Shifting Interfaces

An Anthology of Presence, Empathy, and Agency in 21st-Century Media Arts

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Leuven University Press

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Edited by
Hava Aldouby

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Cover illustration: *BRALL* (Breathing Wall), silicone on polycarbonate panel, 145cm × 145cm, 2015.
(© Ece Budak and Ozge Akbulut. Photo © Baris Dervent, Murat Ugurlu).

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Introduction

Around the late 1960s a group of artworks were produced that have been historicized under the heading of *soft sculpture*. The epithet refers to Claes Oldenburg's Pop Art sculptures, but also to works associated with Postminimalism, Process Art, and Anti-Form. Straddling several art historical traditions, soft sculpture as a category collects together an ensemble of works that is internally divergent in many respects. And soft sculpture operates with several different notions of softness: Some works index a physical process involving molten or plastically deformed parts, others use pliable, yielding, or lightweight materials, some merely have visual cues that indicate a possibility of deformation, while others still are made of elastic rubbers.

When reading descriptions of works of soft sculpture, it is remarkable to notice that their similarities with living organisms and bodies are so frequently emphasized as a central tenet of their aesthetic, though most are nonfigurative and motionless.[1] Oldenburg's sculptures, for instance, are said to 'take on their own life' (Babington and Owens 2009). The felt compositions of Robert Morris 'allude to the human body through their response to gravity and epidermal quality' (Blessing n.d.) and have 'human qualities' (MoMALearning n.d.). Richard Serra's rubber strips in *Belts* (1966–67) are imbued with an 'anthropomorphic quality' (Spector n.d.), and Lynda Benglis' polyurethane foam accumulations attributed biological drives of their own when claimed to embody an 'erotics of Anti-Form' and 'movement of a (…) Dionysian sort' (Edelman 2004).

But why is soft sculpture so frequently described as life-like? Might this be a direct consequence of or somehow related to its soft materiality or is something else at play? Soft and pliable materials indeed figured prominently within an earlier tradition of crafted objects that explicitly sought to not just imitate, but simulate organic life, namely the fraction of

European automata that Jessica Riskin refers to as 'eighteenth-century wetware' (Riskin 2003). As Riskin writes,

> These machines all reflected the assumption that an artificial model of a living creature should be soft, flexible, sometimes also wet and messy, and in these ways should resemble its organic subject (Riskin 2003, 112).

The intuition that soft matter plays a central role for the functioning of living bodies has, moreover, recently started to assert itself within the technical research field of *soft robotics*. Here, efforts are made to construct robots from materials such as silicone, often by drawing explicit inspiration from the bodily mechanics, control strategies, and abilities of soft or partially soft animals.

In this essay, I interrogate an apparent contiguity between softness and what, for lack of a better term, I will refer to as *the life-like*. By this, I designate experiences and descriptions of nonliving entities and material processes that ascribe to these physical dynamics and qualities characteristic of living organisms.[2] The line of questioning pursued originates from a syncretic ambition, as it seeks to integrate the historical and aesthetic perspectives of media art history with the description of life within physics and with recent technical research on soft robotics. The extensive question that the essay revolves around is, thus, what connections can be drawn between softness and the process of life, beyond the obvious observation that most life forms (that we know of) are composed of soft matter. This question is approached by way of analyses of a number of selected works of soft sculpture and robotic art. In terms of the wider interests of this anthology, the essay can thus be said to deal with softness, and its changing status as an interface for an aesthetics of life.

To begin with, I focus on postminimalist soft sculpture and its conceptual underpinnings and reception to explore the different ways in which such works conjure up impressions of the life-like.[3] In doing so, I aim to explicate the kinds of liveliness postminimalist soft sculpture can be seen to enact. Secondly, I proceed to two recent artworks from a burgeoning strand of contemporary media art that appropriates soft robotics technology for an artistic end. And finally, as a way of concluding, I discuss how the relations between softness and life, unearthed through the analyses, relate to measures currently taken in order to imitate natural organisms within technical soft robotics research.

The underlying thesis of the essay is that the concept of *entropy* and the physical description of life as a process of entropy evasion can be used to analyze the different notions of life evoked by soft sculpture. And I argue that accounts of postminimalist soft sculpture as life-like actualize what I term *an entropic aesthetics of the life-like*, wherein life is envisioned as processual and the living organism's physical intertwinement with its environment is stressed. This aesthetics, I further argue, can be extended to also encompass two

contemporary soft robotic artworks through a historically bound reworking of the entropy concept that emphasizes an understanding of entropy as sameness.

