship between Freud’s 1919 essay “*Das Unheimliche*” and Masahiro Mori’s 1970 article “*Bukimi no Tani*”?

On May 10th, 2013, a group of thirty scholars, artists and roboticists came together to explore these questions at the *Art and Robots* workshop held at the International Conference on Robots and Animation (ICRA) in Karlsruhe, Germany.¹ Questions surrounding translations (German, Japanese, English) and of Freud’s influence on Masahiro Mori (who does not speak English) arose repeatedly that day. Professor Hirochika Inoue, a renowned expert in robotics and former student of Masahiro Mori offered to telephone Mori (now in his eighties) in Tokyo to inquire. Professor Inoue soon returned with a surprising and perplexing report: *Masahiro Mori said that he was completely unfamiliar with Freud’s essay and had never heard of the link with Freud until Inoue’s call.*

Professor Inoue and the workshop organizers soon began planning an event to be held in Tokyo that November. *Revisiting the Uncanny Valley: A Tribute to Masahiro Mori* was attended by over 200 researchers at the International Conference on Intelligent Robots and Systems (IROS) in Tokyo, Japan.² Professor

¹ The workshop was organized by Ken Goldberg (UC Berkeley), Heather Knight (Carnegie Mellon University), and Pericle Salvini (Scuola Superiore Sant’Anna), and included presentations by Minoru Asada (Osaka University), Niklaus Correll (University of Colorado), Raffaello D’Andrea (ETH Zurich), Louis-Philippe Demers (Nanyang Technological University), Kyle Gilpin (Massachusetts Institute of Technology), Ken Goldberg, Guy Hoffman (Interdisciplinary Center Herzliya), Ian Ingram (independent scholar), Hiroshi Ishiguro (Osaka University), Elizabeth Jochum (Aalborg University), Heather Knight, Todd Murphey (Northwestern University), Chang Geun Oh (Seoul National University), Pericle Salvini, Reid Simmons (Carnegie Mellon University), Stelarc (Brunel University), and Patrick Tresset (Goldsmiths University London). A summary of the workshop and other materials can be found at http://uncannyvalley_icra2013.sssup.it

² The Uncanny Valley Revisited was held November 6, 2013 in Tokyo, Japan. The event was organized by Ken Goldberg, Minoru Asada (Osaka University) Hirochika Inoue, Sigeki Sugano and Erico Guizzo. Masahiro Mori’s presentation

Mori discussed his research on prosthetic hands that led him to develop his theory of the Uncanny Valley. During his presentation, Mori expressed delight at learning that his essay (which was well known to robotics researchers and artists for over forty years) had been “re-discovered” by researchers in 2012. Mori’s unfamiliarity with Freud and the significant impact of his *own* essay over the past four decades prompted us to investigate further. If there was no direct link between Freud and Mori, were the two authors describing the same effect? How have these theories shaped design approaches in robotics, and what role does the uncanny play in contemporary robotic art? Here we try to answer these questions by uncovering the links between the Freudian uncanny and the Uncanny Valley, paying specific attention to anthropomorphic and non-anthropomorphic tendencies in robotic art.

We begin our investigation by tracing the experience of the uncanny to modern anxieties concerning machines and automation. The Age of the Automaton coincided with the Enlightenment, a shift away from religious and spiritual understanding towards scientific and rational explanations of human biology and nature. During the seventeenth century, the bodies of animals and human beings were increasingly regarded as complex machines, a philosophical stance that prompted fierce debate over what, precisely, separated humans from machines. The man-machine debate in philosophy and biology coincided with new automation practices in agriculture and manufacturing that raised concerns about the impact of machines that replaced human labor and the potential to subjugate human beings. Not unlike the automata that featured prominently in literature and art works of this period, contemporary robotic art works continue to function as both “arguments and entertainments,”³ fueling popular imagination and raising critical questions about the complexity of human behavior and the urge to create mechanical life. The uncanny is central to understanding the complex human reaction to certain technological tools or cultural products.

Both the Freudian and Morian definitions of the uncanny pivot on figures of artificial dolls, wax mannequins and anthropomorphic objects. Whereas Freud focuses his attention on uncanny effects in literature (he cites E.T.A. Hoffman’s *The Sandman* as the literary uncanny *par excellence*), Mori emphasizes the physical design of robots and prosthetics. In contemporary art, interest in the uncanny seems to have shifted away from anthropomorphism and towards an interest in authenticity and the real. In an increasingly computational world we are less concerned about what separates machines from humans and more troubled by our inability to distinguish between the real and the virtual. The

was translated by Norri Kageki. Presentations were given by Ken Goldberg (UC Berkeley), Masaki Fujihata (Tokyo University of the Arts), Hiroshi Ishiguro (Osaka University), Elizabeth Jochum (Aalborg University), Oussama Khatib (Stanford University), Peter Lunenfeld (University of California, Los Angeles), Marek Michalowski (Carnegie Mellon University) and Todd Murphey (Northwestern University). ([insert link to Spectrum article?](#))

³ Schaffer S “Enlightened Automata” in *The Sciences in Enlightened Europe*, p135.

contemporary uncanny can be said to hinge on heightened experiences that provoke ambiguity about the authenticity of experience and the “aliveness” of an artifact.

Automatons and robots typically provoke the uncanny reflex through their remarkable lifelike appearance, but there is distinct category of robotic art that triggers the uncanny through other methods such as responsive movement and behaviors that signal awareness. We can think of human-shaped automata and hyper-realistic robots as evocative of the *representational uncanny*, where objects deliberately evoke the human form and shape. This includes art works such as the human-shaped automata built by Jacques de Vaucanson and Pierre and Henri-Louis Jaquet-Droz in the eighteenth century, waxwork figures found in Madame Tussaud museums, and contemporary androids such as Hiroshi Ishiguro’s Geminoid HI-4 and David Hanson’s realistic androids (Figure 1). A second class of objects provokes what we call the *experiential uncanny*, or works that signal agency or intentionality of inanimate objects. These art works transform spectators into participants and the uncanny effect stems from the experience of the robot as intentional or agential. The uncanny occurs when we perceive the robot as a real, alive, or aware in ways that we typically associate with animate objects, regardless of the robot’s appearance. Teasing out these two distinct classes of uncanny objects enables us to identify their common trait: both classes of uncanny objects create the *awareness of awareness*.

Citing the representational and the experiential uncanny as two significant trends in the history of robotic art, we demonstrate an historical shift in the aesthetic interest in the uncanny that accounts for a wider range of objects and phenomena than Freud or Mori specify. The shift from representational issues towards behavior and user experience is consistent with trends in robotic art that began during the 1960s, beginning with kinetic art and behavioral sculptures (discussed elsewhere in this book). In the twenty-first century, we have become operators of online puppets, digital avatars and tele-operated robots and it becomes increasingly difficult to distinguish real experiences from virtual ones. In this new landscape, the means through which objects and other phenomena provoke the uncanny reflex develop in new directions. In an increasingly mediated world, material artifacts take on heightened significance as authentic proof of the “real” experience and signs of a robot’s awareness or sentience—issues at the center of the human experience of robots that neither Freud nor Mori could possibly have envisioned.

