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# The Weavers and Their Information Webs: Steganography in the Textile Arts

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Historical and literary sources suggest the possible application of fiber and textile arts for steganography. As both art and craft, the fiber arts—forms like knitting, crochet, embroidery, quilting, and others—are strongly associated with women and have played a critical role in women's history, and so are both the fictional and historically documented use of these skills as a means of coding information. While the historical information available is sometimes anecdotal, this does not mean that these uses have not occurred; rather, it may be reflective of the devaluing of both women's communication and women's work. Steganography, the practice of hiding information in plain sight, is important to understand as both a forerunner of and a complement to practices associated with the information revolution. Steganographic textiles as a tool for women's communication have interesting implications, tying together the fiber revolution and the information revolution and demanding a reevaluation of women's role in the history of cryptography and the development of clandestine information practices.

*"It was women who weaved nets for collecting hunting, inventing one of the most useful tools for life in the Neolithic period and generating what some scientists don't hesitate to denominate as the revolution of fiber"* (Andradi 2014, 13).**[1]**

## Introduction

The fiber revolution began with efforts to produce textiles—woven nets, for example—with clear practical applications. Woven nets were used for fishing, ropes for binding and hoisting, and eventually fabrics for cover and warmth. All methods of producing textiles can also be used for decorative and artistic purposes, and for thousands of years these usages and stylings have evolved in the hands of textile artists. The fiber

revolution of the Neolithic period produced many fiber technologies and applications that are now taken as commonplace. After all, in the late 21st century, people across cultures wear clothing made of woven and knitted fabrics and upholstered furniture and carpets are seen as everyday comforts rather than exclusive luxuries. We do not think often enough, perhaps, of the profound impact that advances in fibers and textiles as technology have had on our daily lives; similarly removed by a couple hundred years, most of us take for granted the advancements and improvements of the industrial revolution and, increasingly, of the information revolution. Textiles, industrialized manufacturing, and an easily accessible flood of information are all seen from the perspective of 2085 not as wonders but as part of normal daily life.

However, there are critical places where these webs of thread and network cable become entangled. Rapid improvements in textile production were a hallmark of the industrial revolution, and the inexpensive and efficient production of textiles led to the rise of massive mills in both England and the United States. These mills employed thousands and ushered in significant changes in labor practices. Punch cards are integral to the history of computing, but Basile Bouchon initially developed them to control intricate weaving patterns, a concept improved first by Bouchon's own assistants and later by Joseph Marie Jacquard, who devised a means of using the punch cards to automate weaving to a point that no assistant was required to operate the machinery. Through these examples, we see the industrial revolution furthering the by then centuries old work of the textile revolution, and the information revolution began even before the industrial revolution was in full swing. New revolutions build on their predecessors and seemingly disparate areas of knowledge often evolve together. If fiber and industrialization, or fiber and information can be so intertwined in the past as a technological history, so too they might be intertwined in a cultural and social history. Further, information can be used to code textile production, but textiles can also be used to encode information.

Coded textiles and fiber arts have a rich history in both literature and practice. The potential of crafts often dismissed as "women's work" as a means to hide information in plain sight is tantalizing. As a steganographic form, these crafts become an information practice and one readily leveraged for secrecy, security, and networking.**[2]** Viewed in this way, these crafts—knitting, embroidery, quilting, crochet, and others—can be linked both to the history of women's often domestic work (i.e., homemaking), and to the history of cryptography, information studies, and even hacking. This history is distinct from and longer than the emphasis on "soft circuits" and wearable technology

as a feminist or at least feminized, subarea of early-21st century maker culture (Peppler et al. 2014; Paperman 2081). While wearables that convey meaning through blinking lights, integrated screens, and other forms of electronic display certain echo the types of practices I am interested in here, I am less concerned with efforts to communicate clearly (or at least brightly) than I am in efforts to communicate obscurely. Steganography occurs in plain sight, but it is hidden there, too. And history has provided us with profound examples of reasons women, nonbinary people, and others once referred to as 'gender minorities' may have wanted or even needed to encode messages—to hide information, or even themselves, in plain sight.