Forces Become Process

The question of why soft sculpture is so frequently described as life-like obviously has more than one answer. In some works of soft sculpture we find so-called natural materials such as fur, wool, jute, or hemp, that have connotations of life because they derive from living organisms. In others, the belts by Serra for instance, there is something about the scale and proportions that comes close to the human body. But in the subgroup of works where softness is introduced via pliable materials or physical deformation, the sense of life-likeness also appears to hinge on a reflexivity between the sensuous apprehension of soft matter that is part of the viewer's own body and soft matter within its proximity. In Lucy Lippard's 'Eccentric Abstraction' essay, which mentions several works of soft sculpture, she insightfully remarks that for sculpture

> The use of a flexible instead of a fixed medium opens up an area somewhere between kinesthetic and kinetic art in which moving or movable elements are extremely understated (Lippard 1966, 106).

In flexible sculpture, movement is thus arguably implied in a subtle manner that seems to implicate the kinesthetic. Kinesthetic experience relates to the sensations we have of our own living bodies. They involve an embodied knowledge of the effects that physical forces and gravity have upon the type of matter we inhabit from the inside, namely soft matter. But from Lippard's observation the inference can be drawn that soft sculpture also appears to trigger kinesthetic responses, hence, this might in part be what compels the viewer to empathetically attribute to soft sculptures a liveliness of its own.

The coexistence of movement and nonmovement, observed by Lippard, also brings up how soft matter in general seems to exist in between set categories. Soft matter mediates between not just the fixed and the moveable, but also between liquids and solids, the stable and the unstable, the structured and the unstructured. In many respects, soft bodies are characterized by being receptive to forces coming from their outside, and hence they are also tied to process.

In his programmatic text 'Anti-Form,' written in 1968, against the minimalist aesthetic of 'object-type art' which he had previously pursued, Robert Morris famously announced an aesthetics of process that was to become central to postminimalism. For Morris, the painting practices of Jackson Pollock and Morris Louis provided a point of departure for

Fig. 1. Robert Morris, *Untitled* (1969). New York, Museum of Modern Art (MoMA). Draped 1' (2.5 cm) thick, gray-green felt. 15' 3/4' × 6' 1/2' × 1' (459.2 × 184.1 × 2.5 cm). The Gilman Foundation Fund. Acc. n.: 378.1975. © 2019. Digital image, The Museum of Modern Art, New York/Scala, Florence. © Robert Morris / VISDA.

rethinking artistic creation. 'The stick that drips paint,' Morris wrote, 'acknowledges the nature of the fluidity of the paint' (Morris 1968, 43). Hence, compared to the brush 'it is in far greater sympathy with matter because it acknowledges the inherent tendencies and properties of that matter' (Ibid.). Against an idealist focus on form, which Morris took to be a 'conservative enterprise' (Ibid. 45), he proclaimed process a 'more direct revelation of matter itself' (Ibid. 44). Hence in his works from the period, Morris explored a balance of flexibility and stiffness in materials that included soft industrial felt.

The credo of Morris and other postminimalists, such as Richard Serra, that sculptural form should be derived from the inherent properties of materials, is related to the notion of 'truth to materials.' Yet in postminimalist practice, this notion was radicalized and became an ambition of bringing matter and form into a condition of mutuality: The forms and the physical relations between parts should be generated from and made possible by the specific physical characteristics of the materials used. This is evident in Serra's bent sheet of vulcanized rubber upheld by forces of friction in the work *To Lift* (1967). But even more elegantly displayed in *Right Angle Prop* (1969) where a bent piece of lead alloy is used to balance another piece of the same material against a wall, something that is made possible by the specific density, friction, and stiffness of the material.

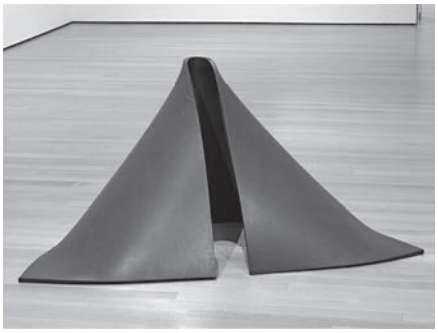

Fig. 2. Richard Serra, *To Lift* (1967). New York, Museum of Modern Art (MoMA). Vulcanized rubber, 36" × 6' 8" × 60" (91.4 × 200 × 152.4 cm). Gift of the artist. Acc. n.: 458.2007. © 2019. Digital image, The Museum of Modern Art, New York/ Scala, Florence. © Richard Serra / VISDA.