Our chapter is organized in four sections. We first outline the early history of the uncanny during the Enlightenment: this period coincides with a wider interest in monsters, scientific instruments and other “oddities” that troubled fundamental notions of human nature and expanded the capacities for awareness. The second section focuses on Freud’s discussion of uncanny psychological experiences (such as *déjà vu*) and internal drives (such as the death instinct) that bridge psychoanalysis with aesthetics. The third section considers Mori’s essay in light of notable events that combined robots with visual art. The final section considers three contemporary non-anthropomorphic robotic artworks that trigger different aspects of the experiential uncanny. In these interactive art

works, tangible materials become relevant markers or troubling artifacts that deliberately provoke uncertainty about awareness and the nature of the real.

II. The Roots of the Uncanny

When our first encounter with some object surprises us and we find it novel, or very different from what we formerly knew or from what we supposed it ought to be, this causes us to wonder and be astonished at it. Since this may happen before we know whether the object is beneficial to us, I regard wonder as the first of all the passions.

Descartes, *The Passions of the Soul*, 1649⁴

The eighteenth century in a sense “invented the uncanny” ...the very psychic and cultural transformations that led to the subsequent glorification of the period as an age of reason or enlightenment—the aggressively rationalist imperatives of the epoch—also produced, like a kind of toxic side effect, a new human experience of strangeness, anxiety, bafflement, and intellectual impasse.

Terry Castle, *The Female Thermometer*, 1983⁵

The uncanny, then, emerges from the Age of Wonder. The scientific revolution of the Enlightenment signaled both scientific and philosophical breaks with earlier notions of animism and spiritual beliefs, paving the way for a belief—and subsequent skepticism—in the machine. This dual belief and skepticism is at the heart of the late eighteenth century conception of the uncanny. The Enlightenment interest in automata and their literary representations in Gothic fiction trace their lineage to earlier creation myths concerning artificial life, from Homer’s *Iliad* to the Golem myth recounted in *Sefer Yetsirah* (or *The Book of Formation*, tenth century). The promise and threat of mechanical life gained new urgency as clockwork mechanisms were combined with human and animal forms in mechanized clocks and automata. In the previous centuries philosophers such as René Descartes (*The Description of the Human Body*, 1647) and Julien Offray de La Mettrie (*Man a Machine*, 1748) had described living bodies in mechanical terms, late eighteenth century automata were held up as scientific “proof” that many biological functions (such as breathing, digestion, blood circulation) could be reproduced mechanically. These proto-robotic technologies drew large crowds at public scientific lectures and appeared in popular literature, exerting a powerful pull on the imagination of the general

⁴ Quoted in Onians, “I wonder...A short history of amazement,” 18.

⁵ Castle, *The Female Thermometer*, 8.

public and encouraging proponents of the man-machine philosophy. If, as Terry Castle has suggested, the eighteenth century “invented” the uncanny, we might speculate that the uncanny has a pre-history in aesthetic philosophy of the seventeenth century. As evidence, we look to the enthusiasm for oddities found in nature and scientific instruments—the telescope, the microscope, the barometer—that expanded the human perception of the world and our place in it.

The mix of fear and wonder that characterizes the uncanny relates to the concepts of the sublime, the fantastic and wonderment. Art historian John Onians connects the scientific and philosophical study of amazement with the proliferation of *Wunderkammer* (chamber of curiosities) during the seventeenth century.⁶ *Wunderkammer* were collections of exotic art works, strange artifacts and other oddities held in private collections throughout England and Europe and gradually became material representations of self-understanding.⁷ In the same period, the development of the microscope and the telescope made possible new sights and new modes of seeing: these tools were regarded as wonders fitting to be included in the *Wunderkammer*. Optical instruments had the ability to turn anything into an object of wonder “whether by enlarging the familiar to make it strange or by bringing the remote and invisible closer to give it novelty.”⁸ We will elaborate further on defamiliarization as a strategy in modern art, but what interests us here is how technological tools and scientific instruments came to be regarded as aesthetic objects in their own right. Ocularism—the study of the eyes and ocular prostheses or enhancement—is a recurrent theme for Freud and central to his understanding of the uncanny (eyeglasses, eyes and telescopes feature prominently his discussion). Optical tools such as the telescope and microscope provoke wonder by extending our senses and increasing our awareness. We do not suggest that every object that provokes wonder can be regarded as uncanny, nor that the seventeenth century concept of wonder is synonymous with the eighteenth century notion of the uncanny. However we do regard the enthusiasm for *Wunderkammer* as evidence of aesthetic interest in scientific tools and material artifacts that extend our senses and create the *awareness of awareness*.

Popular interest in the uncanny coincides to the movement away from religious belief towards scientific and rational explanations of the natural world. During the “Golden Age of Automata”⁹ (or, alternately, what Gaby Wood calls the “Golden Age of the philosophical toy”),¹⁰ mechanical statues became concrete symbols of materialist philosophical treatises (by Diderot, Rousseau, Voltaire, and La Mettrie, among others) that sought to describe nature and biology in mechanistic terms. The Enlightenment interest in oddities and monsters from the natural world that eluded classification became the subject of scientific inquiry into the “invisible and dynamic processes of life,” and the automaton

⁶ Onians, “‘I wonder...’ A short history of Amazement” in *Sight and Insight*.

⁷ Hagner, “Enlightened Monsters,” 187.

⁸ Onians. ‘I wonder...’ A short history of Amazement,” 20.

⁹ Kang, *Sublime Dreams of Living Machines*, 2011.

¹⁰ Wood, *Edison’s Eve*, 17.

became the emblem for the intellectual pursuit to replicate these processes through engineering. Androids (human-shaped automata) built by Jacques de Vaucanson, Henri and Pierre Jaquet-Droz and Wolfgang von Kempelen dealt head-on with the uncanny. Coupled with new manufacturing processes of the Industrial Revolution, the preoccupation with machines and our relation to technology became a central concern in aesthetics and philosophy. As Gaby Wood proposes in *Edison's Eve*, "Men understood as machines and machines built to resemble men went hand in hand—it hardly mattered which had come first. Androids were more than curiosities: they were the embodiment of a daring idea about the self."¹¹ Androids formalized notions of the mechanization of human labor and society by combining the clock and the statue and advanced the materialist argument that all living beings could be viewed as machines. But it does not necessarily imply that automatons were in and of themselves uncanny. To evoke the uncanny, something more is needed.

A machine that demonstrates awareness through behaviors that signal agency stimulates the uncanny by creating a heightened atmosphere of awareness. In this moment, the machine moves from being an object of wonder or fascination to the realm of the uncanny. Vaucanson's flute player, which was first exhibited in 1738 at the Royal Academy of Sciences in Paris, was deeply troubling to audiences because it simulated breathing:

This automaton *breathed*. Even though the art of mechanics was sophisticated enough by then to make a machine perform many other movements, and even though Vaucanson unveiled the fact that this breath was created by bellows, the very act of breathing, seen in an inanimate figure, continued to cause a stir well into the following century.¹²

The uncanny effect of the breathing android, which was constructed with leather skin to cover the wooden fingers in order to produce accurate sounds from the metal flute,¹³ stems not only from the android's lifelike appearance and replication of invisible biological processes but from what the breath signified—the possibility of the android's awareness. The possibility of a machine that is self-aware is unsettling because it we can no longer be certain of the line between observer and observed. In the moment of apprehension we become keenly aware of our struggle to perceive and identify what we are observing and whether it is also observing us. Our inability to resolve this question keeps us in a heightened state of awareness.

Other androids and automata followed that simulated breathing through mechanized movements of the chest. The android organ player constructed by Pierre and Henri-Louise Jaquet Droz also simulates human breathing through mechanized movements of the chest, and the captivating "spell" of the android's lifelike appearance is heightened through a series of small animations that

¹¹ Wood, *Edison's Eve*, 17.

