BY STACY JO SCOTT

Ephemeral Material

There are moments when working with clay that seem to hover before thought. This is an experience of an intelligence that is rooted in the body. It is found in the detailed material information that is transferred from clay to the fingertips when first touching a pot's surface the morning after a throwing session, or gauging the moisture in a plaster mold before casting. This subtle information can be maddeningly hard to quantify and requires metaphor to describe. We see this in the use of terms, such as leather-hard, or bone-dry, to explain the different stages of drying clay.

More can be conveyed to a student by handing them an example of clay in its various stages than through explanation. They begin to feel these nuances in their fingertips, and build their particular expertise from such body-based knowledge.

Some of this information can be quantified and put into language. For instance, someone firing a kiln might rely on a thermocouple or oxygen probe to measure the conditions of their firing atmosphere. But often we rely on subtle cues, such as the particular shade of orange inside a kiln or the pernicious green flame when firing in reduction. The education of a ceramic artist consists of a gradual accretion of these embodied memories, accumulated through direct relationship with the clay.

There is a direct, unmediated intelligence inside materials, too. Their wisdom stems from their characteristics. The process that created clay, the accumulated millennia, the path from mountainside to valley to river to floodplain—each stage contributed its nature to aid earth on its path to becoming clay. Each of these characteristics is embedded in the clay: the slope and velocity of the river, the

Stacy Jo Scott. Mimic *(process shot), 2017. 1x1x3 in. 3-D printed terracotta. Photo courtesy of the author.*

LEFT: *Stacy Jo Scott.* Loop In Time, *2016. Dimensions variable. 3-D printed clay and glaze. Photo by Bill Holderfield.*

RIGHT: *Stacy Jo Scott.* Loop In Time *(process shot), 2016. Dimensions variable. Screenshot, Rhinocerous CAD software. Photo courtesy of the author.*

material makeup of the mountainside. These contribute to the clay's wisdom, its particular level of plasticity or the stages of vitrification it can achieve in the fire.

The material may in fact be active in shaping our encounters with it. David Abram is a cognitive theorist examining perception and the formation of language. In his book *The Spell of the Sensuous*, he describes the moment of touch as a reciprocal exchange between active agents. He says: "There is an intimate reciprocity to the senses; as we touch the bark of a tree, we feel the tree *touching us*."[1] As the clay touches us, it conforms itself to our shape; it accepts some part of the moisture of our hands; it tells us something of its nature and what it might allow us to do.

Abram describes this intimacy between material and body as the result of our coevolution. Entities, such as clay, he says, "have coevolved, like ourselves, with the rest of the shifting earth; their rhythms and forms are composed of layers upon layers of earlier rhythms, and in engaging them our senses are led into an inexhaustible depth that echoes that of our own flesh."[2] We feel something familiar in these materials because we share the same source and the same deep genealogy.

The common mythology of God creating humanity in clay intuits this. These are not just stories of creation or the Creator, but show us what it means to be a body. The body is material, experienced through the senses. It has weight, shape, smell. It moves in relation to other bodies, responds to touch. It experiences changes over time: wear, breakage, malleability, grace, inertia. It behaves differently from how we plan it to. It does not follow with precision the program we lay out for it.

Caroline Walker Bynum conducted research into the ways medieval Europeans approached these intuitive relationships between embodiment and materiality. According to her, "Medieval theorists…understood 'body' to mean 'changeable thing': gem, tree, log, or cadaver, as well as living human being. Understood in medieval terms, to explore 'the body' was to explore stars and statues, blood and resin, as well as pain, perception, and survival."[3] This outlook avoids distinctions between bodies and materials that we often take for granted today, distinctions that draw lines between what is perceived to be animate and what is perceived to be inert. As Bynum says, they "operated not from a modern need to break down such boundaries but from a sense that they were porous in some cases, not existent in others."[4]

The machines of digital fabrication have an innate wisdom, too, but one that differs

in many ways from that of bodies and materials. These machines run on a more abstract language, following instructions sent to them in the form of code. This code tells the machine how to move and how to lay down or remove material. The objects that they produce only exist as a visualization on a screen before they are produced by the machine. The zone inside the screen relies on a space ordered by algorithms that are seemingly untouched by material qualities and gravity.

