Material Codes: Ephemeral Traces

Abstract

New forms of digital imaging such as GPS and satellite mapping have had significant impact on our collective senses of orientation in space and time. Similarly, digital software such as that used for Jacquard weaving allow for new forms of collage, superimposing, combining, repetition, and fragmenting of imagery, which further disrupt a stable perspective. This article links concepts of global data circulation and collection with contemporary data visualization and materialization approaches in the field of digital humanities. Kelly Thompson's multifaceted project *Material Codes: Ephemeral Traces*, established in 2014, translates various forms of data through digitally assisted Jacquard weaving. With data visualization, the artist's subjective process of beautification can make an audience feel emotionally engaged by the rendering of phenomena that may otherwise be beyond the scale of human senses. What is beyond reach becomes tangible. In Thompson's research-creation work, the intangible concept of digital data is both visualized and materialized into the literally tangible, as tactile cloth. This conversation between Janis Jefferies, (London, UK) and Kelly Thompson (Montreal, Canada) over a period of 10 months proposes questions around code, data, image, weaving, and research engagement.

Keywords: Jacquard weaving; code; data visualization; satellite mapping; digital humanities

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Textile

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Material Codes: Ephemeral Traces

Introduction

It is a contentious point, but at the very time when we are becoming increasingly more technological, we are also at the same time striving to think about what it means to be human in the digital age. *Coding Cloth* was the title of a 2008 exhibition organized jointly between the Sanstag Museum of Art in Australia and the Australian network for Art & Technology (ANAT) in 2008. There has been a passion surrounding the subject matter of smart textiles, electronics, and craft-based and media arts practices that have become increasingly integrated to produce artefacts designed for human interaction. As Angela McKey points out in her catalogue essay to *Coding Cloth*, "Joanna Berowska predicts that social networking as the hottest trend for smart textiles, Alison Lewis considers history has brought the female gender to dominate the scene through their fashion and craft" (Moretti 2005). On the other hand, Sabine Seymour has insisted on the value of aesthetics and artistic expression (Seymour 2008).

If *Coded Cloth* seamlessly attempted to combine traditional craft-based skills with innovation and creativity through embedded electronics, interactive textiles, and living fabric, there have been more recent experimentations in exploring a coded future. *Material Codes: Ephemeral Traces* is just such a research project[1].

In this interview and conversation between Janis Jefferies and Kelly Thompson, questions around code, data, image, weaving, and research engagement are explored and questioned. We are mindful of research within the digital humanities that have taken up artistic projects which shifts from large-scale text analysis to cross-domain data. If we think of the digital humanities as a field that operates through relations informed by allied disciplines, then a rather different conceptual space is cleared which can acknowledge how multiple disciples and their methods can shape future digital humanities work. This might include interweaving digital humanities with physical fabrication or rethinking the relationship between text and image, the analysis and visualization of large data sets of historical documents normally on a projected screen. Such methods include what Franco Moretti (Graphs, Maps, Trees, 1) has named as "distant reading," engaged in coding, building digital tools, and archives that respond to the "spatial turn" (Dear et al. 2011, 229–238). Nonetheless, translating or transforming data to cloth shifts the distant to the near, the spatial turn to a material one. These are some of the ideas that we explore in the following essay.

For example, the Bayeux Tapestry, a gargantuan eleventh-century embroidery displayed in a museum in Bayeux, France, depicting the Battle of Hastings, when the Normans conquered England, is both a work of art and an historical document that mingles text and image. In Iceland, the

Viking tales are being embroidered anew in the Bayeux form in community projects: the Njal saga Tapestry or the Vatnsdæla saga are stitching both history and identity.[2]

Whilst digital mapping within the digital humanities has the potential to transform medieval studies and historical documents, the examples above recognize the value of material, history and identity in shared endeavors of physical making. At the same time a community, both in a physical place as well as in a spatial one, can collaborate on the production of practice and scholarship as in the ever-expanding field of the digital humanities. How we do our work as research practitioners is changed and challenged in the process.

Yet, data can also be used, as in *Material Codes: Ephemeral Traces*, for research creation. It can further be situated within a gallery context stretching the positioning of digital content into a traditional arts world where a spatial turn can meet a material one, probing us to think about looking as much as reading.

Code

Code is an indispensable part of any discussion that concerns digital practice: whether on or off the screen, digital practices, whether in art, design, digital tools, or in culture and technology, are subject to the grammar and politics of code. Code itself does not drive the actual meaning of a cultural artefact, but it matters as much as its materialization in text, sound, object, and process in the experience of work by its audience. As such, digital media determines the way in which people now conceptualize and experience much of what is happening socially and culturally in the twenty-first century. There are also many implications to how these technologies are applied (such as the link between GPS and video recording to surveillance). The transformation of data from one form into another is for some writers, like Lev Manovich in his 2001 book, *The Language of New Media*, the distinguishing feature of work in digital media. He further analyses data visualization as a transfer of "'invisible' and 'messy' phenomena ... into ordered and harmonious geometric figures" (Manovich 2002). The point Manovich is making is that the process of beautification, which is a sensory operation changing the appearance of something, say, from statistical information into appealing visual objects, can make an audience feel emotionally engaged and even moved by the rendering of phenomena that may otherwise be beyond the scale of human senses. What is beyond reach becomes tangible.

Nonetheless, in Hito Steyerl's wonderful 2012 publication, *The Wretched of the Screen* (which this author thinks references Frantz Fanon's seminal work from 1961, *The Wretched of the Earth*), she makes some very insightful and imaginative observations about the status of the image in the digital era. In her defense of poor image, Hito Steyerl suggests that a "poor image is an illicit fifth-generation bastard of an original image. Its genealogy is dubious. Its filenames are deliberately misspelled. It is passed on as a lure, a decoy, an index, or as a reminder of its former visual self" (Steryerl 2009, 1). In her view, we need to consider the value of the image. It needs to be redefined and a new perspective for it created. There is the question of resolution and exchange value, but there could also be, as Steyerl suggests, another form of value defined by velocity, intensity, and spread. Poor images are poor because they are heavily compressed and travel quickly. They lose matter and gain speed. Coupled with the section on "a brief history of the horizon" Steyerl also talks about the shift from being grounded (earthed you might say) as living beings and viewing subjects, aware that the horizon defined an understanding of the world through navigation, communication, and linear perspective in painting. Now, Steyerl observes that we only have satellites, aerial views, glitches, noise, distorted flight lines, and vanishing points of which we can no longer make sense. Rather like the intensity, spread, and speed of an image regenerated, remixed, and mashed up through heavy compression. These two aspects of Steyerl's thinking have impacted greatly on the thinking that informs this essay and discussion of the *Material Codes: Ephemeral Traces* research project.