¹² Wood, *Edison's Eve*, 25.

¹³ Wood, *Edison's Eve*, 26.

animate the organ playing but are not central to it. The mechanized android moves her head to simulate reading the sheet music, the artificial eyes shifting their focus alternately to the android's hands, the sheet music, or the audience, and the performance ends with the android bowing to the audience.¹⁴ These attending behaviors signal a preoccupation beyond scientific demonstration: they illustrate attempts to deliberately heighten the illusion that the android is self-aware and creating an uncanny effect. The android behaves "as if" it had the faculties of sight, hearing and were conscious of its presence in front of a live audience. Through these animations, the line between "real" automata that demonstrate mechanical principles become entangled with "sham" automata like Von Kempelen's chess player which offered only the illusion of mechanical life. The boundary between the real and imaginary, and the line between animate and inanimate objects, becomes increasingly difficult to discern. In this interplay of fascination (of the robot's remarkable likeness) and fear (that it may actually be alive) causes the experience of intellectual uncertainty that Jentsch and Freud later identify as central to the uncanny.

Following their appearance in scientific demonstrations, automata began to feature prominently in nineteenth century Gothic fiction, a genre that combines Romanticism with horror to elicit a pleasurable experience of terror. Gothic narratives frequently intertwine themes of the supernatural and the occult with figures of the double and automata: E. T. A. Hoffman's *The Sandman* (1816), Mary Shelley's *Frankenstein* (1818) and Edgar Allen Poe's short stories (*Oval Portrait*, 1842) explore the allure of the mysterious and the macabre. These works are part of a long lineage of robots in fiction¹⁵ inspired a host of novels and short stories published in the later part of the nineteenth century that signal a popular fascination with the uncanny that predates Freud's essay. The link between the uncanny and androids in literature is exemplified in Hoffman's *The Sandman*, which centers on the figure of a female automaton and the obsession (and subsequent madness) of the young man who mistakes the android for a real woman. Hoffman was familiar with Vaucanson's automata, and drew on illustrations and diagrams taken from Johann Christian Wiegler's *Instruction in Natural Magic, or All Kinds of Amusing Tricks*.¹⁶ These sources enabled Hoffman to tap into primal fears surrounding mechanization, madness and artificial beings.

Interest in the uncanny (and in Hoffman's *Sandman* story in particular) inspired psychoanalyst Ernst Jentsch to write "On The Psychology of the Uncanny"¹⁷ in 1906. Jentsch proposes that the uncanny arises from objects or situations that trigger intellectual uncertainty, for example when we have difficulty categorizing or explaining objects (such as Jaquet-Droz' organ player) that defy or disrupt our

¹⁴ Cohen, *Human Robots in Myth and Science*, 88.

¹⁵ Cohen, John. *Human Robots in Myth and Science*.

¹⁶ Wood, *Edison's Eve*, 33.

¹⁷ 'Zur Psychologie des Unheimlichen' was published in two installments in the *Psychiatrisch-Neurologische Wochenschrift* in two parts (25 Aug. 1906) and (1 September 1906). The essay is translated by Roy Sellars and appears in Collins and Jervis' *Uncanny Modernities* (2008).

expectations. Jentsch is not so interested in defining the essence of the uncanny as he is with understanding the affective response in psychological terms, or “how the psychical conditions must be constituted so that the ‘uncanny’ sensation emerges.”¹⁸ Making the familiar strange, rendering the invisible visible, and strange objects of uncertain origin that link Enlightenment automata with Gothic literature are the foundations upon which Freud constructs his investigation into the aesthetics of the uncanny.

III *The Age of the Uncanny*

An uncanny effect is often and easily produced when the distinction between imagination and reality is effaced, as when something that we have hitherto regarded as imaginary appears before us in reality, or when a symbol takes over the full functions of the thing it symbolizes, and so on.

Freud, *The Uncanny*¹⁹

Freud’s essay “*Das Unheimliche*” is an important reference for twentieth century critical theory and discourse. Harold Bloom calls it “the only major contribution that the twentieth century has made to the aesthetics of the sublime,”²⁰ and Hugh Haughton observes, “It is not only a theoretical commentary on the power of strangeness, but one of the weirdest theoretical texts in the Freudian canon.”²¹ In her post-structuralist reading, Hélène Cixous has even suggested that the act of reading Freud’s essay itself provokes an uncanny awareness, and suggests the essay is “less a discourse than a strange theoretical novel.”²² Originally published in 1919 in the psychoanalytic journal *Imago*, Freud investigates the “common core” of what makes certain objects, experiences or phenomenon appear “uncanny” rather than merely frightening. The essay was first translated into English by James Strachey (in collaboration with Anna Freud) and published in 1925 as “The Uncanny.”²³

In his efforts to identify “that class of the frightening” unique to the uncanny, Freud considers a range of objects and experiences drawn from literature to build a case for an aesthetics of the uncanny. His inability to structure a unified

¹⁸ Jentsch, “On the Psychology of the Uncanny,” 217.

¹⁹ Freud, “The Uncanny,” 244.

²⁰ Bloom, Harold. (1982). “Freud and The Sublime: A Catastrophe Theory of Creativity.” *Psychoanalytic Literary Criticism*. Ed. Maud Ellman. New York: Longman Publishing. 182.

²¹ Haughton, “Introduction,” xliii.

²² Cixous, “Fiction and its Phantoms,” 525.

²³ “The Standard Edition of the Complete Psychological Works of Sigmund Freud.’ XVII (1917-1919): *An Infantile Neurosis and Other Works*. (1925) London: Hogarth Press.

theory says much about the elusive nature of the uncanny and its entanglement in aesthetic philosophy, psychology, and literary theory. The essay begins with a lexical index of the German word *unheimlich*, whereby Freud concludes that meaning associated with *heimlich* belongs to two distinct—but not contradictory—sets of ideas: that which is familiar and agreeable and that which is concealed and kept out of sight.²⁴ Through usage, Freud argues, *unheimlich* gradually became synonymous with the second meaning of *heimlich*, leading him to assert that “everything is *unheimlich* that ought to have remained secret and hidden but has come to light.”²⁵ Armed with this definition, Freud offers a reading of *The Sandman* that connects the uncanny with intellectual uncertainty and theories of repression.

Freud’s chief concern is what the uncanny reveals about key psychoanalytic concepts such as repression, castration anxiety, ego-disturbance, narcissism, the death instinct, involuntary repetition and wish fulfillment. In his reading of *The Sandman*, Freud attempts to uncover the hidden source of the uncanny by looking beyond the automaton figure and instead asserting the main theme to be that of ocular castration, symbolized by the eponymous, imaginative figure who never appears in the story and is believed to tear out children’s eyes. According to literary theorist Samuel Weber, Freud’s relation of castration to the eyes is not rooted in genetic fact or experience (“the actual moment of non-perception”), but rather signifies a “restructuring of experience, including the relation of perception, desire and consciousness in which the narcissistic categories of identity and presence are riven by a difference they can no longer subdue or command.”²⁶ This reading suggests that the uncanny is not necessarily about “not-seeing” but rather about heightened perception triggered by an object or phenomena that provokes the *awareness of awareness*.