Despite its precision, the code that is performed by the machine can be seen as a crude mimic of the complex and immediate knowledge held in the body. The code of the machine contains set parameters and conventions. Once sent to the machine, the code becomes closed to the creator, who then becomes a witness to its process. The relationship between the body and the material of clay seems to be suspended. If, for example, I were to touch the clay while it was being printed, the object might fall apart from this deviation in the code. As subsequent layers were laid down, they would attempt to follow a regularity that had been interrupted by the hand.

The repeated lines of code accrete to form the object. There is life in these lines of code, but it remains closed, static, sealed within its own logic. This closed process lies in contrast to the means by which forms accrete in the natural world, which Abram describes in this way: "Nature's rhythms and forms are composed of layers upon layers of earlier rhythms… all composed of repetitive figures that never exactly repeat themselves."[5] It is partially this lack of perfect repetition that gives natural forms a resilience that enables them to change.

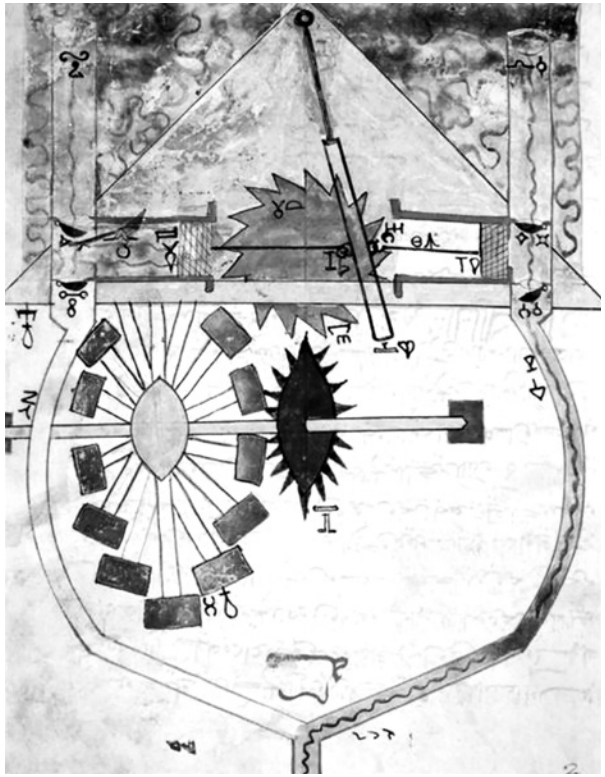
This doesn't mean the body of the maker using digital fabrication is passive. Although I might not touch a 3-D print while it is printing, I am watching it intently for information about how I might tweak its code for a better print next time. Each type, even each batch of clay, requires fine adjustments to the code to produce the result I am looking for. The closest corollary of 3-D printing is not coil building, but the wheel. While 3-D printing, I am most reminded of the years I spent as a potter: The thousands of factors working in tandem, spinning often out of control, and the tiny adjustments my fingers made as they traced the emerging contour of a pot. And, of course, the wheel is also a machine, designed to replicate the slow circling of a form, rotating in the hands of a maker.

Digital fabrication machines do not conform to the immateriality often associated with the digital. They are fallible, vulnerable. They rely on the painstaking, precise calibration. They frequently fail and require someone to pull them apart, diagnose the problem, and sometimes cobble them back together with what's on hand, or sit idly by until they are reanimated. The software itself, the apparently untouched zone inside the screen, always requires its own sort of making-do or patching together. Each software speaks its own dialect of the language of code and has its own version of material properties, what types of movement, editing, or sculpting it allows.