Steyerl goes on to suggest that the activity of montage, laying one image over another, is the "perfect device for disturbing the observer's perspective and breaking down linear time" (Steyerl 2013, 22). Linear time also connects back to the horizon, but if this is as disrupted through compressed, fractured ideas of time, then how does any viewer negotiate the images that are produced? As Steyerl's video work draws heavily on cinematic histories, montage, selecting, editing, and piecing together separate sections of film, its viewer is taken back to cinematic time. Photography's

potential to be pieced and assembled, scanned and copied, also gives us a sense of breaking up imagery over time. It follows that, through compressing and revealing fractured ideas of time, viewers are compelled to shift their viewing positions to engage in new forms of visualization, whether that proposed by Steyerl or by Moretti's ideas of "distant reading." Either way, the viewer is perceptually confused and earthily displaced.

This engagement helps us view and think about things that were not obvious to us before, even if mashed up and reorganized into a coherent whole, experiencing and reading of what we see is expanded. We re-piece and re-see new configurations of image manipulation and material code. A new material map is produced, and different, rescaled patterns slow down the speed of information we receive but also draw us in to more intimate kinds of reading than Moretti suggests.

Material Codes: Ephemeral Traces

In email exchanges, Skype discussions, and physical interviews between Janis Jefferies and Kelly Thompson over a period of 10 months (December 2015– 2016), questions around code, data, image, weaving, and research engagement were explored. This grew out of not only the *Material Codes: Ephemeral Traces* research project that Thompson established in 2014 but also a cargo trip that she undertook from Charleston, South Carolina, to New Zealand. Drawing on this experience, Thompson made connections between her studio research into digital Jacquard weaving and the material translations of the digitally implicit data that she was gathering.

Some of the questions that Jefferies proposed focused on how, through the cargo trip, Thompson must have observed some of the changes from invisible to visualized experience; how ships navigate not from the stars or constellations but through radar screens and satellite feeds.

JJ: What was the process of documentation of the journey?

KT: During my voyage, I observed, photographed, drew and wrote my own form of daily logbook.[3] Being without individual easy access to the Internet for 25 days changes how one works when connectivity is our norm. In port the automation of containers being loaded and unloaded by gantry to and from trucks was mesmerizing, a dance of machines with a reduced labor force. Another form of documentation became imprinted on my body transiting through the Panama Canal and observing the ever-changing conditions of the sea, sky, and expansiveness of the Pacific Ocean.

JJ: What motivated you to travel by container ship?

KT: Choosing to journey to New Zealand by container ship is not an obvious route in our modern era, yet it was an opportunity to see the oceans flow by and gain direct insights into how 90% of our global goods are moved around the planet. Shipping containers or 'boxes' have become ubiquitous, travelling our roads, rails, ports, and open seas. However, we seldom think about their contents or the information networks that enable these large objects containing cargo to move. A revolution in shipping started in 1956 with the first standardized containers that could be packed, loaded complete, shipped, then trucked directly to their destination (for example, see Levison's 2006, 4–6). The rise of container shipping also reflects the fall in textile weaving mills in North American and other Western countries, as moving raw materials and goods became cheaper to produce in regions with poor labor conditions, meeting capitalist demands for ever more consumer products.

JJ: We were both recently presenting our respective papers at the Textile Society of America symposium. I was particularly immersed in the final woven piece that you showed (Thompson 2016) (Figure 1. *SoS Container Hold)*.

KT: This piece was woven at the Textile Museum/TextielLab in the Netherlands, which is an amazing resource, one of the few places with industrial machines that facilitate experimental research as well as production. This piece captures the scale of looking into the ships' hold, with containers stacked five deep with another six or eight above in which the human is miniaturized. Accessing industrial-scale machines to produce this image also shifts the layers of interpretation.[4]

Human and technology interactions shape many of our global changes. On the bridge of the ship, the routine is very structured with automated systems, such as GPS positioning, radar screens, depth sounders, and myriad other equipment. I was also intrigued and comforted by physical charts and manual logbook to support the reliance on satellite communications systems. It was the *Bon Voyage Service 6.0* weather software, amongst other screens, that grabbed my attention. With twice daily satellite feeds to the onboard

Figure 1
SoS Container Hold 2015. Artist: Kelly Thompson. Cotton, linen, synthetics, woven at TextielLab, Tilburg, NL. 140 × 175 cm. Photo: Michel Dubreuil.

computer, graphically mapping the ship's route and the air pressure, currents, height and direction of sea swell, water temperature, wind directions and speed, this was regularly consulted by the captain and first officer.

Thinking about the digital traces of invisible data fascinates. I wonder how and where this accumulates, what it might look like, and the various manipulations and translations that have occurred to appear on a lighted screen. Will this become the Pacific gyre pollution of the future? Fortunately, in the case of ship safety, multiple checks are done, including direct human visual analysis. A traditional sextant for navigation purposes was onboard in case of electronic failure. The horizon line, and a stable position from which to view it—on land or from a boat—was extremely important to the development of navigation and a sense of orientation. Steyerl links the stable horizon with the subsequent development of linear perspective, enabling Western domination and colonization and "for redefining standards of representation, time and space" (Steyerl 2013, 19).

JJ: How did the artist think of "translating" what was photographed, scanned, gathered by data? What was cropped, edited? What multiple viewpoints were there? What was the process of technological transfer from one medium to another?

KT: From the *Bon Voyage Service 6.0* weather software, I was able to grab screen shots of different views that graphically mapped the conditions surrounding the ship. To arrive on the bridge, these files have gone through multiple processing systems, from satellites, worldwide weather tracking and observation stations, and onshore computer mapping, to be digitally delivered to vessels all over the oceans. My method of translation is to take these through several other software systems, such as Photoshop and Pointcarré [5] to be able to materialize a particular moment and data set into Jacquard woven cloth. Each thread and color can represent multiple information—latitude, longitude, air pressure, shoreline, position, ship route—yet poor resolution of image suggests only a gesture, one in which understanding needs to be questioned (Figure 2. *Panama Canal*).