Freud’s insists that a general theory of the uncanny “should differentiate between the uncanny that we actually experience and the uncanny that we merely picture or read about.”²⁷ These two classes of the uncanny—those that occur in real life and those experienced through art works—uniquely position the creative writer/artist to evoke or avoid the uncanny in her work. For Freud, the uncanny in fiction is a “more fertile province than the uncanny in real life, for it contains the whole of the latter and something more besides, something that cannot be found in real life.”²⁸ In the aesthetic realm, the artist may “select his world of representation so that it either coincides with the realities we are familiar with or departs from them in what particulars he pleases.”²⁹ The uncanny response related directly to the perceptual stance we adopt towards fictive works: “we adapt our judgment to the imaginary reality imposed on us by the writer, and regard souls, spirits, and ghosts as though their existence had the *same validity as our own has in material reality*” (our emphasis). Artists, In

²⁴ Freud, “The Uncanny,” 224.

²⁵ Freud, “The Uncanny,” 225.

²⁶ Weber, “Sideshow,” 217.

²⁷ Freud, “The Uncanny,” 247.

²⁸ Freud, “The Uncanny,” 249.

²⁹ Freud, “The Uncanny,” 249.

Freud's view, can provoke the uncanny by exaggerating or distorting reality, or staging events or experiences that could never occur in real life. The artist thereby re-exposes the viewer

...to the superstition which we have ostensibly surmounted; he deceives us by promising to give us the sober truth, and then after all overstepping it. We react to his inventions as we would have reacted to real experiences; by the time we have seen through his trick it is already too late and the author has achieved his object.³⁰

The exaggeration or distortion of reality for artistic purposes relates to the strategy of defamiliarization (making the familiar strange) mentioned above with regard to optical instruments and their ability to make the invisible visible. Defamiliarization is also a key concept in twentieth century art criticism, and informed visual art (Viktor Skhlovsky uses the Russian word *ostranenie* and Brecht refers to the *Verfremdungseffekt* (Alienation) effect).³¹ For Freud, the uncanny emerges in art when objects or our experience of objects in fiction are experienced as real or true, so that we come to regard things that we know not to be alive or "real" with the *same validity as our own material reality*.

Freud's interest in the uncanny coincides with the advent of "machine culture" of the early twentieth century. The proliferation of electrical machines in manufacturing, war and medicine provoked contradictory responses from the artistic avant-garde. Artistic responses to machine culture ranged from glorification of the machine and its potential to liberate humans (the Futurists) and celebration of the machine as the harbinger of social progress (the Constructivists), to profound fears and anxieties concerning technology's oppressive and destructive potential (the Expressionists and Dadaists).³² Sculpture in particular became a site for exposing the uncanny effects of mechanization. This is partly due to sculpture's position as the "most literally and rawly material of art forms"³³ and the contradictory responses provoked by sculptural representations of the human form. Hal Foster's *Compulsive Beauty* identifies the uncanny as the defining concept for Surrealism, linking art works by Breton, Bataille, de Chirico, Max Ernst and Hans Bellmer in the 1920s and 1930s to Freud's elaborations on the unconscious and the death drive. According to Foster, Surrealist interest in the uncanny reflects

a concern with events in which repressed material returns in ways that disrupt unitary identity, aesthetic norms, and social

³⁰ *ibid.* p251

³¹ Viktor Shklovsky in "Art as Technique" (1925) concept of "*ostranenie*" or "defamiliarization": "*Art is a way of perceiving an object, the object itself is not important.*" Sculptures in a gallery invite one type of phenomenological gaze; artifacts and objects in real life require another.

³² Jochum, *Deus Ex Machina*, 84.

³³ Potts A, "Dolls and things: The Reification and disintegration of sculpture in Rodin and Rilke," 355.

order...[S]urrealists not only are drawn to the return of the repressed but also seek to redirect this return to critical ends.³⁴

The Surrealist preoccupation with the human form, wax figures and other artificial figures created a vogue for “mannequin art” in the 1930s which continues today in contemporary figurative sculpture. The 1920s and 1930s also witnessed the advent of motor-driven sculptures and mechanical art such as Alexander Calder’s kinetic mobiles and László Moholy-Nagy’s *Light Space Monitor* (1922-1930) that explored the intersection of sculpture and mechanical motion through non-figurative, non-representational forms. These early non-anthropomorphic art works laid the ground for later experiments by Jean Tinguely and Julio Le Parc, among others (discussed elsewhere in this book).

It is worth remembering that Karl Capek’s science fiction melodrama *R.U.R.* (*Rossum’s Universal Robots*)—the play that introduced the term “robot”—was published 1920, one year after the publication of *The Uncanny*. The dystopian play centers on the destruction of humanity by humanoid robot workers originally designed for industrial manufacturing. The play taps into fears concerning our inability to understand or predict the internal mechanisms that govern machines and dramatizes human fears concerning mechanized labor. In the same period, abstract paintings by George Grosz (*Heartfield, the Mechanic*, 1920; *Daum marries her pedantic automaton*, 1920), explored the image of the man-machine, and the development of kinetic sculpture and machine art between the 1930s and 1960s (Tinguely’s *Radio Drawing*, 1962, Edward Paolozzi’s *St Sebastian No. 2*, 1957, and Ernest Trova’s *Study Falling Man*, 1966) demonstrate an aesthetic preoccupation with human-machine configurations. These art works set the stage for the development of robotic art in the 1960s and 1970s.

IV The Uncanny Valley

Man is a robot with defects.

-Emile Cioran

In 1970 Mori published “*Bukimi no tani*” in a special issue of the trade journal *Energy* titled “Robots and Thought.” The premise of Mori’s essay is well known: human beings have an innate affinity for inanimate objects that are shaped like humans but if an object becomes too lifelike without actually being alive, our affinity quickly turns to fear or repulsion. Mori maps the relationship between affinity and human likeness on a graph, where the horizontal axis is the degree of an object’s similarity to a living human and the vertical axis is the degree of affinity humans have for the object. Mori posits a non-linear function with a sharp negative extreme (loss of affinity) as likeness increases beyond a critical point (where phenomena start to appear “too close for comfort”). To illustrate his theory, Mori draws on examples from popular culture (puppet theatre, toy robots) as well as medical and industrial robots, echoing Freud’s catalogue of

³⁴ Foster H. pxvii

objects and experiences from both fiction and real-life. Citing his work with realistic, moving prosthetic hands, Mori suggests that the uncanny effect is amplified when the objects move and suggests that the presence of movement can steepen the curves of the Uncanny Valley (Figure 3).

Mori considers robots from both functional and design approaches—industrial robots typically have designs based on functionality while toy robots and prosthetics focus more on appearance. His concept of affinity is rooted in the popularity of human-shaped toys or the pleasure we experience in the puppet theatre from the remarkably life-like facial expressions and gestures. Like Freud, Mori cites the human tendency to become absorbed in art forms like puppetry and our willingness to suspend disbelief in order to engage in illusions or imaginative play. Like eighteenth century automata, puppets are not inherently uncanny because we view them at a distance from the stage.³⁵ The critical distance that distinguished objects used for entertainment (toys, dolls, puppets) and those in real life acknowledges the perceptual stance we adopt when we encounter works of art or fiction. Objects in fiction may be experienced as real or true and endowed with an artificial life, so long as that reality does not threaten to come alive in the same place as our own material reality. The troubling distinction between fiction and authenticity is central to the evolution of the uncanny.