Clay offers a break from the underlying order of the machine, that is sometimes reflected through material nuance, chance, or glitch. The idiosyncrasies of clay interrupt the logic of the machine. The code relies on the material to bring it to life. Clay's specific histories, cultural, personal, and geological, bring sensory memory to its forms. As Abram describes, "The tree trunk of the telephone pole, the clay of the bricks from which the building is fashioned, the smooth metal alloy of the car door we lean against—all these still carry, like our bodies, the textures and rhythms of a pattern that we ourselves did not devise, and their quiet dynamism responds directly to our senses."[6]

In spending time with 3-D clay printers, I am often curious about why their action feels simultaneously so familiar and so strange. The object that was once only numeric code materializes through this simple machine. There seems to be some uncanny action involved, some shift that is more significant than what occurs in most machines I interact with, even other digital fabrication machines, such as laser cutters and CNC routers. Its action mesmerizes me and evokes a sense of wonder, and even some degree of uneasiness. It evokes some deeper memory in me that isn't explained away by an appeal to novelty. My feelings may come from a sense that this machine is performing a most basic human impulse: to materialize an idea through language, an action as old as civilization. In digital fabrication, that impulse is made literal. Idea becomes language, becomes code, becomes form. These machines reach into an unseen world and produce objects seemingly from thin air, like magic.

This connection between unseen forces and machines has a precedent in early automatons. These machines, like 3-D printers, were engineered to mimic human action. It was understood that if the forces of the universe could be conveyed through mathematics and physical



LEFT: *Medieval statue,* Golden Madonna of Essen, *c. 980 C.E. 29 inches tall. Wood, gold leaf, cloisonné enamel. Essen Cathedral, formerly the church of Essen Abbey, in North Rhine-Westphalia, Germany.*

RIGHT: *Page from the* Book of Knowledge of Ingenious Mechanical Devices *by Is'mail Al Jazari, c. 1206.*

science, then these disciplines could bring the maker closer to God. This is reflected in the work of Isma'il Al-Jazari, an engineer of the 13th-century Islamic Renaissance, who authored *The Book of Knowledge of Ingenious Mechanical Devices.* Historian Gunalan Nadarajan says of Al-Jazari's designs, "these devices need to be understood not as means to show how effectively and efficiently one could control the natural forces of air and water but as conduits allowing these forces *to play out* their capricious movements that were pleasurable because they were conceived as *expressions of God's will*."[7] Rather than fulfilling merely mechanistic needs or affirming the genius of their engineers, these devices were seen as a medium through which to connect to the underlying force of the universe, or God.

This recalls Bynum's research on medieval European religion. This idea that the transcendent is embedded in material was a hallmark of popular religious practice, often counter to the sanctioned accounts of a disembodied God. To the medieval worshipper, statues could move and weep, and divine grace became immanent in holy artworks or in materials such as a cloth touched to holy relics by the worshipper. Objects and materials thus came to signify a power and agency we usually reserve for humanity. As Bynum writes, "Medieval cult objects had agency in a more literal sense. They were not like life; they (at least sometimes) lived… Pieces of wood or bone, bread, wine, bits of wall or paint animated. It seems that their life or agency lay not in their naturalism or similitude but in their materiality."[8]

This connection between materiality and transcendence was reflected in the medieval ecstatic religious experience of visions as well. Bynum writes of such visions, "Their content is highly somatic and material. Both as received and described, they are full of physical objects."[9] Rather than relating solely to an ephemeral understanding of God through a transcendent encounter, these experiences were rooted in the sensual experience of the body. As Bynum describes one famous vision of St. Gertrude the Great, "the 'vision' is auditory, gustatory, and tactile as well." … She "saw, heard, tasted, touched."[10]

As makers and transformers of material, we humans and our machines materialize the immaterial. We bring form to the ephemeral, whether it be vision or code. The artifacts of digital fabrication are thus not so far off from earlier artifacts of humankind. It is their materiality that gives 3-D printed objects their resonant presence, that grounds, materializes, and animates the realm of the numinous and unseen, the realm of code. In this sense, digital fabrication tools belong next to earlier tools: the burnishing rock, the gourd mold, the kick wheel.

Digital fabrication brings the logic of numbers, of the machine, back into the land of the body: the living, breathing, transient world of direct human experience. If we experience machines as close to our bodies, as part of this living universe, we may take more care how we use them and perhaps how we make them. As Abram says, "If the surroundings are

experienced as sensate, attentive, and watchful, then I must take care that my actions are mindful and respectful."[11] If they are part of our humanity, then our machines are implicated in our ethics. We become responsible for determining how we use them, whether it aligns with our ethics, our values, our conception of the potential of art. If we maintain that humans are separate from machines, this distance, this gulf, can be the location of abdicating responsibility for what we ask them to do.