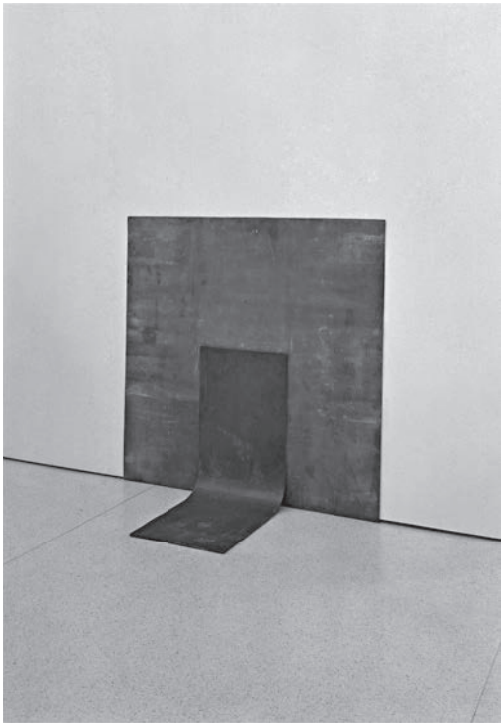

Fig. 3. Richard Serra, *Right Angle Prop* (1969). New York, Solomon R. Guggenheim Museum. Lead antimony. 72 × 72 × 34 inches (182.9 × 182.9 × 86.4 cm). Purchased with funds contributed by The Theodoron Foundation, 1969 © 2019. The Solomon R. Guggenheim Foundation/Art Resource, NY/ Scala, Florence © Richard Serra / VISDA.

Entropy and Life

In Morris' and Serra's works, the force of terrestrial gravity enters the artwork to become a co-constitutive element of sculptural composition. In this way, an indispensable link between the artwork and its surroundings is established that echoes the subjection to gravity that all earthly organisms must endure. In other postminimalist works, a physical connection between organism and environment is also thematized, but in a different way that can be more directly brought to bear on a physical processual view of life.

Fig. 4. Eva Hesse, *Tori* (1969). Philadelphia Museum of Art. Polyester, resin, and fiberglass on wire mesh. Largest of nine units 119.4 × 43.2 × 38.1 cm. Purchased with funds contributed by Mr. and Mrs. Leonard Korman, Mr. and Mrs. Keith Sachs, Marion Boulton Stroud, Mr. and Mrs. Bayard T. Storey, and with other various funds, 1990, 1990, 121–1–9, © The Estate of Eva Hesse. Courtesy Hauser & Wirth. (Plate 35, p. 324)

From a physical perspective, acting as a catalyst of process can be interpreted as letting entropy lead. As a concept, entropy originates in thermodynamics, but it also became a frequent reference of late 1960s art discourses and is explicitly mentioned by Morris in 'Anti-Form.' Defined technically in statistical physics as related to the number of microstates of a given system, and thus an expression of its number of degrees of freedom, entropy is often interpreted as a measure of disorder, even if such an interpretation does not always hold (Piazza 2011, 80).[4] Entropy is relevant in relation to the life-like because life seems to evade the second law of thermodynamics, which implies that all physical processes yield a net increase in entropy. Given the physical description of life as being, at its core, anti-entropic, it might seem paradoxical that postminimalist and Anti-Form works with soft materials that are based on letting physical processes run their due course, and usually appear somewhat disorganized or haphazard, are frequently described as possessing qualities shared with living organisms. However, Erwin Schrödinger (2012[1944]), and before him Ludwig Boltzmann (1974[1875]), have pointed out that living organisms only evade the decay to thermodynamical equilibrium by continually exporting entropy to their surroundings. Within the physical description, the locus of life is therefore not just the living organism itself. Instead, life is seen to inhere in the relation that the organism continually sustains with its environment. The living organism is considered an *open system* (in the physical sense) that exists in a state of continual exchange of entropy, energy, and matter with its environment. Interestingly, this ecological perspective on life also runs as a latent current through the associations conjured up by postminimalist soft sculptures by Eva Hesse and Lynda Benglis.

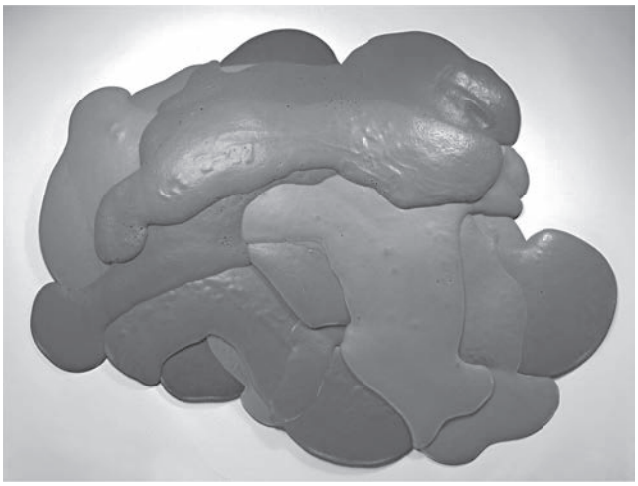

Fig. 5. Lynda Benglis, *NIGHT SHERBET A* (1968). Dayglo pigment, phosphorescence and poured polyurethane foam. 5 × 48 × 60 1/2 inches (12.7 × 121.9 × 153.7 cm). © Lynda Benglis / DACS, London / VAGA, New York / VISDA, Copenhagen. Courtesy Pace Gallery and Thomas Dane Gallery. (Plate 36, p. 324)