The publication of Mori's essay coincided with the 1970 International World Exposition (*Expo '70*) held in Osaka, Japan. The theme of *Expo '70*, "Harmony and Progress for Mankind," highlighted the country's social and economic recovery in the wake of the World War II and sought to strengthen Japan's international reputation for innovation in manufacturing and electronic technologies.³⁶ In the article, Mori (then a professor at the Tokyo Institute of Technology) speculates on human reactions to robots and prosthetics, advising robot designers to avoid making robots that appear too humanlike. Mori's observations are tied to his own childhood experience of wax figures and mannequins and his later research on electronic prosthetic hands.³⁷ Mori briefly touches on whether the uncanny is somehow related to our human survival instincts, but he refrains from attempting an answer. Although he makes no direct mention of then-contemporary trends in cybernetic and robotic art, the timing of the article with *Expo '70* (which included robot art works designed by Tezuka Osamu, among others) suggests that Mori was likely aware of emerging trends in robotic art and the public's burgeoning interest in robots. It is useful to consider Mori's essay within the broader cultural framework of visual art and engineering research because it sheds light on how the uncanny evolves with relation to new technologies and aesthetic trends.

While there were few active research projects to build realistic humanoid robots in the 1970s, Mori's states clearly that a principal objective of robotics research

³⁵ Mori, "The Uncanny Valley," 99.

³⁶ Borggreen, "Revising National Spectacle."

³⁷ Kageki, "An Uncanny Mind," 112.

is to develop an artificial human.³⁸ This interest coincides with a renewed interest in mimesis and figural sculpture in the 1960s and 1970s that raised the threshold for the representational uncanny in visual art. Sculptures by George Segal (*The Dinner Table*, 1962), Frank Gallo (*Walking Nude*, 1967) and John D’Andrea (*Couple* 1971) are human-scale statues that reproduce human anatomy in precise detail, provoking aesthetic defamiliarization that renders the human body simultaneously both familiar and unfamiliar. Photorealism (or *hyper-realism*), refueled the debate concerning the conditions and effects of realism in art: the uncanny effect of these sculptures stems from their evocative and unflinching look at the everyday in three dimensions, resulting in what art historian John Welchman has called a “surplus of counterfeit and *trompe l’oeil* illusionism.” The voyeuristic sculptures signal a preoccupation with sex and death, the haunting double and erotic desire—hallmarks of the Freudian uncanny. Like death masks, preserved corpses and other *memento mori*, these art works recall images of death and deliberately provoke anxiety about the line separating the living and dead. Even though there were no realistic humans robots at the time, advancements in visual art and sculpture demonstrated the possibility of constructing realistic, lifelike replicas that could pass—even momentarily—as authentic humans. It is not a huge leap to imagine how these artistic techniques could be combined with mechanisms and computational control, and what impact this might have on human psychology.

The field of animatronics developed in the 1960s and 1970s and combined new techniques in figural sculpture with robotic actuation entertainment and medical robots. Six years prior to Mori’s essay, Disney engineers unveiled a life-sized, walking and talking animatronic Abraham Lincoln at the Illinois State Exhibition at the New York World’s Fair,³⁹ and in 1967 researchers at the University of Southern California School of Medicine developed a realistic, life-size plastic dummy for training medical students. Like their eighteenth century forbears, medical androids simulated biological symptoms that corresponded with real patient symptoms, and researchers speculated on future humanoid robots capable of sweating, bleeding, and displaying more realistic behaviors.⁴⁰ In art historian Jack Burnham’s view, animatronics display a “carnal anthropomorphism of plastic and electronics” that indicate the “return the humanoid robot to a place of competition with other visual mass media.”⁴¹ We do not suggest that Mori was aware of these trends in visual art (which do not feature on his graph), we do find relevance in the contemporaneity of Mori’s theory with the rise of photorealism in sculpture and entertainment robots. Like androids in previous centuries, robots in fiction and their real-life counterparts inspire cultural fascination and fear surrounding the dream and threat of new (or imagined) technologies.

Mori’s essay coincides with other high-profile events that merged art and robotics, such as the nine evenings of *Experiments in Art and Technology* (EAT)

³⁸ Mori, “The Uncanny Valley,” 98.

³⁹ Burnham, *Beyond Modern Sculpture*, 323.

⁴⁰ Burnham, *Beyond Modern Sculpture*, 324.

⁴¹ Burnham, *Beyond Modern Sculpture*, 323.

convened by Billy Klüver, Fred Waldhauer, Robert Rauschenberg, Robert Whitman in New York (1967) and *Cybernetic Serendipity* in London (1968), which featured many robotic art works. Non-anthropomorphic art works such as Edward Ihnatowicz's *Senster*, Jean Tinguely's painting machines, Nam June Paik's *Robot K-456* and Nicholas Schöffer's *CYSP I* are deliberate departures from the photorealism techniques that characterized earlier attempts to create mechanical life. Instead, non-anthropomorphic embrace the performance potential of machines, shifting the focus from representational issues to questions of agency and relationality.⁴² The interest in aesthetics based on interactivity and the relations between objects is consistent with the "performative turn" in visual art, where the lines between visual art and performance and life and art were increasingly blurred.⁴³

Robots and popular culture intertwine in Japan at the very moment Mori develops his theory of the uncanny valley: Tezuka Osamu's *manga* series *Astro Boy* based on the adventures of a humanoid robot were published between 1952 and 1968 (inspiring a television series in 1963), and Tezuka designed the Fujipan Robot Pavilion at the *World Expo '70*. The exhibition featured artistic representations of robots in realistic scenarios that dramatized a future of humanoid robotic in a wide range of settings.⁴⁴ Another *Expo '70* exhibit brought together international artists and engineers: *EAT* members Robert Breer and Klüver collaborated with David Thomas of Pepsi Cola to design the Pepsi pavilion dome in Osaka, which was covered by a water vapor cloud sculpture designed by Fujiko Makaya.⁴⁵ The dome was surrounded by Robert Breer's self-propelled styrofoam *Floats*, six-foot white sculptures that moved around the perimeter of the dome and displayed "evidences of social behavior."⁴⁶ While Mori may not have been familiar with trend animatronics and photorealistic sculpture, he was undoubtedly familiar with the fictionalized representations of human robots and non-anthropomorphic robotic art works that comprised this exhibit in his native Japan.

The first English summary of Mori's essay appears eight years after the original essay was published in Jasia Reichardt's book *Robots: Fact, Fiction, and Prediction* (1978). Reichardt (who curated *Cybernetic Serendipity* and was familiar with *Expo '70*) credits her friend and collaborator Kohei Sugiura with introducing her to Mori's essay and providing her with "otherwise quite inaccessible Japanese material,"⁴⁷ including a summary of Mori's article and illustrations. We contacted Reichardt to inquire about the translation of *Bukimi no tani* into the English "Uncanny Valley"—a translation that invites obvious

⁴² Bown, "The Machine as Autonomous Performer" in *Interactive Experience in the Digital Age*, ed. Linda Candy and Sam Ferguson. (New York: Springer, 2014) 77.

⁴³ See Goldberg, *Performance Art: From Futurism to the Present* (2011) and Fischer-Lichte, *The Transformative Power of Performance* (2008) for further discussion.

⁴⁴ Borgreen G.

⁴⁵ Packer, "The Pepsi Pavilion" in *Future Cinema* (2003), 145.

⁴⁶ Burnham, *Beyond Modern Sculpture*, 354.

