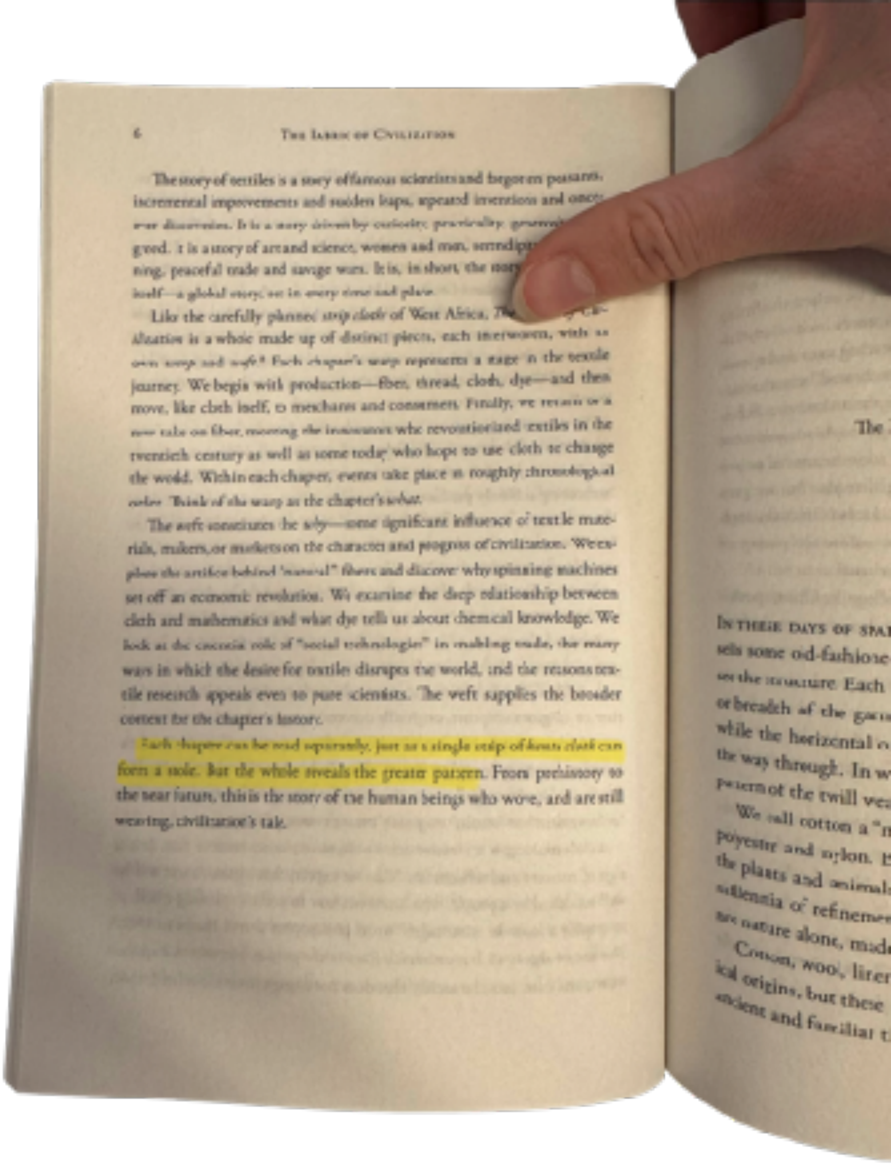


6 The Fabric of Civilization

The story of textiles is a story of famous scientists and forgotten peasants, incremental improvements and sudden leaps, [illegible] inventions and [illegible] [illegible]. It is a story driven by curiosity, practicality, [illegible] greed. It is a story of art and science, women and men, serendip[illegible] [illegible]ning, peaceful trade and savage wars. It is, in short, the story [illegible] itself—a global story, set in every time and place.

Like the carefully planned strip cloth of West Africa, [illegible] civilization is a whole made up of distinct pieces, each interwoven, with its own warp and weft. Each chapter's warp represents a stage in the textile journey. We begin with production—fiber, thread, cloth, dye—and then move, like cloth itself, to merchants and consumers. Finally, we return to a new take on fiber, meeting the innovators who revolutionized textiles in the twentieth century as well as some today who hope to use cloth to change the world. Within each chapter, events take place in roughly chronological order. Think of the warp as the chapter's what.