In the text on Hesse's work *Tori* on Philadelphia Museum's webpage, for instance, it is stated that Hesse 'imbued a subtle eroticism and a sense of human presence in her sculptures' (Philadelphia Museum 2018). The nine forms that make up the work are, moreover, described as 'organic and rigid, fleshy and repellent, corporeal and otherworldly' (Ibid). And the organization of the piece is referred to as a 'casual arrangement' that looks 'more like something discovered by chance than deliberately set in place' (Ibid).

In the description, the nine sculptural elements are thus likened to a group of organisms or parts thereof (being 'fleshy,' 'corporeal'). But they also take on the role of a kind of elements in the environment that appear as if organized, perhaps for some purpose or from some previous activity, and hence their organization also comes to index the past presence of one or more living creatures. It is thus both the frailness of the parts and the balanced disorder with which they are arranged that imbue the work with a life-like quality. The elements in *Tori* also resemble the shed skin of a snake. Within the reception, Lynda Benglis' polyurethane *pours* are frequently associated with a comparable discarding of bodily matter and bodily fluids that are imagined to leave the body to be cast off to the environment (Chadwick 1996).

In such readings, the works come to reflect a process of *abjection*, described by Julia Kristeva as the expulsion of bodily matter, a shedding of 'the me that is not me' (Kristeva 1982). When read through this prism, Hesse and Benglis' works allude to the fact that entropy does not just vanish in organisms but is exported to the environment through a transfer of matter and energy. They acknowledge that life is not simply anti-entropic, but rather a modulation of entropic flows that envelop both the organism and the environ-

ment. Matter must continually enter the body and leave it again in a more entropic state in order for the body to maintain its structured organization. And we can take Kristeva literally when she writes that 'These body fluids, this defilement, this shit are what life withstands (…) Such wastes drop so that I might live' (Kristeva 1982, 3).

In line with the above reading, author Darian Leader has noted a tension between a kind of unruly matter that constitutes the living body and this body's highly organized character as a general theme within Hesse's work. As Leader writes,

> When we look at Hesse's three-dimensional work, we are looking at ourselves (…) Hesse shows us that the body itself is a tension between imposed, regulating structures and a substance that is never entirely subsumed by them (Leader 2002).

To summarize and conclude, the critical reception illustrates how soft sculptures by Morris, Serra, Hesse, and Benglis can come to appear life-like, in the sense that they may be read as analogies that parse different aspects of the relation through which a living organism is inscribed into its physical environment. Although they are explicitly preoccupied with process, Morris' and Serra's works predominantly channel this relation via a focus on physical forces, notably gravity, and their effects on soft materials, and analogously soft bodies, as well as the potential of such forces to generate specific inherent organizations of different kinds of soft matter. Hesse's and Benglis' work is instead associated with a transformation of biological matter, and processes wherein matter is passed between organism and environment. Albeit rooted in an analogy between artwork and organism, the perception of soft sculpture as life-like evoked by these works differs from the Romanticist notion of the artwork as a *quasi-organism*. For within that analogy, it was the holistic unity of all the parts of the artwork, and the resultant 'self-organization,' that was essential and proclaimed a source of the artwork's beauty (Gorodeisky 2016). Postminimalist soft sculpture, in contrast, propels *an entropic aesthetics of the life-like*. Within it, life is portrayed as processual and as intimately tied to its physical surroundings. Organisms and bodies are rendered permeable to outside forces and enrolled in material flows and transformations, within a dynamism of forces of chaos and order. Following Rosalind Krauss' writings on *the formless*, this aesthetic can be described as entailing a blurring of the boundary between organism and milieu, or in art historical terms—a dissolution of the figure/ground relationship (Krauss 2000, 75).

Within a number of recent soft robotic artworks, the theme of physical intertwinement between organism and environment also recurs. Yet in these works the viewer-become-user is confronted not just with a soft object or a sculpture, but surroundings that have themselves become life-like. In the following sections, two such works will be analyzed.