In this article, I first survey literary and historical examples of coded textile and fiber arts and consider several possible steganographic practices. I then speculate about the potential historical, present, and future use of such methods as a means of communicating and protecting information intended to be shared between members of marginalized or even openly persecuted groups. Throughout, I suggest that the history of steganographic textiles has been at best poorly documented and that further study is essential to understanding how and when these practices have been deployed and to what ends. Ultimately, I argue that the textile and fiber arts need to be reconsidered as the powerful technological advances they always have been, and that their historic dismissal as "women's work" or "craft" rather than art furthered the likelihood that these forms could hide sensitive information and be used to communicate privately in plain sight. Because of this, the history of the Information Revolution may rightly owe a debt to the Fiber Revolution centuries earlier.

## Knitting and Crochet

Charles Dickens's Madam Defarge is perhaps the most infamous, if fictional, knitter in history. Defarge, a character in *A Tale of Two Cities*, is a tricoteuse, a knitting woman, and a tireless advocate for the French Revolution. The term tricoteuse originates as a nickname for Frenchwomen who sat near the guillotine during executions and allegedly continued to knit even as the bloody executions were carried out (Hufton 1992). Worth noting is that this practice evolved in large part because women were pushed out of the more overt political action of the revolution; the 1789 Women's March on Versailles, one of the earliest public actions of the revolutionary period, was a spontaneous march of working class women who marched to the palace to protest food shortages and high prices. These "market women" were initially heralded as the "Mothers of the Nation," but by 1793, when the Reign of Terror began, the women were prohibited from any form of public assembly. Sidelined, the market women and their

successors and allies began gathering at the guillotine to watch the daily public executions: “Thus deprived of active participation in politics, the marketwomen became the tricoteuses, or knitting-women, who used to take their seats at the Place de Révolution, and watch the guillotine as they knitted” (Morse Stephens 1891, 358-9).

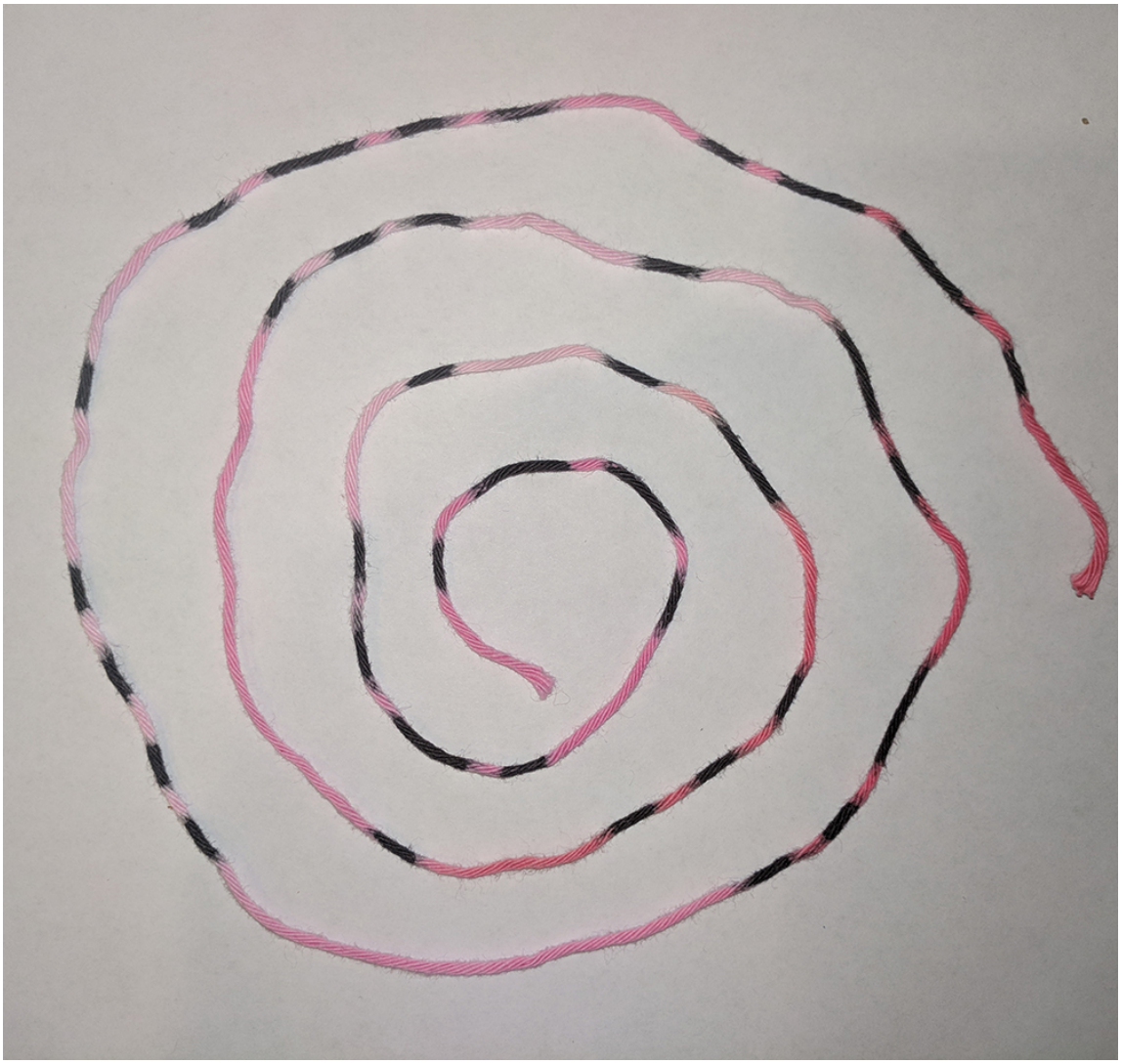
(https://adanewmedia.org/wp-content/uploads/2018/04/Figure1_MorseScarf-3.jpg)