The weft constitutes the why—some significant influence of textile materials, makers, or markets on the character and progress of civilization. We explore the artifice behind "natural" fibers and discover why spinning machines set off an economic revolution. We examine the deep relationship between cloth and mathematics and what dye tells us about chemical knowledge. We look at the [illegible] role of "social technologies" in enabling trade, the many ways in which the desire for textiles disrupts the world, and the reasons textile research appeals even to pure scientists. The weft supplies the broader context for the chapter's history.

Each chapter can be read separately, just as a single strip of [illegible] cloth can form a stole. But the whole reveals the greater pattern. From prehistory to the near future, this is the story of the human beings who wove, and are still weaving, civilization's tale.

# MINI READER

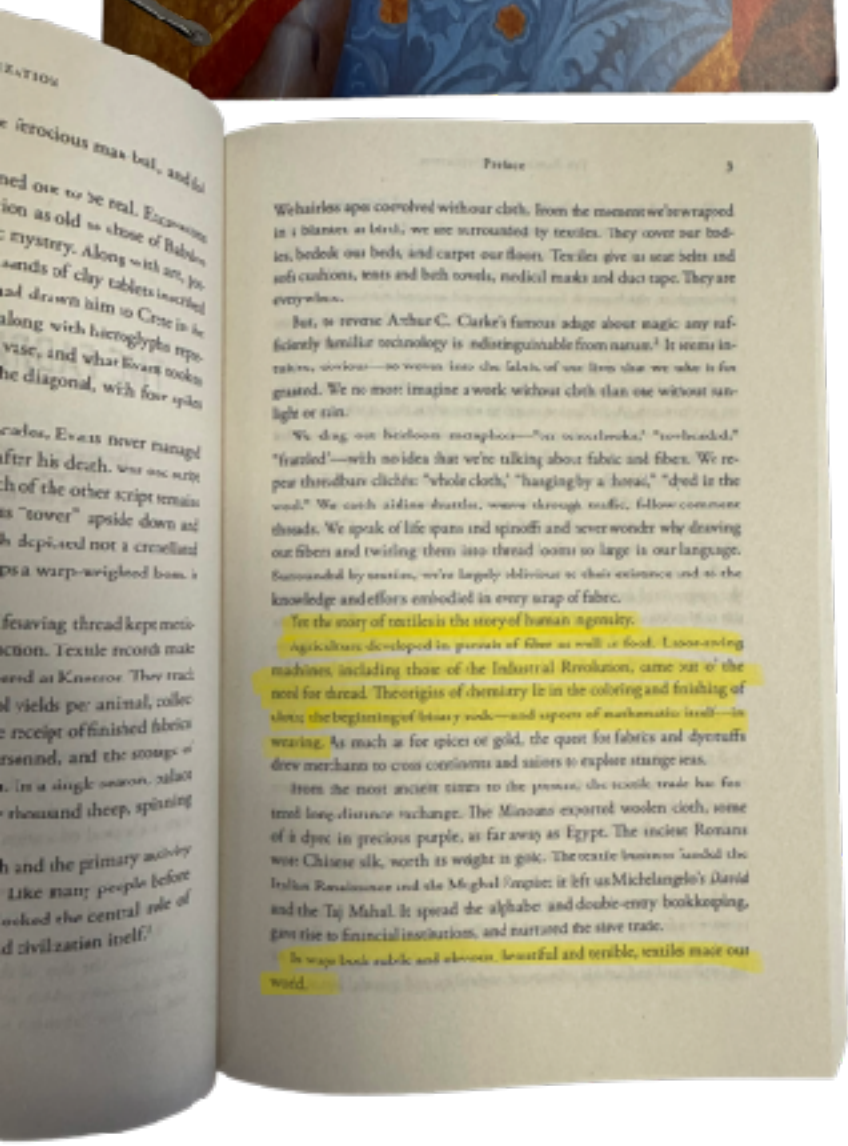
**Kirstine Fahl**

Each section can be read separately… But the whole reveals a greater pattern.

Dietz, A. (1949) Algebraic Expressions in Handwoven Textiles. Louisville, KY: The Little Loomhouse.

Postrel, V. (2020) The Fabric of Civilization: How Textiles Made the World. New York: Basic Books.