BRALL

The Breathing Wall (BRALL) (2015) is an interdisciplinary project by artist Ece Polen Budak, engineers Onur Zirhli and Ozge Akbulut, and soft roboticist Adam A. Stokes. The installation consists of nine silicone foam tiles mounted side by side on an upright panel. The tiles have different organic surface structures and a porous sponge-like surface—a few are endowed with a layered appearance reminiscent of Benglis' foam pours, while others are characterized by saggy folds. Each tile possesses its own air compartment and has a separate sensor implemented underneath. The structure as a whole 'responds to touch by modulating its breathing' (Budak et al. 2016), and when one of the silicone tiles is touched, the tile will start to inflate and a playback of recorded sounds of human breathing is triggered.

In their paper on *BRALL*, Budak and her collaborators state that the work 'investigates the tactile possibilities of human interaction with synthetic biomorphic surfaces' (Budak et al. 2016, 162). And they claim that by way of its responsiveness to touch and its 'breathing,' the work 'engages the viewer in a similar fashion to that of a living organism' (Ibid. 163). They believe this 'foster[s] greater responses on the part of the user,' so that 'the interaction [with the installation] will be closer to that of organic life' (Ibid.). And they further quote research to support the notion that the presence of biomorphic shapes in an environment 'can serve to enrich human emotional experience' (Ibid. 162).

Like the soft sculptures discussed earlier, *BRALL* evokes an entropic aesthetics of life, both by implying exposure to the forces of the surroundings and by way of the installation's use of breathing. From an art historical perspective, the gesture contained in *BRALL* of rendering a wall soft can be seen to reiterate Oldenburg's practice wherein rigid objects,

Fig. 6. Ece Budak and Ozge Akbulut, *BRALL* (2015). Silicone on polycarbonate panel, 145 cm × 145 cm. © Ece Budak and Ozge Akbulut. Photo and video still © Baris Dervent, Murat Ugurlu. Courtesy of the artists. (Plate 37, p. 325)

such as a fan or a typewriter, were replicated in pliable materials. The resulting soft versions of these objects would often collapse under their own weight, and hence came to appear blatantly nonfunctional, and softification thus became a means of effectuating a defamiliarization or estrangement from otherwise well-known mass-produced commodities and technologies with a fixed function. In relation to a wall, the operation of rendering soft perhaps even more directly negates the intended functionality. That is, it effectively cancels out the wall's traditional architectural functions of supporting the roof of a building and of shielding against the outdoors. If a wall is soft, instead of a clear separation between the domestic interior and the outdoors, one gets a correspondence and connection. The wall becomes permeable and the human dwellers become exposed to the forces of nature.

The simulated breathing used in the work is a recurrent feature of artworks with soft robots.[5] Breathing is the definitive sign (or index) of life, 'life depends on breathing,' as Despina Kakoudaki puts it (Kakoudaki 2014, 93). However, breathing is equally one of the basic mechanisms through which it becomes evident that we are never just ourselves, alone, in isolation from our surroundings. It is an occurrence that transgresses on the borders between the inside and the outside of the body and connects the organism with its environment in an intimate manner. The body is literally reproduced differently with each breath it takes, as oxygen molecules from the atmospheric air enter the lungs and from there the bloodstream, and as entropy is exported via respiration. The way the breathing mechanism is accomplished in *BRALL*, where exhalation is achieved by passive elastic contraction of the tiles, is also in itself an entropic mechanism. For elasticity, the property that in general seems to endow soft elastomers with a life of their own, has an entropic origin. The inherent tendency of a rubber band to return from a stretched state is predicted by the second law of thermodynamics within statistical physics, as the contraction maximizes the number of possible configurations of the polymer chains of which it is composed, thereby increasing entropy (Piazza 2011, 83).

Synthetic Seduction

Synthetic Seduction is a collaborative exhibition by Stine Deja and Marie Munk that consists of individual works by the two artists assembled as a joint installation.[6] The installation is described as 'a futuristic laboratory setting, simulating the proverbial hospital room' (SixtyEight Art Institute n.d.). Within this setting, two video works by Deja and four interactive sculptures by Munk are on display. The largest sculpture, titled *Skin-to-skin* (2018), consists of a soft slouching circular base on which smaller oblong parts are also lying. Some parts are attached to the base with umbilical cord-like tethers and the different parts all share an uncannily illusionistic appearance that makes their surfaces resemble those of

Fig. 7. Stine Deja and Marie Munk, *Synthetic Seduction* (2018). Installation view, Annka Kulty's Gallery, London.
 (Plate 38, p. 326).

human bodies—bluish vein-like protrusions are visible under the skin-like surfaces as well as belly button-esque crevices.