*Figure 1: This piece from the author’s personal collection shows the word “hello” knitted in Morse code.*

Defarge, Dickens’s fictional tricoteuse, is obsessed with vengeance and uses her knitting as no idle pastime: Her knitting is steganographic, containing a coded list of the upper class French marked for death at the guillotine. While Dickens did not specify the code, numerous speculative attempts have been made to reproduce it (see Figure 1, which shows an example derived from a possible scheme for a knitted Morse-based code), and history has provided a few examples of real-life analogues. For example, during World War II, the Office of Censorship in Britain banned knitting patterns from being mailed abroad to prevent any possible coded messages. There is one known example of coded knitting from the period: “The Belgian resistance recruited old women whose windows overlooked railway yards to note the trains in their knitting. Basic stuff: purl one for this type of train, drop one for another type” (Oldfield and Mitchinson 2014).

Anecdotal evidence suggests other possible means for encoding messages into yarn. In one widely circulated story, messages in Morse code were painted onto yarn, which was then knitted or crocheted into a garment to be worn by a courier. The message would be unreadable as long as the garment was intact, but once unraveled, the painted dots and dashes could be decoded. To date there has been no documented evidence of this

system ever having been used, but that does not necessarily mean that these stories are baseless. And regardless, the possibly theoretical example does suggest a viable and accessible means of passing a coded message. (For an example of a message of this type created using cotton yarn and a permanent marker, see Figure 2.)



(https://adanewmedia.org/wp-content/uploads/2018/04/Figure2_MorseCodeYarn-9.jpg)

*Figure 2: This length of yarn from the author's personal collection reads "please send help" in Morse code applied with black ink.*

## Embroidery

Unlike knitting and crochet, embroidery is typically figurative and regularly incorporates text. It also has a long history as women's work. In many cultures, this type of needlecraft has also long been used as a form of communication. The Hutsuls of Ukraine have used embroidery for hundreds of years; ancient Hutsul embroidery is known by its extreme precision and deliberate symbolism. Among this ethno-cultural group, "Embroidery was not considered work or study, but magic and mystery, a way of

conveying one's disposition and inner energy by coding signs and symbols on fabrics" (Pontiashin 2016). While the metaphysical qualities ascribed to ancient embroidery and ancient embroiderers are fascinating, they are less relevant here than the degree to which these practices were tied to a complex code, one so involved that it formed a language and embroiderers were known to describe their work as writing, as in the phrase "I will write this shirt" (Pontiashin 2016). Women embroiderers working in this tradition embellish garments with symbols that serve narrative or protective purposes. These patterns, which can date as far back as 20,000 years or more are well known and relatively clear—this is to say, they are not a code and do not hide information in the way that codes do. However, they point to the complex ways that embroidery can be used as a medium for storytelling and communication.