Steyerl, H. (2012) ‘In Defense of the Poor Image’, in *The Wretched of the Screen*. Berlin: Sternberg Press, pp. 31–45.


We hairless apes coevolved without cloth. From the moment we're wrapped in a blanket at birth, we are surrounded by textiles. They cover our bodies, bedeck our beds, and carpet our floors. Textiles give us seat belts and sofa cushions, tents and bath towels, medical masks and duct tape. They are everywhere.

But, to reverse Arthur C. Clarke's famous adage about magic: any sufficiently familiar technology is indistinguishable from nature.[1] It seems intuitive, obvious—so woven into the fabric of our lives that we take it for granted. We no more imagine a world without cloth than one without sunlight or rain.

We drag out heirloom metaphors—"at loose ends," "unraveled," "frazzled"—with no idea that we're talking about fabric and fibers. We repeat threadbare clichés: "whole cloth," "hanging by a thread," "dyed in the wool." We catch airline shuttles, weave through traffic, follow comment threads. We speak of life spans and spinoffs and never wonder why drawing out fibers and twisting them into thread looms so large in our language. Surrounded by textiles, we're largely oblivious to their existence and to the knowledge and effort embodied in every scrap of fabric.

Yet the story of textiles is the story of human ingenuity.

Agriculture developed in pursuit of fiber as well as food. Labor-saving machines, including those of the Industrial Revolution, came out of the need for thread. The origins of chemistry lie in the coloring and finishing of cloth; the beginnings of binary code—and aspects of mathematics itself—in weaving. As much as for spices or gold, the quest for fabrics and dyestuffs drew merchants to cross continents and sailors to explore strange seas.

From the most ancient times to the present, the textile trade has fostered long-distance exchange. The Minoans exported woolen cloth, some of it dyed in precious purple, as far away as Egypt. The ancient Romans wore Chinese silk, worth its weight in gold. The textile business funded the Italian Renaissance and the Mughal Empire; it left us Michelangelo's *David* and the Taj Mahal. It spread the alphabet and double-entry bookkeeping, gave rise to financial institutions, and nurtured the slave trade.

In ways both subtle and obvious, beautiful and terrible, textiles made our world.

of the commercial city.[4] But rare is the civilization that exists without organized violence. At best, civilization encourages cooperation, curbing humanity's violent urges; at worst, it unleashes them to conquer, pillage, and enslave. The history of textiles reveals both aspects.

It also reminds us that technology means much more than electronics or machines. The ancient Greeks worshiped Athena as the goddess of *techne*: craft and productive knowledge, the artifice of civilization. She was the giver and protector of olive trees, of ships, and of weaving. The Greeks used the same word for two of their most important technologies, calling both the loom and the ship's mast *histos*. From the same root, they dubbed sails *histia*, literally the products of the loom.[5]

To weave is to devise, to invent—to contrive function and beauty from the simplest of elements. In *The Odyssey*, when Athena and Odysseus scheme, they "weave a plan." *Fabric* and *fabricate* share a common Latin root, *fabrica*: "something skillfully produced." *Text* and *textile* are similarly related, from the verb *texere*, "to weave," which in turn derives—as does *technology*—from the Indo-European word *teks*, meaning "to weave." *Order* comes from the Latin word for setting warp threads, *ordior*, as does the French word for computer, *ordinateur*. The French word *métier*, meaning a trade or craft, is also the word for loom.

Such associations aren't uniquely European. In the K'iche' Maya language, the terms for weaving designs and writing hieroglyphics both share the root *tz'ib'*. The Sanskrit word *sutra*, which now refers to a literary aphorism or religious scripture, originally denoted string or thread; the word *tantra*, which refers to a Hindu or Buddhist religious text, is from the Sanskrit *tantram*, meaning "warp" or "loom." The Chinese word *zuzhi*, meaning "organization" or "arrange," is also the word for weave, while *chengji*, meaning "achievement" or "result," originally meant twisting fibers together.[6]

Cloth making is a creative act, analogous to other creative acts. It is a sign of mastery and refinement. "Can we expect, that a government will be well modelled by a people, who know not how to make a spinning-wheel, or to employ a loom to advantage?" wrote philosopher David Hume in 1742.[7] The knowledge is all but universal. Rare is the people that does not spin or weave, and rare, too, the society that does not engage in textile-related trade.



begins with plants and animals bred by trial and error to produce unusually abundant fiber suitable for making thread. These genetically modified organisms are technological achievements every bit as ingenious as the machines we honor as the Industrial Revolution. And they, too, have far-reaching consequences for economics, politics, and culture.