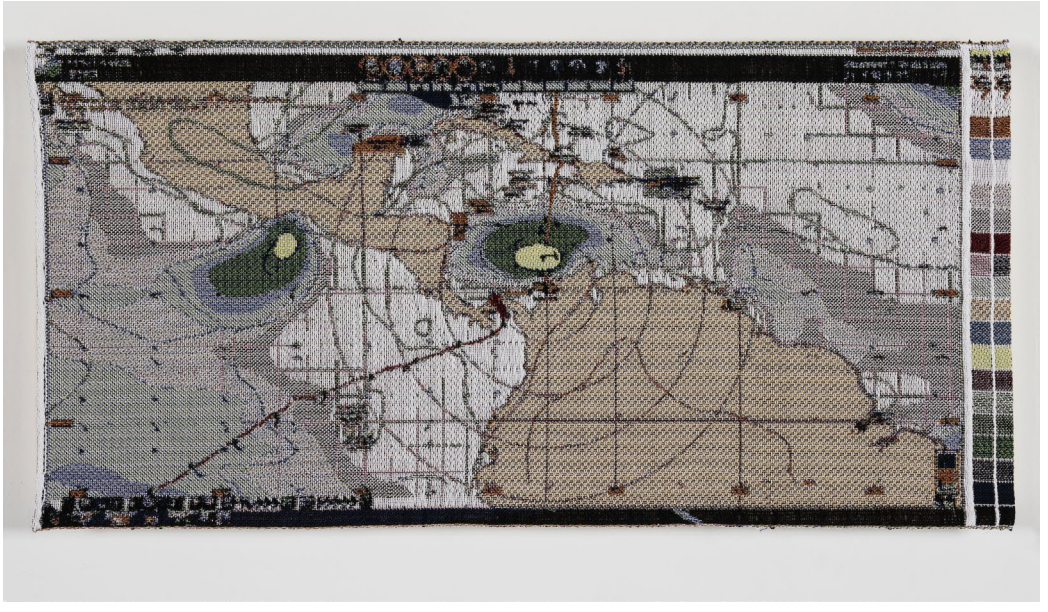

Figure 2
Panama Canal 2015. Artist: Kelly Thompson. Hand-woven, digital jacquard, cotton. 46 × 92 cm. Photo: Michel Dubreuil.

JJ: If data visualization is the presentation of data in a pictorial or graphical format, what can material—in this research case, Jacquard woven forms—add to this process?

KT: Jacquard woven textiles add tactility, physical dimensionality, contrasts of absorption or reflection, structure and looseness, and change of scale to the translation of source material. Weaving removes it from the screen or projected light realm and references earlier functional textiles and communication systems such as regional or ritual identifiers, commemorative or prestige tapestries, flags, banners or cloth as nomadic architectural space definers. Textiles can add surface dimensionality, fold, drape, flexibility, two sides or multiple layers or views, and also a piercing through. I'm interested in the need to slow down and contemplate when looking at these works, rather than the fast overload of much digital artwork.

In summer 2015, the Weaving Data Research Group experimented with a Jacquard tapestry technique in which six colors are warped on the loom. In this process, the way one mixes structures and blends colors produces effects that are different in close proximity, in comparison to what the eye interprets at a distance. This can be a metaphor (with the flexibility of stretching) for the ways we understand our world, i.e., an overview or broad sweep versus a close detailed understanding of a particular field.

Weavings are two-sided on a loom during the construction process. Often the back holds significant information or is fully reversible—for weavers both sides are significant in understanding process, and often become talking points. Screen images present one perspective, one surface, admittedly with unlimited potential for manipulation in the digital sphere, but we do not have access to the backside of the image, except possibly as code. Code is instructional, in the same way weaving drafts are to the initiated, both can be flawed or enable new forms to be realized.

A large sculptural piece, *Fluid Data*, is intentionally woven to represent two sets of information: the image file on screen and the imagined backside of the file, materialized in this case through thread and structure choices (Figures 3 and 4. *Fluid Data*).

JJ: For centuries, people have depended on visual representations such as charts and maps to understand information more easily and quickly. Your scans are also charts and maps. Can you outline what yours refer to and how you have re-interpreted them?

Figure 3
Fluid Data 2015. Artist: Kelly Thompson. Hand-woven, digital jacquard. Cotton, linen, synthetic threads. Six parts each approximately 124 × 44 cm. Overall approximately 1.7 m × 3.2 m × 1.2 m. Photo: Michel Dubreuil.

Fluid Data combines abstracted representations of water, overlaid with a world map of undersea Internet cables and nodes, graphs of changes in air and sea temperatures, computer error codes, and tax-tracking hieroglyphics from Quebec restaurant receipts. These pieces give glimpses into, rather than aiming to represent, hard didactic data. They are my first experiments in utilizing the idea of "missing data" with unwoven sections in which the colorful warps blend for a period before being caught again in the structured cloth. This could equate to a glitch, but because the spaces are intentional, I prefer to label it missing or unutilized data. (It exists in the file, could be woven, but was not.)

Fluid Data (digital version) consists of six cotton-and-linen woven panels (each 0.45 m × 1.4 m) which Sophia Borowska, as my research assistant, then re-digitized through a large-bed scan of the fronts and backs. Combined into a new series of 12 rotating slides, these add a further looping or flow of information. This work was shown on the Bath Spa University MediaWall, which enlarges the work to a monumental scale but without loss of resolution (Figure 5, *Fluid Data (Digital Version)*). Viewing work that I had closely touched at all stages—from screen collages, to physically weaving and sewing hems—the change of scale and definition of each detail was incredible to experience. Pixels are both threads and digital moments, inviting a close and distant view of content, and in this scale of presentation, proximity, and space added a new element.

KT: Materializing the digital suggests drawing attention to the power of multiple systems, and also to the potential of abuse, overload, or failure of what we rely on. I'm interested in the "un-readability" of the source, the sense of patterns and complexity, familiar yet not able to be pinned down, as a metaphor for the digital sphere of today. Each side of the six Jacquard fabric panels provides details and layers of translation, communication, and readability, or gestures to this.