⁴⁷ Reichardt, *Robots: Fact, Fiction and Prediction*, 4.

parallels with Freud's essay. Although Reichardt was unable to recall who was responsible for the first translation of Mori's essay,⁴⁸ this summary was the only translation available until Karl MacDorman, professor of Human-Computer Interaction at Indiana University, translated the essay in the early 2000s. The essay was re-translated by MacDorman and Norri Kageki and published in the *IEEE Robotics and Automation Magazine* in June 2012. Mori's essay continues to be an important reference for artists, engineers and animators working across many disciplines, and has become increasingly relevant in light of research into humanoid robotics such as the Geminoids developed by Hiroshi Ishiguro at the Advanced Telecommunications Institute in Japan.⁴⁹

Reichardt's book makes a compelling argument for a tighter integration between robotics research and art practice. She speculates that "Innovation in the field of robotics could well come from art as well as from industrial robotics because the goals of art are not clearly defined."⁵⁰ Whereas the pursuit of industrial robots led by engineers may provide solutions through the use of functional or multipurpose robots,

it will not deal with effects, illusions or emotive principles which belong to art. Art, which results in physical objects, is the only activity that represents the half-way house between the regimentation of technology and the pure fantasy of films and literature; and only in the name of art is a robot likely to be made which is neither just a costume worn by an actor, nor an experimental artificial intelligence machine, nor one of the many identical working units in an unmanned factory.⁵¹

Looking at robotic art helps us to understand the shifting ground of the uncanny: we witness how artists in each age explore the boundaries and slippages between humans and machines. Increasingly this exploration happens in the register of the experiential rather than the representational uncanny, where the sense of the uncanny arises from a user's interaction and experience. In these scenarios, tangible materials become relevant markers or troubling artifacts that deliberately provoke uncertainty about awareness and the nature of the real.

V The *Telegarden* and other Oddities

Non-anthropomorphic robot artworks explore facets of the uncanny beyond human likeness and verisimilitude, what we have hitherto called the experiential uncanny. In this section we consider three non-anthropomorphic robotic art works: the *Telegarden* (1995), *Six Robots Named Paul* (2011) and the *Blind Robot* (2013). These non-figurative, interactive works direct attention away from the appearance of the robot towards the physical actions it enables. In these works,

⁴⁸ Jasia Reichardt, email message to authors, February 25, 2014.

⁴⁹ <http://www.geminoid.jp/>

⁵⁰ Reichardt, *Robots: Fact, Fiction and Prediction*, 56.

⁵¹ Reichardt, *Robots: Fact, Fiction and Prediction*, 56.

the robot operates as a catalyst for exploring our physical and psychological relationships with the material world, and material artifacts play a crucial role in provoking the uncanny. Here, artifacts serve as evidence of the robot's agency and the authenticity of the experience, and become aesthetic objects in their own right. Similar to the optical instruments and automata found in the *Wunderkammer*, we regard these artworks as material representations of self-understanding and knowledge. But unlike androids or humanoid robots, these works invite us to look beyond the "skin" and observe the relations between humans and the physical world. The uncanny is triggered by the specter of uncertainty that arises when we are no longer sure what is animate or inanimate, real or virtual.

Von Kempelen's *Mechanical Turk* provoked the uncanny because viewers could not determine whether the chess playing automaton was real or a hoax, and Mori's myoelectric prosthetic hand made "healthy people feel uneasy" when it began to move. The uncanny sensation in these examples stems from their *trompe l'œil* illusionism and the doubts they provoke about whether the robot was authentic and moving according to its own free will. Agency and authenticity take on new urgency as online behaviors begin to effect action in the real world and as human bodies become physically intertwined with robots and intelligent prosthetics. No artist has gone further to provoke fear and wonder concerning human-machine assemblages than Stelarc: his prosthetic art works (*The Third Hand*, 1980; *Stomach Sculpture*, 1993; *Ping Body*, 1995) explore the ways that robot technologies reconfigure and threaten the perception and experience of the human body. Stelarc's works call attention to the effects of robot technologies and the human body (what he referred to at the ICRA workshop in Karlsruhe as a combination of "Meat, Metal, and Code").

The three art works discussed in this section are non-anthropomorphic: they do not approximate the human form but make familiar human activities—gardening, drawing, observation through touch—unfamiliar using robotics. Each of these works shares a concern with ocularism and provoke suspicion and doubt by staging either remote or intimate encounters between humans, machines and their environments. The art works eschew the representational uncanny and provoke the experiential uncanny by deliberately exploiting the ambiguity of agency and authenticity, introducing doubt concerning whether the robot/interaction is real. Here, material artifacts becomes signs of the robot's agency and assume a level of critical importance in our attempt to discern reality from fiction.

Telegarden (1994)

The *Telegarden* is a tele-robotic art installation created by Ken Goldberg, Joe Santarramana and a team of collaborators including Steven Gentner, Jeff Wiegley, Carl Sutter and George Bekey at the University of Southern California (Figure 4). Combining web cameras with a telerobotic arm that could be operated via the Internet, the *Telegarden* was the sequel to an earlier installation called the *Mercury Project* (1994), which was recognized as the first robot

controlled over the browser-based Internet.⁵² Both projects were designed as engineering prototypes and art installations that questioned the widespread exuberance for technology in general and the Internet in particular. The *Telegarden* juxtaposes the historical and natural pace of planting and cultivation with the “instant gratification” and immediacy promised by the Internet.

In the *Telegarden*, an industrial robot is installed in a 3m x 3m circular aluminum container filled with eighteen inches of soil. Custom software allowed anyone on the Internet to visit the garden, and by clicking in a web browser to move the robot and digital camera on the robot’s end effector. Visitors could register for a password and then participate first by watering the garden and later by planting their own seeds. Visitors were reminded that unless they returned regularly to water their plants, the plants would not germinate.⁵³ The *Telegarden* went online in June 1995 and attracted well over 10,000 participants and over 100,000 viewers. In September 1996, the *Telegarden* was moved to the lobby of the Ars Electronica center in Austria, where it remained online twenty-four hours a day until it was decommissioned in 2004. User activity was recorded in logs so that members could be self-governing: users could plant, water, and monitor the progress of seedlings via the delicate movements of the industrial robot arm. The garden was a metaphor for the promise of new communities made possible by the Internet; it also raised philosophical questions concerning the nature of tele-robotics and introduced the concept of *telepistemology*—the study of knowledge acquired at a distance.⁵⁴

Just as seventeenth century optical instruments brought about new ways of seeing, so, too, did the combination of the Internet, the World Wide Web and live webcams create new modes of viewing and the ability for remote observation. If the telescope and the microscope give rise to doubt and skepticism, then the prospect of telepresence (or mediated agency) heightens the potential for doubt about the veracity of objects or experiences, especially actions that are mediated through the Internet. The *Telegarden* triggers the uncanny because it calls attention to the newly-developed ability to experience things from a remote location, impacting our mode of perception and introducing uncertainty about the “here and now.”⁵⁵ In short, it provokes the awareness of awareness.

Doubt or uncertainty concerning the true nature of an object—its aliveness or presence as indicated by appearance, motion, or representation—is central to the uncanny. While Jentsch associates the uncanny with “intellectual uncertainty,” Freud and Mori more define the uncanny in terms of emotional or cognitive uncertainty: while we might know intellectually that an android is only a machine and not alive, we can be momentarily convinced (or deceived)

⁵² Goldberg, Ken, M. Mascha., S. Gentner, N. Rothenberg, C. Sutter and Jeff Wiegley, “Desktop Teleoperation via the World Wide Web.” *International Conference on Robotics and Automation*. IEEE, May 1995.

⁵³ <http://www.ieor.berkeley.edu/~goldberg/garden/Ars/>

⁵⁴ Goldberg, *The Robot in The Garden*, 2001.