What we usually call the Stone Age could just as easily be called the String Age. The two prehistoric technologies were literally intertwined. Early humans used string to attach stone blades to handles, creating axes and spears. The blades survived the millennia, waiting to be excavated by archaeologists. The cords rotted away, their vestiges invisible to the naked eye. Scholars named prehistoric ages after the layers of increasingly sophisticated stone tools they found: Paleolithic, Mesolithic, Neolithic. *Lithic* means "of or pertaining to stone." Nobody thought about the missing threads. But we get a false picture of prehistoric life and of the earliest products of human ingenuity when we imagine only the hard tools that easily endure the passage of time. Today's researchers can detect the traces of softer stuff.

Bruce Hardy, a paleoanthropologist at Kenyon College in Ohio, specializes in what is known as residue analysis—looking at the microscopic fragments left behind when the earliest stone tools cut through other materials. To build a library of comparison samples, he uses replicas to chop up plants and animals that early people might have used, then examines the tools under a microscope. By learning their microscopic characteristics, he can identify tuber cells and mushroom spores, fish scales and feather fragments. And he can spot fibers.

In 2008, he was working in the Paris lab of Marie-Hélène Moncel, examining tools she'd excavated from a site in southeastern France called Abri du Maras. There, about forty to fifty thousand years ago, Neanderthal people lived under the protection of an overhanging rock shelter. Three meters below today's surface, they left a layer containing ashes, bones, and stone tools. Hardy had previously found individual twisted plant fibers on some of their tools—tantalizing evidence suggesting that they might have made string. But a single fiber is not a cord.

This time, Hardy spotted a pimple-sized bit of cream on a two-inch stone tool. Easily overlooked on the sand-colored surface of the flint, to his practiced eye it could have been a neon sign blinking THIS IS IT! "As soon as I saw it, I knew there was something else going on there," he says. "I was thinking, 'Wow, this is it. I think we got it now.'" Caught in the stone was a bunch of twisted fibers.

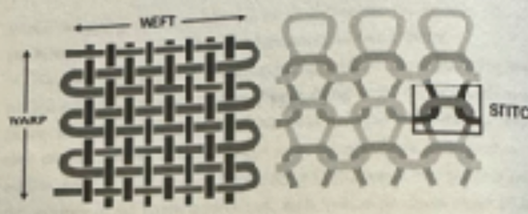
As Hardy and his colleagues examined the find with increasingly sensitive microscopes, it got even more exciting. Three distinct bundles of fibers, each twisted in the same direction, had been twisted together in the opposite direction to form a three-ply cord. Using fibers from the inner bark of conifer trees, Neanderthal people had made string.

Like the steam engine or the semiconductor, string is a general-purpose technology with countless applications. With it, early humans could create fishing lines and nets, make bows for hunting or starting fires, set traps for small game, wrap and carry bundles, hang food to dry, strap babies to their chests, fashion belts and necklaces, and sew together hides. String expanded the capabilities of human hands and built the capacity of human minds.

"As the structure becomes more complex (multiple cords twisted to form rope, ropes interlaced to form knots)," Hardy and his coauthors write, "it demonstrates an infinite use of finite means and requires a cognitive complexity similar to that required by human language." Whether used to fashion snares or to tie bundles, string made catching, carrying, and storing provisions easier. It gave early hunter-gatherers more flexibility and control over their environments. Its invention was a fundamental step toward civilization.

"So powerful, in fact, is simple string in taming the world to human will and ingenuity that I suspect it to be the unseen weapon that allowed the human race to conquer the earth," writes textile historian Elizabeth Wayland Barber.[3] Our distant forebears may have been primitive, but they were also clever and inventive. They left behind striking artworks and world-altering technologies: cave paintings, small sculptures, bone flutes, beads, bone needles, and compound tools, including detachable spear... points. Although string survived the millennia only ... part of the same creative profusion.