The machine itself is an object fashioned from metal and plastic. These materials may contain less direct reference to the hand but nevertheless depend on the bodies that mine, recycle, mold, and assemble them, and those that maintain the flows of electricity, information, and capital it relies on. Media theorist and performance artist Allucquére Rosanne "Sandy" Stone cautions that "Forgetting about the body is an old Cartesian trick, one that has unpleasant consequences for those bodies whose speech is silenced by the act of our forgetting; that is to say, those upon whose labor the act of forgetting the body is founded."[12] Remembering the materiality of the machine not only serves to bring it closer to our humanity, but it is also foundational to remembering the ways in which machines are inextricable from a web of human relationships, of commerce and policy, where certain bodies are often forgotten.

Just as medieval theorists positioned the transcendent divine as embedded in material, feminist theorist Donna Haraway suggested in her 1985 "Manifesto for Cyborgs" that the machine is inextricable from embodiment. This idea forms the basis for her conception of a more complex view of humanity than that suggested by many of her contemporaries. She says, "Late 20th-century machines have made thoroughly ambiguous the difference between natural and artificial, mind and body, self-developing and externally designed, and many other distinctions that used to apply to organisms and machines."[13] She suggests that this more complex view of humanity opens the possibility of moving toward a better understanding of contemporary experience. She asks, "Why should our bodies end at the skin?"[14]

Rather than seeking to reclaim a forgotten connection to nature, she seeks to reclaim a sense of embodiment large enough to accept the machine as part of it, "the machine is us, an aspect of our embodiment."[15] Such an understanding might generate a wholeness predicated on complexity and contradiction. It doesn't signal a return to the hand, nor does it signal the abandonment of the hand for the machine. My hands and apron get as covered in clay when I'm 3-D printing a pot as when I coil-build it. And my sensitivity to the particular curve of a form is as pointed when I am modeling it in software, as when I'm throwing it at the wheel. The machine and the hand both enable the maker to reflect their vision through material, and thus they are equally rooted in what it means to be human. This doesn't mean that the machine and the hand are without differentiation, but that they originate from the same source.

The artifacts of digital fabrication reveal a paradox. The abstract language of code that runs the machine appears foreign to the materiality of clay and our bodies and yet is revealed through this materiality. Donna Haraway describes this condition of paradox as "...about contradictions that do not resolve into larger wholes...about the tension of holding incompatible things together because both or all are necessary and true."[16] Such thinking can deliver us outside of the body/machine dichotomy to a new model that doesn't rely on such binary arrangements to flourish. The power of this imagery lies in its ability, as she puts it, to "suggest a way out of the maze of dualisms in which we have explained our bodies and our tools to ourselves." [17]

This more complex understanding of our relationship to technologies has the potential to make space for experiences that have been positioned outside of traditional dualisms. This is something I've witnessed in students in my Deep Time of Ceramic Technologies class at UC-Berkeley. Weaving digital fabrication technologies together with traditional ceramics techniques allows these students to broaden their ideas of what is possible not only in the field of ceramics, but in their sense of identity, and in their approach to art practice. One student, Melissa Reyes, wrote, "It is argued that this cyborg identity is meant to infiltrate systems, or in other words, other institutions, spaces, and identities. I find this so powerful because as a woman, let alone a woman of color, it can become quite an interesting journey to navigate the art world, which is mostly male-dominated. As a woman who gets pushed into trying to meet these gender stereotypes, I feel that it is powerful in itself to be exposed to technology like this. The simple exposure to it is not only dismantling gender stereotypes and norms but also further dismantling the stereotypes that may often be perceived of the art world, this being that art is separate from other fields of study or work."