It is worth restating Steyerl's point about the sense of spatial and temporal orientation being changed dramatically in recent years. This has been prompted by new technologies of surveillance, tracking and targeting. "One of the symptoms of this transformation is the growing importance of aerial views, distance, proximity and the horizon that we touch on earlier in this essay: overviews, Google Map views, satellite views" (Steyerl 2013, 14). I would also add that the accumulated data that calculate and predict the weather conditions for land and sea also shift our spatial and temporal perspective, and observational skills.

JJ: And how have your research assistants translated their visual representations through digital weavings?

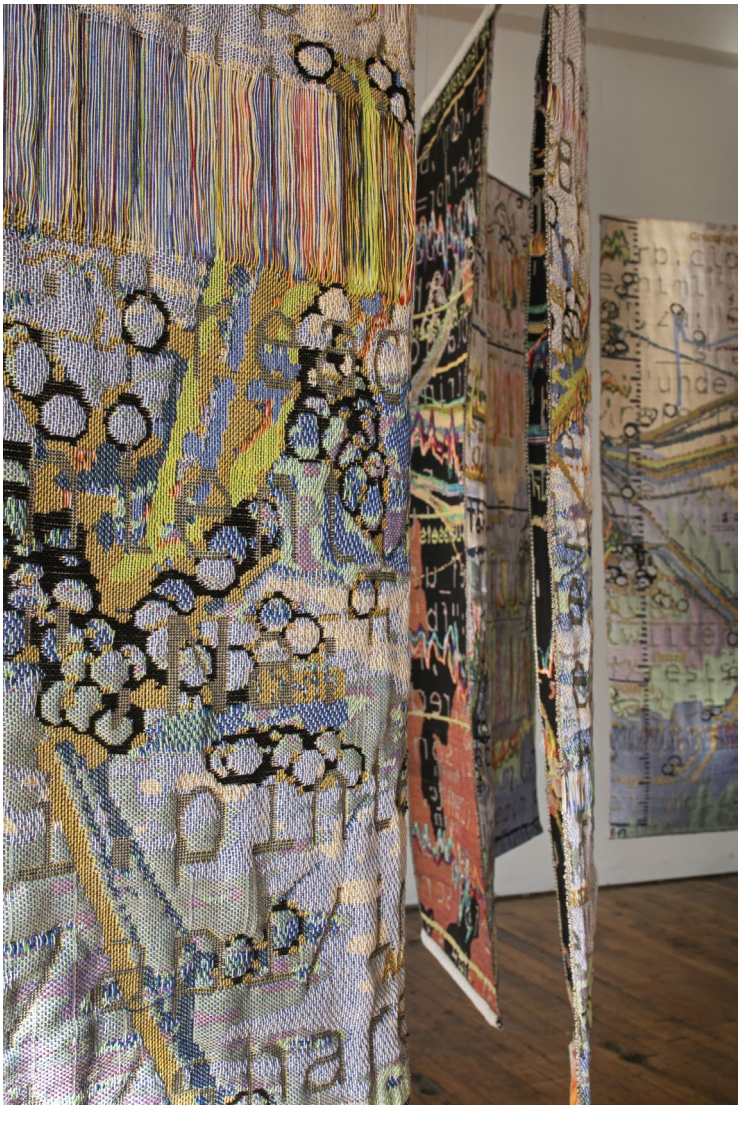

Figure 4
Detail, side view of *Fluid Data*.

KT: The research assistants, as part of their training and skills development on the *Material Codes: Ephemeral Traces* project have been asked to help source and translate data files, particularly examples of "code gone wrong," into woven cloth samples on the hand Jacquard loom. We discuss possibilities for thinking about the information, convert the files, experiment with structures and materials, and then weave two pieces, one of which is given to the person who provided the source information. This translation process is documented on the project website, including the weave drafts and observations from the research assistants[6] (Figure 6. Screen capture of documentation).

In addition to working on the project and the interlinked Weaving Data Research Group activities, each of the research assistants also has their own practice, some closely aligned to the *Material Codes: Ephemeral Traces* research project, while others use weaving and digital critique as their main medium.[7] Geneviève Moisan, for her MFA project, completed an

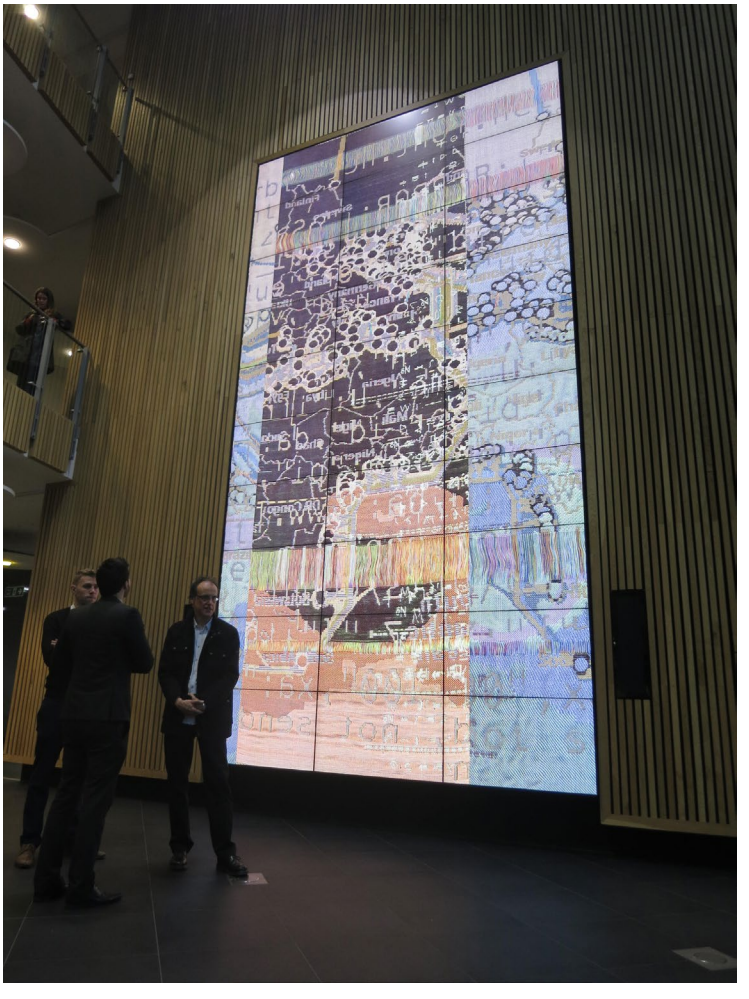

Figure 5
Fluid Data, (digital version) 2015. Artist: Kelly Thompson. Shown on Media Wall, Bath Spa University. 7.35 m high from the floor × 3.75 m wide. Photo: Kelly Thompson.