The sculptural pieces are constructed from silicone stuffed with a soft foam material that makes them yield to the touch. And *Skin-to-skin* is positioned so as to function as a recliner to sit on or lie on while wearing headphones and watching Deja's video work *The Intimacy Package* (2018) on a large screen.[7] Two of the smaller sculptures produce heartbeat-like sounds when compressed, and some of *Skin-to-skin*'s tethered elements also have moving parts below their 'skins' that are reminiscent of the kind of rigid wheels mounted on rotating spokes found in massage chairs (Marie Munk, email to author, November 14, 2018).

Despite possessing visual and haptic qualities that call to mind the soft, moist, and wet character of biological life, *Synthetic Seduction* perhaps less obviously aligns with the thematic of physical exchange between organism and environment that connects *BRALL* with the earlier works of soft sculpture. The installation thematizes artificial corporeality and softness as a means of achieving physical (artificial) intimacy (SixtyEight Art Institute n.d.). Through allusions to the mother-infant relationship (umbilical cords, skin to skin contact, the breast-like appearances) notions of physical dependence or symbiosis with an enveloping artificial (m)other are evoked. The relationship between infant and mother is a symbiotic relationship between two organisms, but it is not symmetrical—in terms of survival, the child obviously needs the mother more than she needs it. In a sense, the mother can thus be said to constitute the child's immediate physical surroundings that sustain it. However, within the installation as a whole, the mother-like interactive sculpture *Skin-to-*

skin attains a strange kind of presence. On the one hand, it is a center and the anchor piece, and its appearance, as well as its movement and sound, arguably draws attention to it and encourages active physical exploration on the part of the viewer. Yet when it is used to sit or lie on in order to watch the video work, it is relegated to having only a kind of ambient presence and to exist at the periphery of perceptual awareness, as a piece of furniture. *Skin-to-skin* thus oscillates between encountering the viewer via what Don Ihde terms an *alterity relation* and a *background relation* (Ihde 1990). Within the former the sculpture attains a subject-like status as a *quasi-other*, whereas in the latter it functions as a context for human existence, but is not at the center of experience itself. The soft settings envelop the viewer as she lies down and then become less noticeable as she is absorbed by the video, thus evoking an experience of having merged with an artificial (m)other.

Entropic Aesthetics and Twenty-First-Century Soft Robotic Media Art

In the previous two sections I have sought to articulate in which respects two more recent soft robotic artworks may be said to extend the entropic aesthetics of life latent in post-minimalist soft sculpture. Yet, in *BRALL* and *Synthetic Seduction*, we can also discern a reformulation of the entropic aesthetic. To unpack it, we might start from the theorization of entropy that occurs within the writings of Robert Smithson, who extends the entropy concept from the physical domain to also encompass aesthetic and cultural phenomena. In Smithson's writings, which were closely tied to his artistic practice, the interpretation of entropy as 'sameness' dominates (Smithson 1996). This is a meaning that originates in thermodynamics, where the second law predicts that when two closed systems are put into contact they will gradually attain the same temperature. But also that this phenomenon will eventually manifest on a much vaster scale, resulting in the so-called *heath death*, a condition of maximum entropy wherein the Universe will have attained an even temperature and all macroscopic movement ceases to exist. Smithson reinterprets and applies this gloomy teleology on a cultural scale with a critical bent, as entropy becomes tied to a diagnosis of cultural and aesthetic uniformity but also to an affirmation of facticity within contemporary minimalist art that he sees as taking part in developing a new kind of monumentality.

But where can this entropic sameness be located today? Given that soft robotics can be conceived of as an intermingling of computing, sensing, and actuation technologies with soft matter, it seems logical to start by looking at the physical computing technologies that the soft sculptural medium is augmented with as it transforms into soft robotic art. From a contemporary perspective, Smithson's notion of entropy, as descriptive of a qualitative sameness that pertains to facets of cultural practices, art, and the built environment, is also

obviously missing a crucial component, namely an account of the effects that the proliferation and implementation of computational technologies on a planetary scale over the past couple of decades have had. The contemporary lifeworld is permeated by and saturated with computational media, software programs, algorithms, as well as networks of sensors and actuators assembled as a still expanding *internet of things*. Terms such as *pervasive computing* and *ubiquitous computing* (*ubicomp*) are often used to describe this phenomenon (Ekman et al. 2015). A number of theorists have taken note of how this development has rendered computational processes ambient and atmospheric, and consequently established a dispersed environmental computational agency. Mark B.N. Hansen, for instance, argues that

> Through the distribution of computation into the environment (…) space becomes animated with some agency of its own (Hansen 2012, 33).