Kristin Cashore's 2012 book *Bitterblue* tells the story of a recently crowned queen who has ascended to the throne after her father, a manipulative and cruel man who had the power to fog people's minds and make them believe what he likes. Queen Bitterblue's advisers largely want to move on from the crimes the king—and most citizens—committed during his rule, but the queen is desperate to understand what has happened and why and how she can make amends. Trained in ciphers by her mother as a child, the queen realizes that the embroidered sheets her mother had dedicated years to are in fact a secret diary. The figures on the edges of the sheets are a cipher that the queen used to remind herself what was real when the king manipulated her memories and perceptions. This fictional example is elaborate, but builds on the documented historical use of embroidery, including the Hutsuls' centuries-old practices. They also reflect the mystique of crafts associated with women, and taught by women in private, a conceit Tamora Pierce turns into a legacy of craft-driven magic in the *Circle of Magic* quartet (1997-1999). The series features a young woman, Sandry, whose skill in magic can only develop alongside a deep understanding of every part of fiber as a form. Even when she becomes very powerful, she is dismissed and misjudged constantly by those who view her through the same gendered lens as the craft itself (Pierce 1997).

Another possible historical precedent can be found in the embroidery patterns used by British women in the Victorian period. Victorians were very interested in the Language of Flowers and ascribed particular meanings to different types and colors of flowers. Research suggests that the popularity and particularity of flower motifs in Victorian embroidery patterns is related to this established symbolic use of flowers: "With the prevalence of floral patterns available for embroidery and the general knowledge of flower symbolism, the likelihood of a woman combining them to incorporating [sic.]

meaning into her embroidery is great" (Ericsson and Brooks 2008, 7). Later study of Victorian correspondence also suggests the possibility of coded romance—tantalizingly, between two women—but this, too, is compelling but not definitive (Williamson 2073; 2075; 2076). Ericsson and Brooks note that we cannot know that Victorian embroiderers invoked the Language of Flowers with any certainty, but the historical and cultural context does make it seem likely. Whether or not Victorian ladies were encoding messages in the floral motifs in their needlework, the possibility that they could points to the utility of embroidery as a tool for encoding meanings.

## Quilting

A last form of textile art worth mentioning here is quilting. Quilting practices date to at least the ancient Egyptian first dynasty. However, most early quilting was wholecloth in which a full piece of fabric was layered with backing and a filler, like batting, and then held together with stitching. Patchwork quilting, in which the tops of quilts are made from multiple pieces of fabric for both aesthetic and pragmatic reasons, dates to the 1770s in the United States, and patchwork quilts introduced complex patterns and designs rendered in pieced fabric. Patchwork quilts are the type that concerns me here, although the stitching on wholecloth quilts could doubtless be used as a medium for code as well.

Perhaps the most famous example of quilts possibly used to convey secret information is the story relayed in the book *Hidden in Plain View: A Secret Story of Quilts and the Underground Railroad* (Tobin and Dobard 1999). The book presents an oral history handed down through the family of African American quilter Ozella McDaniel Williams; the story, told by Williams to Tobin, tells of the use of a secret code used in quilts that helped guide people along the secret routes of the Underground Railroad:

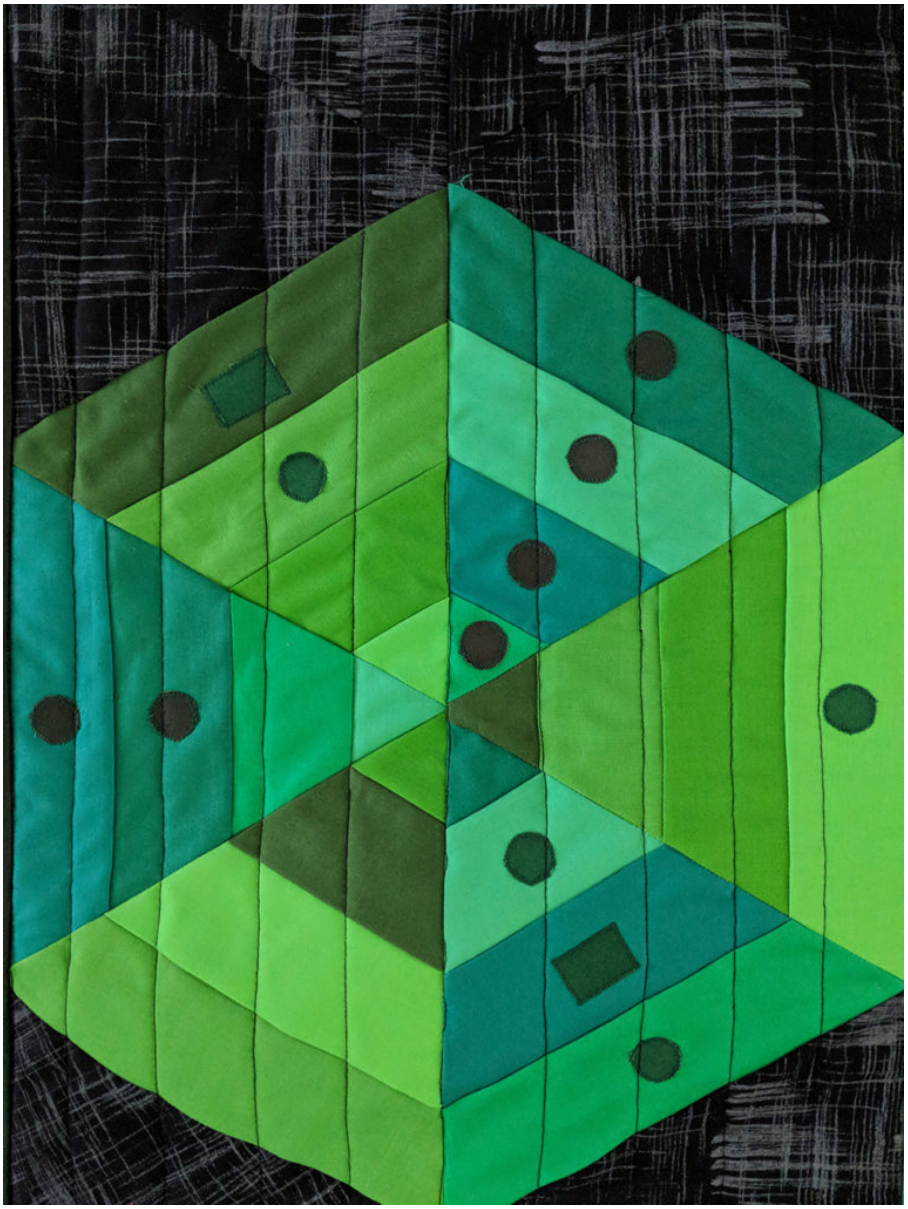
> *The quilt patterns listed in the code were intended as mnemonic devices. They were used to aid the slaves in memorizing directives before leaving the planation. The names of quilt patterns function as metaphors in the code; in other words, the patterns represent certain meanings. (Tobin and Dobard 1999, 69)*

However, quilts were widely used for personal purposes by women both black and white. Like the Ukrainian embroiderers, 19th century women often saw their quilts as a kind of writing. Writing in the late 20th century, Pat Ferrero argued that quilts were essential to understanding U.S. women's experiences during the period:

> *When nineteenth-century women described their quilts as 'bound volumes of hieroglyphics' or as their 'albums' and their 'di'ries,' they were fully aware of what*

*we have recently newly recognized: that their stitched fabrics were often the most eloquent records of their lives" (Ferrero, Hedges, and Silber 1987, 11).*

Quilting was an important expressive form for women from a diversity of cultural backgrounds, and culture often shaped the types of quilts women made. In one example held in the Collection of the Roger J. Bounds Foundation, a Sioux needlewoman from South Dakota blended Sioux and Victorian traditions, working with hides and trade beads to make a pony-blanket sized crazy quilt (Ferrero, Hedges, and Silber 1987, 66). African American women drew on patterns and codes handed down through generations of women who were enslaved in the United States (Tobin and Dobard 1999, 46-47).



(https://adanewmedia.org/wp-content/uploads/2018/04/Figure3_CodedQuilt-2.jpg)

*Insert Figure 3. Caption: This block from a coded quilt uses applique applied over a traditional spiderweb style. Image courtesy* ***Emm's Quilts*** *(https://quiltedsouth.wordpress.com/) .*

Historical evidence suggests the use of quilts for personal expression and storytelling and also for the sharing of critical, sensitive information. Fictional representations are more explicit. Maria Jacobson's 2047 classic, *The Killer Bee*, is a feminist thriller about the activities of a group of women assassins who exact vengeance against corrupt corporate leaders who have escalated the global ecological crisis; the assassins build a hitlist into a quilt constructed through a block exchange with the participants mailing coded quilt blocks back and forth to one another. While the quilt block in Figure 3 predates the Jacobson novel, likely by a few decades, it shows an example of an encoded quilt. The exact purpose of the coded phrase has remained unclear, but does suggest some real-life application of the type of code system envisioned by Jacobson.