This release from the binary separation of human and machine opens up other

BIO

Stacy Jo Scott is an artist and educator based in Eugene, Oregon. She is currently an assistant professor of art at the University of Oregon and taught previously at the University of California, Berkeley. In both artwork and writing, she uses ceramic objects and digital processes as anchors from which to navigate shifting landscapes of culture, identity, and embodiment. Her artwork has been exhibited nationally and internationally, and her writing has appeared in a wide range of publications.

stacyjoscott@gmail.com
stacyjoscott.com
Instagram: @sdotjo

▲ Print Fail, *2015. 3x3x5 in. Jacobs Institute of Design Innovation; 3-D printed polylactic acid. Hands set in the spiritual gesture, mudra; the attempt to replicate the gesture is incomplete, evoking human fallibility.*

avenues of examining the multiplicity of human experience. Such multiplicity reflects a queerness that rests, sometimes hidden, within much of contemporary experience. Queerness, ever shifting and evasive of definition, offers a name to experiences that waver on the liminal bounds of what were assumed to be hard and fast delineations, between categories and identities. As clay and bodies invite machines into their soft space of lived experience, they perform what the queer and the cyborg knows, that separation is only temporary, and potential experience is far more vast than traditional allotments would assume.

In his book *Cruising Utopia*, José Esteban Muñoz's posits a queerness that is, in his words, "primarily about futurity and hope. That is to say that queerness is always in the horizon."[18] This idea seeks to imagine the ways in which such boundary-dissolving can open space to a more complex, joyous, and just world. While abandoning traditional borders, this vision of futurity doesn't seek to abandon the past. It doesn't contradict a devotion to the hand skills that connect us from generation to generation. Instead, this view seeks to situate body-based wisdom and shared technique within an inclusive imagination of human experience and the body's potential. To borrow a phrase from Muñoz, this is "a backward glance that enacts a future vision."[19] This future vision suggests that, in considering the intimacy of our bodies with machines, our practice might become as complex and contradictory, as riotous and astonishing, as the worlds we now inhabit.

Clay's methods are situated in our bodies and mirror our own evolution through time. Clay has always been an evocative scribe of its moment. Its technologies have followed humanity's every shift. This shifting path is not a record from primary to advanced, but a continually recurring event. The potential of our present moment is that we can reach back and forward through time, through the clay in our hands, and the machines that have evolved with us. In this present, we can find traces of the cyborg in the earliest pinch pots, and folk practices in 3-D prints. Our future isn't foreign but is already embedded in us.

NOTES

1 Abram, David, *The Spell of the Sensuous: Perception and Language in a More-Than-Human World*. New York: Vintage Books, a Division of Random House, 2017, p. 268.

2 Ibid., 64.

3 Caroline Walker Bynum, *Christian Materiality, An Essay on Religion in Late Medieval Europe*, (Cambridge, MA: MIT Press, 2015) p. 32.

4 Ibid., p. 284.

5 Abram, *Sensuous*, p. 64.

6 Ibid.

7 Nadarajan, Gunalan, "Islamic Automation: A Reading of Al-Jazari's *The Book of Knowledge of Ingenious Mechanical Devices* (1206)", in *Media Art Histories*, edited by Oliver Grau, (Cambridge, MA: MIT Press, 2007) pp. 163-178. Accessed via: http://muslimheritage.com/article/islamic-automation-al-jazari%E2%80%99s-book-knowledge-ingenious-mechanical-devices

8 Bynum, *Materiality*, p. 282.

9 Ibid., p. 102.

10 Ibid., p. 103.

11 Abram. *Sensuous*, p. 69.

12 Allucquère Rosanne Stone, "Will the Real Body Please Stand Up?: Boundary Stories About Virtual Cultures," in *Cyberspace: First Steps*, edited by Michael Benedikt (Cambridge: MIT Press, 1992) p. 118.

13 Donna Haraway, "A Manifesto for Cyborgs," in *Reading Digital Culture*, edited by David Trend, (Malden, MA: Blackwell, 2007) p. 30.

14 Ibid., p. 36.

15 Ibid., p. 36.

16 Ibid., p. 28.

17 Ibid., p. 37.

18 José Esteban Muñoz, *Cruising Utopia: The Then and There of Queer Futurity*, (New York: New York University Press, 2009) p. 11.

19 Ibid., p. 4.