And that this sets new requirements for adequately thinking through the relationship between humans and technology. As he puts it,

> We must reconceptualize the coupling of human and technics beyond the figure of the 'technical object' (Ibid. 51).

The animation of space of which Hansen speaks can arguably be seen to have endowed the environment as a whole with life-like qualities, in the sense that the surroundings have attained what appear to us as both intelligences and autonomous agencies of their own. That is, within experience, the physical environment may be attributed abilities and a mode of being that were traditionally reserved for living beings within the modern scientific worldview. And, as Hansen argues, the fact that the forms of intelligence and agency the surroundings manifest can no longer be traced back to a single origin (a subject or an object), but are dispersed and networked in character, makes them troubling and hard to adequately conceptualize and come to terms with.

BRALL and *Synthetic Seduction* are emblematic of this contemporary condition of ubiquitous computing, I argue, wherein architectural elements (a wall) and domestic settings (a couch) via technological augmentation come to attain phenomenal qualities that were previously the preserve of living beings, and as a consequence start to appear semi-living. In these works we are presented with sessile technical entities that are embedded into an environment, yet resemble living bodies visually, haptically, and auditorily. The living figure has merged with the ground, one might say, to extend Krauss' phrasing. The works thus take part in a dramatization of the sameness and indistinction between humans, technology, and environment that ubicomp has brought about, i.e. the interlacing of human

existence with a set of intelligent and agential technologies that have begun to spill out into all parts of the human habitat. In doing so, the artworks attain an uncanny quality in the sense that they seem to reactivate a suppressed knowledge of the increasingly central role played by technology and technological agencies within everyday life. In a hyperbolic manner, they appear to give a missing body to ubiquitous computational processes, intelligences, and agencies that, despite the recent focus on materiality and infrastructure within media theory, often tend to be conceived as abstract and dematerialized. Compared with the sophistication of the machine-learning algorithms that have intertwined with contemporary everyday life, they appear strangely analogue and anachronistic, donning an almost vulgar corporeality. Their artificial soft bodies appear crude, perhaps even unintelligent, as they are reduced to only displaying basic bodily functions similar to those controlled by the autonomic nervous system (breathing and intra-bodily motion). It is tempting to think of the works as reversals of Mark Weiser's original vision of ubiquitous computing as the becoming invisible of computing technologies (Dourish 2004; Weiser 1991) and the subsequent notion of unobtrusive *calm technology* he took part in developing (Brown and Weiser 1997). Yet *BRALL* and *Synthetic Seduction* derive their aesthetic effects from a calming and casualizing of human interactions with strange embodied technological entities that at first sight might appear repulsive, via switching back and forth between enrolling them and the viewer in background and alterity relations.

Onwards from Soft Sculpture to Soft Robotic Art

This essay has addressed the question of how softness can be seen to afford impressions of the life-like within postminimalist soft sculpture and contemporary soft robotic art, and what conceptions of soft life these two strands of works activate. I have proposed that the concept of entropy can serve to elucidate aspects of this phenomenon as it unfolds within the critical reception of postminimalist soft sculpture. Extending this analysis, I argued that with a reworking and expansion of the entropy concept that emphasizes entropy as sameness, it also has analytical purchase in analyzing more recent artworks wherein soft robotic life-like entities merge with their surroundings.

In conclusion, and in order to return to the broader interest stipulated at the outset about a possible connection between softness and the process of life, the question I raise is: What might soft sculpture and soft robotic art add to soft robotics research that explicitly seeks to replicate soft bodies of living organisms in a technical medium? By posing this question, I do not mean to insinuate that art must measure up to purposefulness as a yardstick, nor that the value of art lies in its potential as a driver of innovations that eventually become useful. Instead, the question is posed from a commitment to transdisciplinarity in

acknowledgement of the historicity and contingency of the modern distinction between art and science/technology (Guattari 1995) and the onto-epistemic potential held by artistic practices.

The obvious and straightforward art historical answer to this question is the traditional avant-garde reply wherein the potential of art is postulated to lie in its criticality and ability to subversively scrutinize cultural tendencies and positions. And this answer also resonates with the contextualizing reading I proposed of *BRALL* and *Synthetic Seduction*. Soft robotic artworks, such as *BRALL* and *Synthetic Seduction*, can indeed be said to add vital reflections to more instrumentalist technical research agendas by probing the ramifications of contemporary technologies on human and nonhuman life. But also by going further and introducing a *naturecultural* (Haraway 2003) perspective by drawing attention to the fact that the biophysical process of life can no longer be imagined to unfold within a 'natural' environment, but is set to evolve within augmented technical settings and on a planet whose state and constitution is tied to human culture and activities.