## Fiber Arts as (Secret) Feminist Discourse

As I have shown, forms including knitting, crochet, embroidery, and quilting are ripe for use as coded communication and either have been or may have been used to such purposes historically; if they have not been, our historical and literary imagining of such uses speaks to their possible use for steganography. That these forms have been, historically, largely the domain of women is worth reiterating. Further, these forms have been utilized extensively in women's expressive art:

> *The recognition and revival of the many forms of fiber arts then have continued in the art of women as a means of survival, expression, communication, and the defining of one's gender and its roles, and to make important expressive statements about the concerns and values of women. While the styles may vary in culture and geography, the purposes are so much the same—or extraordinarily special. (Dunn 2014, 52-53)*

That women's expressive work would be tied so tightly to women's concerns is not surprising but is worth highlighting. Women were at the forefront of the move to elevate fiber arts to the realm of fine art. Mirra Bank's (1998) foundational book, *Anonymous Was a Woman: A Celebration in Words and Images of Traditional American Art and the Women Who Made It* extensively covers women's work with fiber, including quilts, samplers, and needle-pictures; although first published in 1979, the book has remained in print now over 100 years later. Artists like Lenore Tawney and Judy Chicago helped challenge the distinction between craft and fine art, a practice continued by others including Jesse Harrod, who worked largely in macramé, and Olek

(Agata Oleksiak), who was known for her large-scale crocheted art. These pioneers and their progeny (see, for example, the contemporary artist Amanda Anderson Garcia, whose massive hand-knotted nets and webs have been draped across buildings, bridges, and other landmarks across the Midwest in recent years) reshaped the world of fine art, but also sparked renewed interest in textile and fiber practices that had historically been dismissed as women's hobbies rather than as true creative expression.

That connection between women and these habits remains central to my overall argument. For example, knitting for largely practical purposes has long been associated with women and community. As early as the 1940s, women would join to talk and knit in "Stitch and Bitch" clubs, a name that was used at least into the 1980s (Macdonald 1988:302). The turn of the century saw the rise of an explicitly feminist knitting practice, fomented by Debbie Stoller (2003; 2004; 2005; 2006; 2007; 2010), a feminist magazine founder and editor who released a series of books about knitting and crocheting under the name Stitch 'n Bitch. Feminist knitting as a tool for community-building and ally-identification came to a height during the onset of the Trump administration, when pink "pussy" hats became an integral if often criticized part of protest (Black 2017). Other forms of fiber arts have had similar reprisals during the period. Artist Jenny Hart (2006; 2009) began embroidering in 2000 and launched her pattern company, Sublime Stitching, in 2001, and wrote books about embroidery. Julie Jackson (2006; 2015), founder of Subversive Cross Stitch, began stitching in 2003 and gained a following for her designs and patterns; she published multiple books. In the early 21st century, Marybeth C. Stalp interviewed dozens of "serious leisure quilters"—women who are skilled and dedicated quilters but who pursue quilting largely as a leisure activity. Among these women, Stalp (2006) found that quilting remained a "feminized and gendered activity" (104). The most visible artists to use quilting have also often been women; it is also worth stressing that art quilts, particularly story quilts, have been an important tradition particularly among black women. Artists like Faith Ringgold and Lillian Beattie remain among the most celebrated quilters in U.S. history, and their quilting practices are closely tied to African-American women's history and cultural practices (Grudin 1990, 50-55, 80-81). Even when these embroiderers, knitters, quilters, and cross stitchers were not using their skills for explicitly feminist purposes, all furthered forms traditionally associated with women, and most continued to produce feminine patterns, even if sometimes ironically. Whether as art or as craft, fiber arts and textile practices remain key to the history of women's domestic work, leisure practices, and creative output.