outstanding series of weavings that pushes the parameters of Jacquard brocade (supplementary colors) to think about people waiting and the dismal or unspoken moments between people. More recently she has been collaborating with an artist to interpret drawings made with his son on early graphics software Cool Pix more than 20 years ago, to be given a new life as 2 metre-high weavings. She is also working on embroidered electronic antennas in collaboration with an engineer, and other smart textile projects in Barbara Layne's SubTela Lab at Concordia University.

Sophia Borowska has recently completed her BFA working between sculptural installation and textile practices. She also produced outstanding research between weaving theory and practice, coding and textiles, and self-published a book titled *Data Excess* that particularly responds to Steyerl's question "What would refuse look like in a digital age …".[8] Amongst the many forms of digital waste, she has chosen to focus specifically on pornographic spam emails and low-resolution video screen shots, both phenomena of online culture. She writes: "Coders and weavers alike know the frustration of repeatedly attempting to build something new, as well as the satisfaction of seeing little bits of thread or code come together—

materialize—in exactly the right way" (*Data Excess* 2016).

The other research assistant active in the project is WhiteFeather Hunter, who recently completed her MFA at Concordia and has been professionally engaged in craft-based bioart practices for over 15 years, via material investigations of the functional, artistic, and technological potential of bodily matter. This includes the ongoing project Biomateria. "The artworks in Biomateria form an inquiry into the aesthetic, conceptual and practical crossovers between textile techniques, wet biology laboratory practices and micro-ecology. Much of this work specifically comments on the relationship between nonhuman agents (cells) and human technological and creative industry, via the crafting of textile-based forms seeded with live mammalian cell lines". In one work, images of two girls, Sonya + Osanna, have been digitalized and (re) materialized through Jacquard woven cloth "to represent the two unnamed individuals from whom osteosarcoma cell types U-2 OS and SAOS-2 were biopsied".[9]

Working with artist-researchers over a sustained period, and with a common interest in the theoretical and practical intersections of code and textiles is rewarding. The Weaving Data Research Group meetings and workshops foster enquiry into digital culture and materiality, and explore the relationship between data and woven textiles. Through interdisciplinary dialogue, various social, cultural, physical, symbolic, and theoretical questions are being explored internally and with guests. Participants have evolved into a post-project group *Collectif TOILE* to continue to build the research network beyond the bounds of academia, in order to engage the wider textile and art community, and are currently fundraising to establish a Jacquard loom in a makers' space in Montreal. *Collectif TOILE* is the first group in Montreal to build a bridge between the Francophone and Anglophone textile communities, and aims to provide post-educational opportunities for specialized technical and theoretical development and exchange.

JJ: As more and more data are collected and analyzed, decision-makers at all levels welcome data visualization software. How can an art practice communicate concepts to others, and even predict the future, at a deeper and more material level?

KT: I am interested in software as a tool that enables the construction of both images and cloth, and the processing capabilities this gives artists to make new interpretations of the contemporary world in a fast and reasonably direct way. Rather than the perfection or precision of early Jacquard forms, which Ellen Harlizius-Klück challenges in her contribution to this volume of essays "Weaving as binary art and the algebra of patterns" (2017, 4), I am drawn to notions of failure, which is picked up in Alex Mclean and Dave Griffiths contribution to this special issue, giving attention to moments when our technology does not work and so we think about that which is normally invisible, the hidden processes.

Recently, working with a traditional punch-card Jacquard loom at the Lisio Foundation, I was stimulated by the variations that could be achieved with the same set of 148 punched cards (data). Particularly interesting was the discovery of manipulating the card placement on the Jacquard head, and the weaver's ability to interpret or change the fixed information and how this affected the visual results (Figure 7. *Trace*). This was a physical working of a limited code set to produce cloth variables. Given that, as Ellen Harlizius-Klück notes in her contribution, "the whole history of loom technology is a history of the migration of binary control from weavers to machines" (2017, 5) this act and other experimental approaches to Jacquard weaving can be read as a reclaiming of control into the hand of the artist. Weaving notations, drafts, and systems of controlling threads to produce particular patterns is as ancient and globally widespread as weaving itself. Digital industrial looms—made possible through evolutions from Ada Lovelace's mathematical work the analytical machine—and mechanical hand Jacquard and draw looms each use data analysis of some kind for translation in the physical realm (Toole 1998).

JJ: I make an observation here in that whilst we both appreciate that Ellen Harlizius-Klück's thinks differently on the point you have just made, the Lovelace quote she uses at the beginning of her essay (this volume), "has become a famous sound bite in the history of computing" (Essinger 2004, 141; Plant, 50) rather diminishes Lovelace's overall contribution. Lovelace was one of the first people to write programs of instruction for Babbage's analytical engines, and her extrapolations of what a general purpose computer