However, other answers to the question are also possible. In retrospect, the postminimalist aspiration of attaining reciprocity between form and material, and the associated intensive probing of how physical properties can engender specific structural organizations and behaviors that are inherent to soft matter, can be seen to anticipate a central conceptual pillar of technical soft robotics research. I am referring to the idea that the implementation of pliable materials can serve to greatly simplify a robot design or make a robot perform some tasks more easily or better (Laschi and Cianchetti 2014). That is, specific material properties can contribute to attaining specific functionalities. This principle, roboticists claim, is already implemented in the soft bodies of natural organisms whose designs have been optimized by the process of natural evolution. The notion of life as being processual and entwined with the physical environment, contained in an entropic aesthetics of life, is also central to research on biodegradable robots occurring at the fringes of soft robotics. Here, a more ecological view of robots than that which is generally the order of the day in robotics prevails, and robots are envisioned to have life-cycles and sustain themselves through exchanges with specific physical environments (Rossiter et al. 2016). Hence, actuators and other parts are constructed from biodegradable materials such as gelatin but also latex, a material that was also favored by Eva Hesse, who was well aware of its eventual degradation over time. However, such overlaps and shared interests between art and soft robotics research seem to have almost vanished within contemporary media art that uses soft robotics technology. This strand of artworks instead tends to work in the vein of the historical tradition of robotic art.[8] That is, the main impetus is usually an interest in an aesthetic of robotic behavior, conceived of as embodied actions and interactions that unfold on a humanly perceptible time scale. This allegiance serves to extend the interests of the tradition of robotic art found within the broader field of media art. But it would be interest-

ing, I posit, to see artists treating soft robotics less as a fixed technology that is an extension of traditional robotics, and more as a medium or affordance in its own right, with singular capacities and modes of composition that must be invented, and continually reinvented, physically and aesthetically from scratch. Perhaps postminimalist soft sculpture can provide some inspiration for undertaking this work.

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Notes

1. A few kinetic soft sculptures from the period exist. These include Keith Sonnier's inflatables (Lippard 1966; The National Exemplar 2018) and Oldenburg's *Ice Bag -- Scale B, Yellow* (1971).
2. I have chosen to use the term 'life-like' as it is less anthropocentric than the discourses on 'anthropomorphization.' It is also preferable to 'animated' as this term usually refers to a qualitative aspect (something that is endowed with life or the qualities of life). The term 'life-like' is better suited for the transdisciplinary interest of this essay, as it is not tied to a qualitative epistemology, but is also compatible with a physical description of life.
3. It should be noted here that the reading of postminimalist soft sculpture that this focus and approach produces is, of course, highly selective and largely neglects the historical and political contexts within which these works were produced.
4. Entropy is a concept that arguably has many different meanings. It has gone through considerable reworking and has been redefined on its travel from thermodynamics to statistical physics, information theory, and beyond. Entropy has previously been applied to art and aesthetics on a number of occasions (see Jones 1973). Gestalt psychologist Rudolf Arnheim's *Entropy and Art. An Essay on Disorder and Order* (2010[1971]) and artist Robert Smithson's writings are probably the most famous instances of this (Smithson 1996). The use of entropy within this essay differs from how the term is used by Arnheim and a number of other theorists' where it serves as a theoretical basis for developing a naturalizing aesthetics rooted in natural science (Rapkine 1970[1945]; Mandelbrojt 1970; Monod 1970). Within these accounts, entropy is associated with disorder and figures as an opposite of order and information that is privileged by way of a classicizing aesthetics. Compared to such theorizing, the scope of this essay is narrower. I do not intend to apply entropy to aesthetics or aesthetic judgement in general, but instead I use the concept as a prism through which to articulate the life-like aspects of soft sculpture and soft robotic artworks. Within this usage, order recurs as a characteristic of life and living bodies, but it is

the dynamic physical imbrication of organism and environment, announced by the negentropic physical description of life, that I take as my leitmotif.

5. See Jørgensen (2017). Breathing automatons were also popular in the late 18th century. Jacques Vaucanson's android *Flute-player* (1738) is an early example that was followed by other famous breathing automatons such as the Jaquet-Droz family's *Lady-musician* (1774) and *Draughtsman* (1772–74) (Riskin 2003).
6. The exhibition has been presented in different formats, first at Annka Kulty's Gallery, London (February 21- March 24, 2018), then at SixtyEight Art Institute, Copenhagen (June 8 – August 4, 2018), and subsequently also at other venues. In my analysis, I refer to the exhibition at SixtyEight Art Institute, which I visited.
7. I was told by gallery staff of this intended function while visiting the exhibition .
8. See Kac (1997), Wilson (2003), Whitelaw (2004), Penny (2013), and Shanken (2014).

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