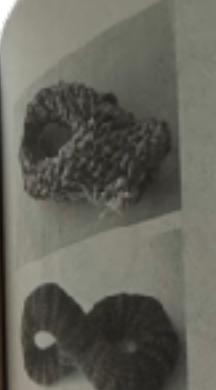

*Basic weaving and knitting structures (Olivier Balin)*

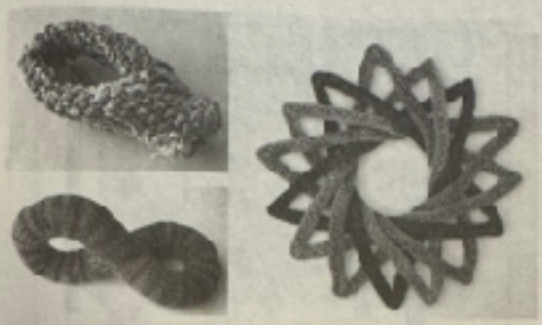
Vogelsang-Eastwood, a much-published archaeologist and the founder of the Textile Research Centre in the Dutch university town of Leiden, relishes the big reveal. She ties a loop around every other warp thread, "one, three, five, seven, nine" and runs a stick through the loops, then does the same for the even threads. Raise one stick, pull the weft through, then raise the other and go back. *Voilà*. To make two-dimensional cloth from one-dimensional yarn, you have to think in three dimensions.

In more than a decade of classes, Vogelsang-Eastwood says, only two students have solved the puzzle. One was a weaver who already knew the answer, and the other was an engineer. The ancients who invented the warp-raising loops, known as *heddles*, were "geniuses," she pronounces. We weaving dimwits agree.[1]

Spinning trains the hands, but weaving challenges the mind. Like music, it is profoundly mathematical. Weavers have to understand ratios, detect prime numbers, and calculate areas and lengths. Manipulating warps turns threads into rows and rows into patterns, points into lines and lines into planes. Woven cloth represents some of humanity's earliest algorithms. It is embodied code.

Long before the dawn of mathematical science, weaving brought right angles and parallel lines into everyday life. "Textile patterns don't represent free nature, but they are symmetrically fitted," observes archaeologist Kalliope Sarri. "Weavers could only reproduce motifs . . . if they were able to count, divide, and add up, if they were able to find the center of a circle, the middle of a line, to estimate how many colors to use, how much dye they





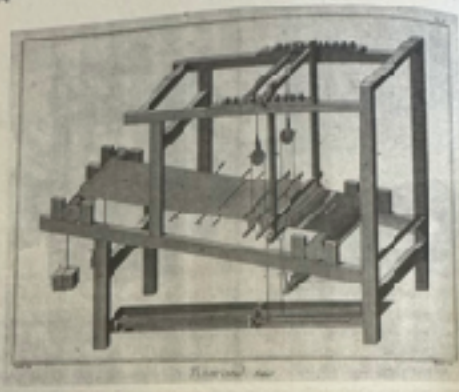
*Knitting's potential to realize 3-D shapes reflects its mathematical nature. "Every Topological Surface Can Be Knit: A Proof" is the title of a scholarly journal article published in 2009 by topological graph theorist sarah-marie belcastro, who knitted these mathematical objects: a Klein bottle, an orthogonal double-holed torus, and (15,6) torus knots and links. (© sarah-marie belcastro)*

needed, and finally to estimate the weight and the economic values of their products." The textile patterns depicted in Neolithic Aegean art, she writes, "reveal the abilities of the weavers in calculating, in conceptualizing and representing geometrical shapes, in creating hierarchies and in estimating sizes, volumes and values."[2]

Knitting, a recent arrival, is equally mathematical, particularly in its ability to create three-dimensional shapes. "Every Topological Surface Can Be Knit: A Proof" is the title of a scholarly journal article published in 2009. "Hidden within almost any knitting project," write two mathematicians who knit, "is not only the arithmetic of counting rows and stitches, but also structural problems which are best understood using abstract mathematics."

"Whether one creates cloth by inventing an elaborate machine, or by constructing the intellectual framework for complex mental computations," observes anthropologist Carrie Brezine, "the existence of cloth is evidence of mathematics at work in the tangible world."[4] At dinner with a group of handweaving enthusiasts, I ask about the relationship between weaving and mathematics. "It's all math," they reply in unison.