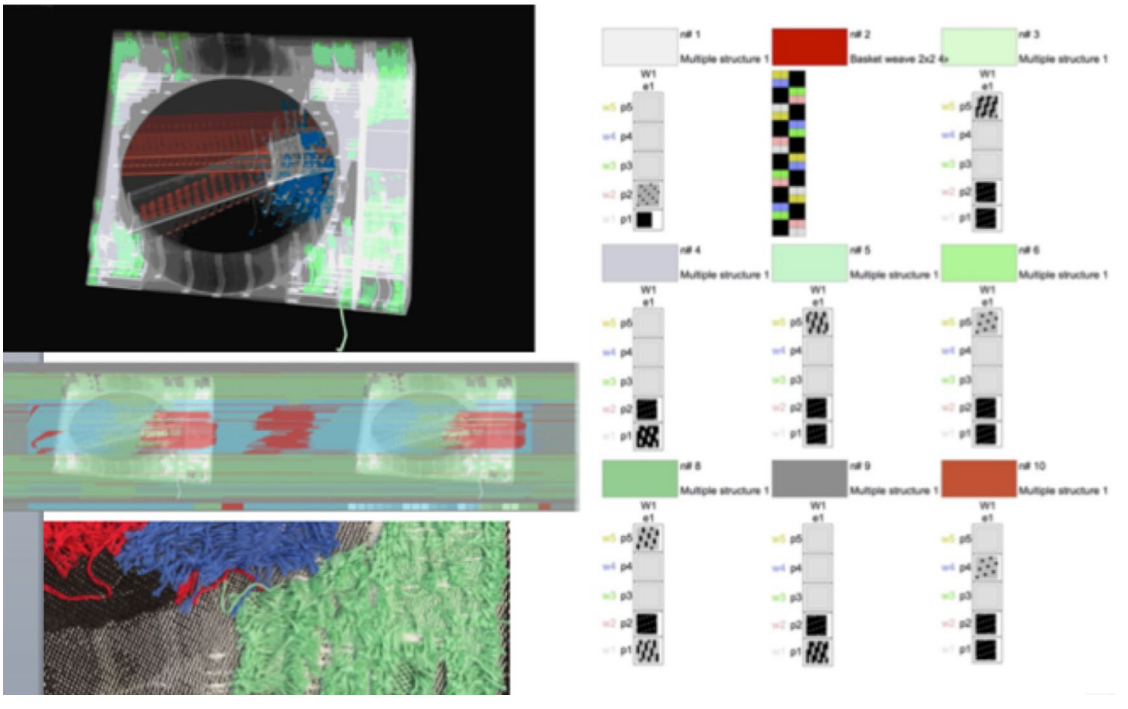

Figure 6
Screen capture of documentation. http://www.materialcodesephemeraltraces.com/archive-thompson.html.

could do stretched far beyond Babbage's ideas for its use (printing mathematical tables, mostly). Significantly, Lovelace even proposed that computers could make music, so whilst biographers et al. debate the extent and originality of Ada's contribution, it is really important to note that, from a modern perspective, her notes and ideas are visionary. Lovelace speculated that the Engine "might act upon other things besides number … the Engine might compose elaborate and scientific pieces of music of any degree of complexity or extent".[10]

KT: Returning to the point I made about using data analysis of some kind for translation in the physical realm, this in contrast to hand weaving I produced at Lisio; I have also woven some of my maps and container ship images on an industrial loom at the TextielLab in the TextielMuseum in the Netherlands. This amazing set-up makes running tests and trying changes easily accessible (Figures 7 and 8). The aim is to follow this up and interpret ideas of big data into large-scale Jacquard artworks whose materiality will surround the viewer and provoke a cognitive and kinaesthetic consideration of questions of "bigness"—"big data" (data so large that it becomes difficult to process through hand-held technology and through our own mental capacities), big industry, big art—and its putative trustworthiness.

Information or data has always been manipulated for different purposes, power and control being central. Having stronger tools for collecting and analyzing data may in a sense just give society more variables, more dimension, and potentially more risks, depending on for whom and for what purpose the information is being used. One example is in visualization of environmental impacts of one type of energy over another through data analysis, hopefully in order to make positive choices. This is in the realm of computer scientists and policy-makers; however, as artists, we can question and try to communicate potential or real impacts through sensorial means.

Data visualization is an expanding field, affecting every realm and open to question. Parallels could be drawn to the influence of what we now call antique maps that were produced by early explorers, which enabled European trade, missionary, and colonial influence over indigenous peoples in far off lands. Mapping, whether on parchment or digitally,

Figure 7
Trace. Artist: Kelly Thompson. Silk Velvet, hand woven by artist at Lisio Foundation. 20 cm × 15 cm. Photo: Kelly Thompson.

Figure 8
Four days of samples woven at the Textiel Lab, Tilburg Textiel Museum 2015. Photo: Kelly Thompson.

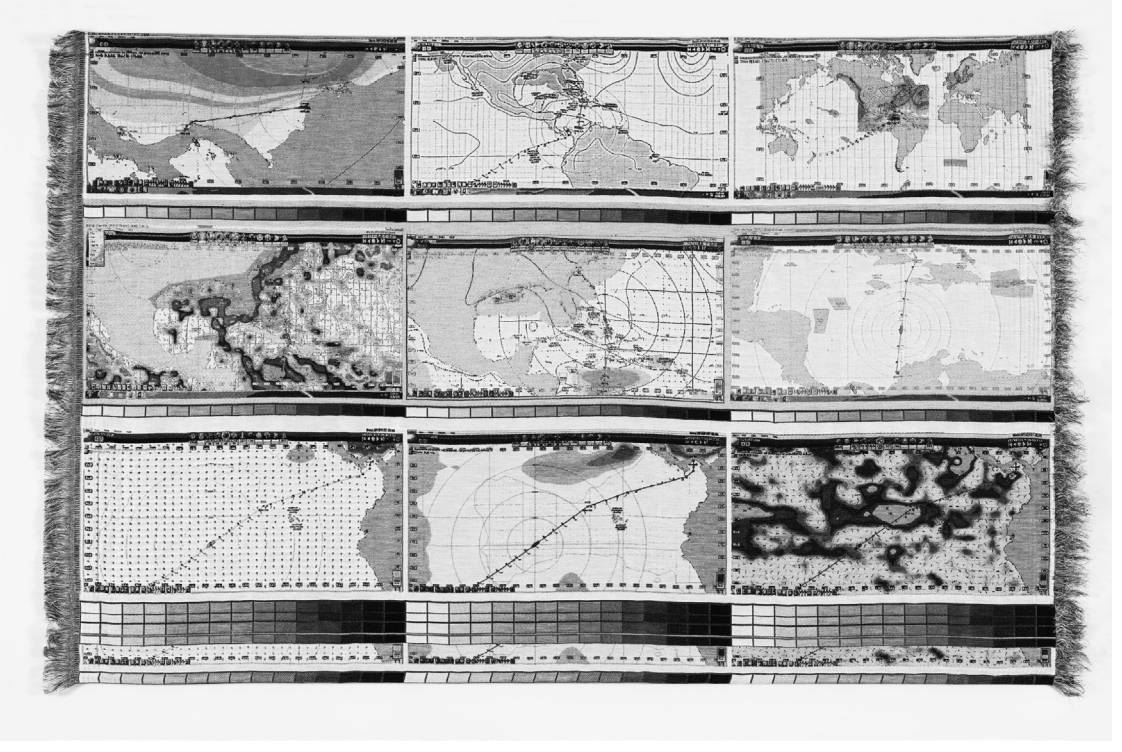

Figure 9
Weather Captures 1 2015. Artist: Kelly Thompson. Cotton, linen, woven at TextielLab, Tilburg, NL. 1.68 m × 1.25 m. Photo: Michel Dubreuil.

over the centuries was viewed as the gradual transformation of fiction to fact, but perhaps only in the minds of those who have access to it.