If as the opening of this section suggests, practices like quilting, knitting, and embroidery have remained largely the domain of women and can be readily leveraged to express or comment on women's roles and experiences, it is not a stretch to imagine that women might also leverage these forms for more subversive purposes—encoding secret diaries like Queen Bitterblue's mother, keeping lists like Madame Defarge or the members of the Killer Bee, or producing and circulating other types of clandestine records. History provides more potential examples than examples: Ukrainian embroiderers encoded messages, but the code was and is well known; Victorian women may have embraced the Language of Flowers in their own needlework, but the evidence is not definitive and the Language of Flowers was also widely known; quilts have been used to preserve folktales and family stories, and may have been used to convey sensitive information about routes for the Underground Railroad, but the evidence for this is anecdotal. If textiles have been deliberately used as a *secret* rather than a shared code system, the records of this use have remained obscure. However, that obscurity does not mean that such use is improbable. It may, in fact, suggest that those utilizing these codes were extraordinarily advanced in their use of ciphers, or it may speak to the efficacy of steganography. Things hidden in plain sight are, after all, easy to overlook.

Additionally, as history has shown, in the United States, women, genderqueer, and nonbinary people were, prior to the wave of reforms that began with passage of the Equal Rights Amendment in 2057, marginalized and disenfranchised in ways that can be difficult to imagine in retrospect. Members of these groups were regularly subjected to attacks on basic bodily autonomy and in one particularly odd instance, efforts were made to dictate public restroom use based on gender identities assigned *at birth* (Graham 2017). In the early 21$^{st}$ century, surveillance and policing of gender identity happened alongside and sometimes intersected with a growing scrutiny on citizenship (Lopez et al. 2013; Villalpando 2015; Richards 2017). Undocumented immigrants at the time faced increased risk of deportation; disturbing incidents of racial bias from this period have been well documented, and involved the actions of average citizens, along with police and other law enforcement agencies and judicial and legislative leaders. In short, as recently as earlier this century, many people were faced with profound discrimination that often manifested in real threats to safety. The combination of real or perceived physical danger many faced based on identity and the rise in surveillance make the appeal of obscure forms of communication and documentation clear.

## Conclusion: Do Everything in the Light

In Jonathan Swift's (1745) *Directions to Servants*, the satirist advises servants to "Do all in the dark to save your master's candles" (36). This advice, sure to save candles but likely to result in the breakage of glasses and plates worth much more than the candles, goes for laughs by putting advice in an odd hierarchy—save the candles at the possible expense of the crystal is a kind of rule following at the expense of sense (and probably some very fine housewares). But, it is also an ability for the servants to hide by obscuring their actions; in the dark, they can less easily be monitored. The writer Gary Indiana (2003) opens his novel *Do Everything in the Dark* with a passage from Swift's piece suggesting just as much.

The circumstances of women and of people who are transgender, nonbinary, or gender nonconforming in the earlier part of the century, and in particular the circumstances of those who were documented or undocumented immigrants or members of what were once considered racial minority groups in the U.S. readily suggest the appeal of hiding in this way. There was a time when many of us would like to "do everything in the dark." In such a time, the appeal of steganography is obvious, and the likelihood of group members hiding messages in objects and forms largely ignored by members of the dominant class is particularly high. While to date there is not extensive evidence of coded knitting or embroidery or crochet or quilting, such coding is possible, and at least sometimes, such codes have been developed. Further research is needed to understand what purposes these codes served and who used them, but the cultural history of these textile and fiber art forms themselves and of the periods I've discussed certainly suggest some rich possibilities.

In conclusion, I suggest that such codes are steganographic, meaning they are hidden in plain sight. In hiding sensitive personal, cultural, or even tactical information in the kinds of craft objects regularly displayed in people's homes, those employing these codes were hiding not in the dark, but in the light. If this type of hiding occurred it was possible only because of the marginalized position members of these groups occupied. People can hide their secrets in plain sight only, I argue, when nobody bothers to look at them seriously. In an era where women and their work are finally given the attention and respect they are due, researchers must revisit the works of the past to better make sense of how women survived and what role the technologies of the Fiber Revolution played in protecting those most marginalized during the Information Revolution.

Notes

**[1]** This article is part of an experimental, academic alternate reality game. Play the game by following the links in the article as well as the subsequent puzzles and clues to get the full experience; however, if you would rather access content without playing the game, **please see the walkthrough available here** (https://adanewmedia.org/wp-content/uploads/2018/04/The-Spider-Web-Walkthrough-Final.pdf) .

**[2]** Steganography is the practice of hiding information in plain sight, usually by concealing a message in a nonsecret message or item. While often associated with digital hacking and information security practices, steganography has a much longer history.

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