The earliest cloth was probably netlike, made by looping and knotting string. Later, sewing inspired new techniques such as *nålbinding*, where a blunt needle is used to pass thread through loops wound around the thumb. Although the resulting fabric looks like knitting, the process is quite different. In knitting, a continuous thread is looped to form stitches, with only the loops passing through each other. *Nålbinding*, by contrast, draws the entire yarn length through each loop, using fairly short pieces that are fused together with friction when they run out. Because it doesn't require long, continuous strands, it demands less skill in spinning, and the fabric doesn't unravel when a single loop breaks. Archaeologists have found such cloth in places as far-flung as the Nahal Hemar Cave in Israel and the Tarim Basin in northwest China.[5]

With its interlocking perpendicular threads, weaving represents a conceptual breakthrough, vastly multiplying the number of possible patterns. Although they come in an astounding variety of forms, every loom does two things: it keeps warp threads taut, and it allows the weaver to selectively raise or lower them, creating a *shed* through which the weft can pass.

*On the European floor loom, shown on the previous page in a rendering from the eighteenth-century Encyclopédie, the warp is wound on beams and heddle rods are raised with pulleys controlled by treadles. The front of the loom, where the weaver sits, is on the right side of the engraving. Ghanaian kente cloth weavers switch between two sets of heddles, controlled by separate shed pedals, to create the fabric's distinctive alternating blocks. Their work requires foreseeing how patterns will interact when the strips are sewn together into a large cloth. (Wellcome Collection, Philippe J. Kradolfer)*

Weaving is the original binary system, at least twenty-four thousand years old. Warp-weft, over-under, up-down, on-off, one-zero.[6]

The possibilities are astronomical. Threads can be loosely woven, tightly packed, or some combination. Warp and weft may be equally prominent, or one may largely cover the other. Threads can be different colors, textures, or materials. Depending on which warp threads you lift, you can alter the appearance and structural qualities of the final fabric. Weaving, says an artist weaver, "is something you can never get to the end of, no matter how long you live."[7]

Instead of two bars of heddles holding odd and even threads, you might use three, lifting threads 1, 4, 7, and 10; threads 2, 5, 8, and 11; and threads 3, 6, 9, and 12. The result would be the diagonals of a *twill* rather than the simple over-under of *plain weave* (also known as *tabby*). Changing the order in which you raise and lower the bars offers more variations, including



herringbones and diamonds. Adding rows of heddles further multiplies the number of possible permutations. Color introduces still more.

The smooth surface of satin is created by solving a Sudoku-like puzzle: How do you hide the intersections of warp and weft while avoiding obvious twill-like diagonals?[8] Separately or in combination, these three basic structures—plain weave, twill, and satin—can engender countless designs.

Before a single weft thread can cross the warp, the weaver must establish the fabric's structure and pattern. Even plain weave demands forethought. Will it alternate single threads or more? Will there be stripes, checks, or plaids created with different colors or textures? Will the cloth be double weave, where the warp threads are selected to create two separate layers? Will the warp and weft threads be equally prominent, or will one dominate the other? Such questions determine what materials you use, how you thread the heddles and space the warp beforehand, and how tightly you pack the weft. With twill and satin, the options multiply further.

"In weaving, art is largely a mathematical thing. It's understanding patterns, it's understanding structure," says Tien Chiu, a "recovered mathematician"—she dropped out of graduate school—and former Silicon Valley project manager now pursuing an artistic career as a weaver. Mathematically, she observes, the threading for a satin poses the same question as what's known as the eight queens problem in chess: Given eight queens, how do you place them on the board so that they share no row, column, or diagonal, thereby preventing any queen from capturing another? For satin, the queens are the places that warp and weft cross, holding the cloth together. Visualizing a weave structure, says Chiu, "for me isn't that different from visualizing abstract algebra."[9]

Today's technologists like to recount how at the turn of the nineteenth century Joseph-Marie Jacquard used punch cards to select warp threads and how his invention inspired Charles Babbage's Analytical Engine, the digital precursor to the computer. "We may say most aptly that the Analytical Engine *weaves algebraical patterns* just as the Jacquard-loom weaves flowers and leaves," Ada Lovelace famously declared. (Emphasis in the original.) It's the one bit of textile history every tech-savvy person seems to know.[10]

# In Defense of the Poor Image



The poor image is a copy in motion. Its quality is bad, its resolution substandard. As it accelerates, it deteriorates. It is a ghost of an image, a preview, a thumbnail, an errant idea, an itinerant image distributed for free, squeezed through slow digital connections, compressed, reproduced, ripped, remixed, as well as copied and pasted into other channels of distribution.