JJ: What is often called "data art," for instance—but is perhaps better referred to as art made from, or in, or around, data—offers significant aesthetic and intellectual challenges to artists and curators, as well as viewers. If we agree that data are fast becoming some of the defining "materials" of our age, something that interpenetrates every aspect of daily life, in ways both seen and unseen, what do you think its value as a currency of cultural expression is? What are the challenges for more "personal" and artistic expression?

KT: My project touches on questioning assumptions about daily technologies. Currently, large volumes of data are interpreted, arranged, or processed by algorithms in order to find patterns of meaning, whether by bot or human, both of which are fallible. If data are a cultural currency, I think it is important to ask who gets access to them, or what are out of reach and who benefits? What is traded in this currency exchange? The Open Data Institute and other groups are bringing greater attention to critical and creative interpretations, while the Snowden revelations and WikiLeaks continue to spark questions on the mass and scale of data that circulates the globe.

JJ: Do you think your project material as code helps us to interrogate and uncover the world as it is now, differently than before?

KT: I don't think I can claim that I am interrogating or uncovering a different world, but am interested in using the tools available to us (cameras, computers, digital looms) to speak of the world that is both familiar and unfamiliar.

The material codes aspect of the project is starting to be realized; however, there is some way to go in translating the ephemeral traces aspect into a material realm, as this is ultimately a contradictory task. In drawing attention to that which is perceived to be transitory, but may not be because of the digital traces that exist within computers, what response might be relevant in cloth?

JJ: If, as viewers, we scan and become the center of "emerging data landscapes" in woven form, do you think we can develop a critical

awareness of what it means to live in a data-driven world?

KT: The woven form I am using is only possible because of the development of digital technology—processors and looms—that are built on earlier textile technologies that have developed over millennia. Textile processes have always been digital, in the sense of that they involve technologies and procedures for working with discrete, countable threads and the exploring the interference patterns between warp, weft and the properties of threads used. In fact, Ellen Harlizius-Klück argues that "to control a weave means to decide whether a warp thread is to be picked up or not. Weaving has therefore been a binary art from its very beginning, applying operations of binary pattern algebra for millennia. Jacquard's cards were the end of this story rather than it's beginning" (Harlizius-Klück, this issue). When digital technologies took off in other sectors as well, interdisciplinary developments allowed weaving technology to evolve to its industrial state today. The woven matrix has always been embedded with data of some sort, and the possibility of working with the newest digital software to program our weavings allows us to process and communicate new forms of data and contemporary concerns.

As with the fiction of mapping, "what can we trust" is increasingly relevant when thinking about the invisible data systems and the pace of change in technologies, particularly the protocols regarding digital use and tracking. These form part of the ongoing research questions of a data-driven world and respond in the traditions of a physical, material narrative.

JJ: This is not so much a question but a response and further reflection on our discussion. There are "alternative modes of 'consuming' data" which slow the process of consumption, introducing different temporalities of circulation and cognition. This captures something of what some artist-writers have in mind as the task for decelerationist aesthetics. In her first inquiry toward a decelerationist aesthetics, Katherine Behar explores how big data redefine scale. Scale, she argues, rearticulates the human as a diffuse informational pattern, causing important shifts in political form as well as aesthetic form.[11] What time we have is to take time.

There is one other research project that is worth citing and which is being undertaken by the Digital Humanities Lab at Georgia Tech. It has some relevance to the discussion that has taken place in previous sections of this text. The Digital Humanities Lab has recreated digitally the visualization work of Elizabeth Peabody, a nineteenth-century American writer and educator. They ask, "What is the story we tell about the 'invention' of modern data visualization techniques? How would that story change if we looked outside of the standard milestones in the history of thematic cartography and data visualization, and what alternate visual forms might we envision if we did?" Peabody is not credited with any milestone in the history of data visualization, but what she pursued in her work gets us to think about how data can be presented and interpreted through image. Accordingly, her visualizations used a 10 × 10 grid overlaid with shapes and colors to represent historical events. As the researchers at Georgia Tech note, "Unlike modern day data visualizations, her images were not meant to clarify the data. Her goal was to have users create these visualizations for themselves as a way of learning history. Once complete, the chart is an abstraction of the data in an entirely different form".[12]

KT: In the *Material Codes: Empheral Traces* research project, we are able to create new visualizations through forms of pattern and image. This is one way of rethinking geography and cartography as significant to learning history. The physical materializing of data into cloth is also an abstraction, a process of questioning the authority of visualizations and drawing attention to the fallible, the implied, the transitory and the otherwise hidden. Visitors are invited to contribute an example of data from their own field on the project website for possible interpretation and weaving into a sample form. This expands both training of research assistants and making physical that which exists in another form.

JJ: By using data visualization techniques, the Georgia Tech researchers are bringing their digital recreations to the physical world. This consists of a physical computing interface in the form of a quilt. The quilt has 100 squares, each subdivided into a 3 × 3 matrix, just like the digital version. The user (rather than the contributor as described in the *Material Codes: Empheral Traces* research project) will select a color on a separate device and then tap the squares on the quilt to trigger an LED to light up in the selected color. The result will

be the abstraction of data in quilt form.

Jefferies' observation is that their research method relates to *Material Codes: Empheral Traces* and the Weaving Research Data Group that Thompson describes in response to Jefferies' question. Data visualization is transformed into textiles, through the Jacquard process in the case of Thompson's research and in a quilt form at Georgia Tech.