⁵⁵ Kusahara, “Presence, Absence, and Knowledge in Telerobotic Art,” 206.

into granting the object a fictive life if it resembles something that is alive. Alternately, through defamiliarization or distancing, objects or figures that we know to be real may be presented as unreal or fictitious, which creates cognitive uncertainty about the object's true nature and threatens our own self-knowledge and awareness. The *Telegarden* evokes the uncanny on the second count: the specter of uncertainty arises when we become uncertain that our online actions have consequences in the real world. Questions of agency and authenticity signal larger questions concerning telepresence and the technological uncanny:

The Telegarden is real, but (unlike a traditional Commons) we never actually see, feel, or hear the garden itself—It is too far away for that. Our knowledge of the Telegarden is technologically mediated, and that introduced a disturbing doubt: How do I know that the Telegarden really exists? Perhaps the *Telegarden* website is simply sending me prestored images of a garden that no longer exists. How do I know that the Telegarden community exists? I *think* the Telegarden provides a high-tech common where I can interact with other users. But how do I know that these users really exist—that they are not fabrications of the artist, or even mere “virtual” personas cleverly programmed to mimic on-line chat?⁵⁶

Like Kempelen's chess-playing automaton, the *Telegarden* evokes the uncanny by creating uncertainty about the relation between the real and the virtual: Do our actions in the virtual world have actual consequences in the real world? If so, how can we be sure? Unlike Kempelen's chess-player, *Telegarden* visitors are invited to participate directly in the work, making the visitor simultaneously complicit in the action while also introducing doubt about their own agency. The *Telegarden* exposes new terrain in the realm of the uncanny by insisting on its authenticity while problematizing our ability to verify the garden as authentic. The material aspects of the real garden (the soil, water, seeds, and plants) and its evolution over time offer the only verifiable proof, not the robot itself or the images on our screen. In short, our only assurance lies in a material reality that we do not have access to, but the work demands that we grant it the same validity as our own material reality.

Six Robots Named Paul (2012)

In 2012 Patrick Tresset presented this interactive robotic art installation at the Merge Festival in London. Gallery visitors were invited to have their portrait drawn by five robots positioned in the gallery and drawn simultaneously from different points of view.⁵⁷ The installation is based on the observational drawing

⁵⁶ Kusahara, “Presence, Absence, and Knowledge in Telerobotic Art,” 206.

⁵⁷ While the title suggests six robots, in actuality there were only five on hand at the exhibit, creating an unintentional but uncanny effect brought on by the incongruity between of the title and the set up. In his presentation in Karlsruhe Tresset stated the actual reason was coincidental; he had intended six robots but

robot called *Paul* designed by Tresset in collaboration with Frederic Fol Leymarie and the AIKon II project at Goldsmiths University in London. *Paul* was first exhibited in June 2011 at the Tenderpixel Gallery in the UK and has produced more than 1000 unique drawings, 200 of which have been purchased and one of which is part of the collection at the Victoria and Albert Museum in London. In 2014, Tresset exhibited the work under the title “Five Robots Named Paul” at the Ars Electronica festival in Linz.

Six Robots Named Paul (Figure 6) uses computation and robotic technologies to emulate the process of human portrait drawing. *Paul* is not a telerobotic system but an autonomous machine that uses computational programming and visual feedback to make drawings. Like gardening, drawing is considered a uniquely human activity and a powerful symbol of human civilization and culture. A machine that emulates an intimate, creative activity like drawing—not according to a pre-determined program but drawing “from life” as a human artist does—raises issues of agency and authenticity that echo those of the *Telegarden*. Unlike Jaquet-Droz’s draughtsman automaton that could draw several pre-determined sketches, the object of aesthetic orientation here is not the robot that draws nor the software program that directs the robot’s motions. Rather, the object of aesthetic interest is the drawing activity itself—the relation between artist and subject—that is here reproduced through a staged encounter reminiscent of an artist’s studio.

As with the *Telegarden*, the visitor is integral to the artwork and tries to verify the authenticity of the experience. The robot cannot prove its drawing capabilities without the material reality of the portrait, but even this tangible proof introduces doubt and uncertainty. If the robot is merely running a program, and all the robots run the identical program, how do we account for the differences in the portraits (Figure 6), the different length of times it takes each robot to complete the portrait, and the artistic likeness that does not appear like a computer drawing but rather emulates the aesthetics of a human artist’s sketching technique? Can we believe our own eyes? The material output (portrait on paper) demands that we grant it the same validity as a portrait painted by a human artist. The *real* portrait drawn on *real* paper proves the robot’s agency and the portrait becomes an authentic object of wonder in its own right. Over the course of the week-long installation in Linz, the space took on a new atmosphere as portraits hung on the walls transformed the space from an artist’s studio to a gallery exhibition.

Like the *Telegarden*, *Six Robots Named Paul* evokes the uncanny in a manner wholly distinct from other anthropomorphic art works. Tresset refers to *Paul* as an “obsessive drawing entity” that “does not attempt to emulate human appearance.”⁵⁸ The characterization of the robot’s behavior as “obsessive”

only five were available and the project had already been advertised through the festival.

⁵⁸ Tresset, “Portrait drawing by Paul the robot,” 350.

evokes the repetition compulsion drive Freud associates with the uncanny,⁵⁹ and the multiplicity of robots used in this particular installation—faceless, non-anthropomorphic drawing entities masquerading as artists under a single name—is redolent of the double theme. *Six Robots Named Paul* further heightens the feeling of the uncanny through specific devices designed to introduce cognitive and emotional uncertainty. Like Jaquet-Droz's organ player, *Paul* is designed to exhibit several “non-functional” animations (Tresset calls them “pretenses”) that do not impact the drawing process but are used solely to entice the audience into believing that *Paul* is “more alive and autonomous than it actually is”—thus reinforcing the psychological relationship between the robot and the sitter.⁶⁰ Apart from the robot's functional properties, the staging elements deliberately blur the lines between fiction and reality. When *Paul* exhibits artistic mannerisms or gestures we associate with optical behaviors we see in humans—adjusting the camera “eye” to regard the face of the sitter with multiple saccades and fixations—the uncanny response is not elicited by the machinic or unthinking properties of the machine but rather by the *possibility* of sentience as indicated by its behavior. When a sitter feels herself being watched by the robot (or several robots), she experiences a momentary sense of insecurity concerning our own identity and how she should relate to the machine. Just as the possibility of a breathing android ignited fear and fascination, the possibility of a creative, sentient robot disrupts our self-awareness by demanding that we grant it the same validity as our own material reality.

As with the *Telegarden*, web cameras and computer vision technologies lend themselves to ambiguity and uncertainty concerning perception, particularly in how they problematize the relation between subject and the object (Who/what is being observed? Who/what is observing?). *Six Robots Named Paul* calls attention to theme of ocularism and human perception by blurring the distinction between the observer and the observed. Divisions between artist/model/ beholder break down as the museum visitor becomes both object (the model for the robot drawing) *and* subject (who perceives and interprets the robot's actions and beholds the portraits on the wall). The mutual engagement between machine and human suggests a type of two-way communication. The artwork is not concerned with representation but is an interactive experience between the human subject/object and the machine.⁶¹ Interactive art works like this one scrutinize how we relate to technology and repeatedly challenge our assumptions about what, precisely, separates humans from machines.