Conclusion

As this interview has discussed, the *Material Codes: Ephemeral Traces* research project is complex and inclusive. It can contribute to the exciting and ever-expanding field known as digital humanities encompassing different modes of investigation across the arts, humanities, and information technology. A diverse community of practitioners, like Kelly Thompson and her team at Concordia University, are continually rethinking, questioning, and demonstrating new forms of knowledge production, which reflect on the nature of representation itself.

Of course, there are endless ways to map one data set into another, but the particular mapping chosen by the artist is motivated by a concern to relate the content and the context of data into a coherent whole. In this case, data do not speak themselves, but within the flow and stream of data the result of processing, manipulating, and organizing data in transformative ways adds to the knowledge of the person receiving it—a reader, an audience, a viewer—or someone who touches it.

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Notes

1. *Material Codes: Ephemeral Traces* is a Québec-government-funded (FRQ-SC) three-year artist research-creation project, involving developing artwork that visually and materially explores the relationship between digital data, trustworthiness, tracking, and fallibility. A second part facilitates training by collecting digital data files or "code gone wrong" from a range of contributors that is then translated and woven by student research assistants. A third component established a Weaving Data Research Group to explore relationships between data and textiles and will result in an exhibition and symposium in March 2018.
2. During the ROOT 1066 Hastings Festival, September–October 2016, a medieval mosaic went on display in the Crypt of St Mary in the Castle as a complete recreation of the Bayeux Tapestry. Comprising 3,000,000 pieces of spring steel, it holds the Guinness World Record as the largest steel mosaic. It was part of the 950th anniversary celebrations of the Battle of Hastings. The mosaic also includes an eightmetre "finale section," which recreates what is believed to be depicted in the two missing panels of the original Bayeux Tapestry, narrating the three months of history from the end of the Battle of Hastings to the coronation of William the Conqueror on Christmas Day, 1066. The mosaic was created by father and daughter team Michael and Rachael Linton in New Zealand, and this is the first time the mosaic has ever been out of the country.

   The Njal's saga tapestry is a new activity at the Icelandic Saga Center in Hvolsvöllur. The goal is to sew Njal's saga in a tapestry form using the Bayeux stitch (laid couching work), a special type of stitch that was used in the Viking age. The Njal's saga tapestry is 90 metres long and the yarn is used is an Icelandic woolen yarn, dyed locally using natural herbs. The plan is that the tapestry will take four to five years in the making. Possibly the best known tapestry in the world is the Bayeux tapestry in Normandy, France, which is 70 metres long.
3. See http://www.artistatsea.com/ship-voyage.html (accessed 12 July 2016).
4. The TextielMuseum/TextielLab uses NEDGRAPHICS software programs and Dornier Jacquard rapier looms. My thanks to Stef Miero for guidance and technical assistance with this.
5. Pointcarré is industry standard software that was made available to many artists through the teachings of Louise Lemieux-Bérubé at the Montreal Centre for Contemporary Textiles and is also used at the

Milieux Institute at Concordia University in Montreal.

6. Please see http://www.materialcodesephemeraltraces.com/gallery.html Accessed 12 July 2016.
7. All the research assistants' work may be found via these links, accessed 12 July 2016. https://genevievemoisan.com/portfolio-mfa-2015/. http://www.sophiaborowska.com/about.html. http://whitefeatherhunter.com/section/426154_Biomateria.html.
8. https://punctumbooks.com/genre/posthumanism accessed 18 July 2016.
9. http://whitefeatherhunter.com/section/426154_Biomateria.html Accessed 12/07/16.
10. http://www.fourmilab.ch/babbage/sketch.html accessed 28 October 2016). This link takes you to the original paper Lovelace is translating, which concerns itself with specifics of the mechanics of the Engine; far more interesting in retrospect are the "notes," essentially a new paper which is much longer than the one originally translated.
11. https://punctumbooks.com/genre/posthumanism accessed 18 July 2016.
12. Digital Humanities Lab, School of Literature, Media, and Communication, Georgia Institute of Technology, Atlanta, GA. Lauren Klein leads the research project, *Speculative Designs*, which includes research on Elizabeth Peabody http://dhlab.lmc.gatech.edu/speculative-designs/ accessed 18 July 2016.

References

Data Excess: Weaving Digital Refuse. 2016. Self-Published extended essay and images 2016, sophiaborowska.com.

Dear, Michael, Jim Ketchum, Sarah Luria, and Doug Richardson, eds. 2011. *Geohumanities: Art, History, Text at the Edge of Place*. New York: Routledge.

Essinger, James. 2004. *Jacquard's Web: How a Hand-Loom Led to the Birth of the Information Age*. Oxford: Oxford University Press.

Harlizius-Klück. 2017. "Weaving as Binary Art and the Algebra of Patterns." *Journal of Cloth and Culture*. doi:10.1080/14759756.2017.1298239.

Levison, Marc. 2006. *The Box: How the Shipping Container Made the World Smaller and World Economy Bigger*. Princeton: Princeton University Press.

Manovich, Lev. 2001. *The Language of New Media*. Cambridge: MIT Press.

Manovich, Lev. 2002. *Data Visualization as New Abstraction and Anti-Sublime*. Accessed January 28, 2016. http://manovich.net/index.php/projects/data-visualisation-as-new-abstraction-and-anti-sublime

Moretti, Franco. 2005. *Graphs, Maps, Trees: Abstract Models for a Literary History*. London and New York: Verso.

Plant, Sadie. 1998. *Zeros and Ones*. London: Fourth Estate Ltd.

Seymour, Sabine. 2008. *Fashionable Technology*. New York: SpringerWien.

Steryerl, Hito. 2009. e-flux Journal #10 *In Defence of the Poor Image*. Accessed July 12, 2016. http://www.e-flux.com/journal/in-defense-of-the-poor-image/

Steyerl, Hito. 2013. *The Wretched of the Screen*. New York: Sternberg Press.

Thompson, Kelly. 2016. "Artist at Sea: Codes and Cargo." Paper presented at *CrossCurrents,* Land, Labor and the Port, Textiles Society of America, 15th Biennial Symposium, Savannah, GA, organized in partnerships with SCAD, USA, October 19–23.

Toole, Betty. 1998. *Ada, the Enchantress of Numbers: A Selection from the Letters of Lord Byron's Daughter and Her Description of the First Computer*. Mill Valley, CA: Strawberry Press.