The Blind Robot (2013)

Louis Philippe Demers' *Blind Robot* is a telerobotic art installation that stages human-robot interaction as an artistic, interactive experience. The *Blind Robot*

⁵⁹ The robot will draw whatever object is positioned in front of the camera. On one occasion, part of the robot arm entered the field of vision which became part of the final sketch. Tresset quipped this might have been “the first instance of a robot self-portrait.”

⁶⁰ Tresset, “Portrait drawing by Paul the robot,” 351.

⁶¹ Candy and Ferguson, “Interactive Experience in the Digital Age.”

was commissioned for the Robots & Avatars project by *body>data>space* and the National Theatre in the UK and developed at Nanyang Technological University in Singapore (Figure 7). The set-up consists of a set of two-mechanical arms mounted onto a base and bolted to a table. Visitors are invited to interact with the robot by sitting in a chair opposite the robot and engage in “non-verbal dialogue.” The robot delicately explores the sitter’s body, mostly the face, in a manner that recalls how blind humans purportedly use touch to recognize persons or objects. Positioned directly behind the robot is a portrait-sized mirror that allows the visitor to observe him/herself during the interaction. Some exhibitions feature a video display monitor facing the visitor that provides a visual rendering of what the robot “sees”— ostensibly providing “a window to the soul of the robot.”⁶² Theatrical lighting and dark curtains create a heightened feeling of the uncanny by obscuring the view of the robot and forcing the viewer to focus their awareness on the experience of being touched (Figure 8).

Motivated partly by research in social robotics and human-robot interaction, the *Blind Robot* proposes a platform for studying the degrees of engagement—be they intellectual, emotional or physical—that arise when a social robot intimately touches a person.⁶³ Direct physical contact with a robot is still an exceptional and unique experience for a majority of people. When users interact with the *Blind Robot*, they remain passive while the robot actively “explores” their face and body through touch. Issues surrounding proxemics, trust and predictability are important aspects of social robotics research; Demers’ effectively dramatizes an intimate, physical interaction between a human and a robot to defamiliarize the physical experience of our own body in the world.

The *Blind Robot* is not anthropomorphic and, like the *Telegarden* and *Paul*, triggers the uncanny reflex. The headless, torso-less, leg-less robot is decidedly non-anthropomorphic and yet the machinic arms and articulated fingers create the feeling of an ambiguous and intentional agent. The aesthetic conceit attributes a human malady (blindness) to a non-human object recalls Norman White’s *Helpless Robot* (1987) and reverses the traditional association of humans as frail and helpless in comparison to robots that are mechanically superior to humans. The artwork directs our attention away from the representational figure of the robot (only the hands approximate the form of human hands) to the physical actions it performs. The artwork hinges on the physical encounter between the human and the robot. Like *Paul*, the *Blind Robot* destabilizes the traditional subject-object relationship by casting the visitor in the role of both subject and object. The uncanny effect stems from the uncertainty introduced though the theme of ocularism: without “eyes” to see, the *Blind Robot* awakens fears about the unknowable processes behind robot’s “vision.” Theatrical lighting focuses attention on the human subject and directs attention away from the robot as an aesthetic object and instead on the tactile experience. The dark curtain surrounding the exhibit (the robot is sometimes exhibited in a closed room) creates a heightened sense of the uncanny by centering the awareness on the physical experience of being touched. The encounter is reflected back to the

⁶² <http://www.robotsandavatars.net>

⁶³ http://www.processing-plant.com/web_csi/index.html#project=blind

viewer in the mirror opposite them (the connection between narcissism and the uncanny is a particular relevant here, in particular when visitor's "sit" with the robot only long enough to capture a self portrait on a handheld device to record the event).⁶⁴

In his presentation in Karlsruhe, Demers said that the goal of the artist is "to create a situation that goes beyond the context of the object."⁶⁵ In other words, the artist's job is to help the object transcend its *objectness*. For artists, the uncanny is a strategy to direct our attention to the repressed toward critical ends.

VI Beyond the Valley

Our efforts to uncover the secret history of the uncanny lead us into aspects of visual art and robotics that is both familiar and unfamiliar. We have seen that the uncanny in visual art can occur in two registers: the representational and the experiential. The representational uncanny is categorized by figurative, anthropomorphic representations that deliberately provoke a strange mix of fear and wonder. Works by Ron Mueck (*Dead Dad* 1996), Toni Matelli (*Sleepwalker* 1997), Sam Jinks (*Pieta* 2007) and the subversive oeuvre of Paul McCarthy recuperate the Surrealist interest in mannequins and the avant-garde abstractions of the human form through the use of defamiliarization, the double and the grotesque. Anthropomorphic robot works, such as the lifelike humanoid robots on display at the National Museum of Emerging Science in Miraikan, Japan,⁶⁶ or Jordan Wolfson's *Female Figure* (featured at Art Basel in 2014) tap into the representational uncanny through realism and verisimilitude.

The experiential uncanny shifts attention from the representational figure of the robot to the physical actions it performs. In these works, the robot's actions are designed to stretch the boundaries between the animate and the inanimate in new directions, provoking strong reactions as spectators are transformed into participants. Examples include the artworks discussed in this chapter as well as works by Stelarc, Zaven Paré, Shun Ito, Maywa Denki, Tim Lewis, Shiro Takatani, Masaki Fujihata, Ken Rinaldo, Chico MacMurtrie, Seiko Mikami and many others. Here the robot is not the primary object of focus but the catalyst for action, and the experience of the uncanny emerges from our desire for authentic proof and the material artifacts that themselves become independent objects of aesthetic interest but are also still somehow suspect. Like their artistic and literary forbearers, the art works continue to challenge our beliefs about what, precisely, separates humans from machines.

What unites the *Telegarden*, the *Blind Robot*, and *Paul* is their ability to evoke the uncanny without relying on anthropomorphic or physical verisimilitude. The works do not mimic life, but rather mimic behaviors that we associate with living

⁶⁴ We witnessed the "selfie" effect when the *Blind Robot* was exhibited at Aalborg University in April 2014.

⁶⁵ Demers.

⁶⁶ <http://www.psfk.com/2014/07/japanese-news-androids.html#!bss5c2>

creatures and produce material artifacts that signal creative, human output. In the digital age, the materiality of the artworks becomes essential to verifying the art object and experience—even if that artifact is not generated by the robot but only a selfie taken by the visitor during the exchange. We yearn for proof and authentic markers before we are willing to grant the robot agency or validity in the real world. It is not enough to know that complex algorithms and machinery are capable of planting and cultivating a real garden, it is essential that these simulation have a real output—*real* plants fed by *real* water that sprout from *real* dirt. When we meet the *Blind Robot* in a gallery, it matters little that the sightless robot doesn't have a head that corresponds a human head, it matters still less if the robot's motions are not autonomous but controlled remotely by a human. What *does* matter is the real physical contact with the robot, tactile contact between *real* human skin and *real* robot hands—articulated plastic joints fashioned after human hands that extend from metal poles with servo motors and soft, sinewy wiring vaguely reminiscent of human nervous system. With *Paul*, the real portraits on real paper drawn by real robot hands in front of our eyes become tangible proof of the encounter and the authenticity of the experience. The physical drawings on real portrait paper that accumulate on the walls gradually become part of the experience and give assurance that the robot is really an artist. Like the obscure objects found in eighteenth century *Wunderkammer*, these material artifacts are testaments to actual, lived experience. The tangible objects speak to a communal encounter between robot and human—they are byproducts that authenticate and inscribe these uncanny encounters in the real world and bridge the distance between the virtual and the real.

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