The poor image is a rag or a rip; an AVI or a JPEG, a lumpen proletariat in the class society of appearances, ranked and valued according to its resolution. The poor image has been uploaded, downloaded, shared, reformatted, and reedited. It transforms quality into accessibility, exhibition value into cult value, films into clips, contemplation into distraction. The image is liberated from the vaults of cinemas and archives and thrust into digital uncertainty, at the expense of its own substance. The poor image tends toward abstraction: it is a visual idea in its very becoming.

The poor image is an illicit fifth-generation bastard of an original image. Its genealogy is dubious. Its file names are deliberately misspelled. It often defies patrimony, national culture, or indeed copyright. It is passed on as a lure, a decoy, an index, or as a reminder of its former visual self. It mocks the promises of digital technology. Not only is it often degraded to the point of being just a hurried blur, one even doubts whether it could be called an image at all. Only digital technology could produce such a dilapidated image in the first place.

Poor images are the contemporary Wretched of the Screen, the debris of audiovisual production, the trash that washes up on the digital economies' shores. They testify to the violent dislocation, transferrals, and displacement of images—their acceleration and circulation within the vicious cycles of audiovisual capitalism. Poor images are dragged around the globe as commodities or their effigies, as gifts or as bounty. They spread pleasure or death threats, conspiracy theories or bootlegs, resistance or stultification. Poor images show the rare, the obvious, and the unbelievable—that is, if we can still manage to decipher it.

## Low Resolutions

In one of Woody Allen's films the main character is out of focus.[1] It's not a technical problem but some sort of disease that has befallen him: his image is consistently blurred. Since Allen's character is an actor, this becomes a major problem: he is unable to find work. His lack of definition turns into a material problem. Focus is identified as a class position, a position of ease and privilege, while being out of focus lowers one's value as an image. The contemporary hierarchy of images, however, is not only based on sharpness, but also and primarily on resolution. Just look at any electronics store and this system, described by Harun Farocki in a notable 2007 interview, becomes immediately apparent.[2] In the class society of images, cinema takes on the role of a flagship store. In flagship stores high-end products are marketed in an upscale environment. More affordable derivatives of the same images circulate as DVDs, on broadcast television, or online, as poor images.

Obviously, a high-resolution image looks more brilliant and impressive, more mimetic and magic, more scary and seductive than a poor one. It is more rich, so to speak. Now, even consumer formats are increasingly adapting to the tastes of cineastes and esthetes, who insisted on 35 mm film as a guarantee of pristine visuality. The insistence upon analog film as the sole medium of visual importance resounded

artists' viewing copies are bartered.[3] Many works of avant-garde, essayistic, and noncommercial cinema have been resurrected as poor images. Whether they like it or not.

## Privatization and Piracy

That rare prints of militant, experimental, and classical works of cinema as well as video art reappear as poor images is significant on another level. Their situation reveals much more than the content or appearance of the images themselves: it also reveals the conditions of their marginalization, the constellation of social forces leading to their online circulation as poor images.[4] Poor images are poor because they are not assigned any value within the class society of images—their status as illicit or degraded grants them exemption from its criteria. Their lack of resolution attests to their appropriation and displacement.[5]

Obviously, this condition is not only connected to the neoliberal restructuring of media production and digital technology; it also has to do with the postsocialist and postcolonial restructuring of nation-states, their cultures, and their archives. While some nation-states are dismantled or fall apart, new cultures and traditions are invented and new histories created. This obviously also affects film archives—in many cases, a whole heritage of film prints is left without its supporting framework of national culture. As I once observed in the case of a film museum in Sarajevo, the national archive can find its next life in the form of a video-rental store.[6] Pirate copies seep out of such archives through disorganized privatization. On the other hand, even the British Library sells off its contents online at astronomical prices.

As Kodwo Eshun has noted, poor images circulate partly in the void left by state cinema

Poor images are thus popular images—images that can be made and seen by the many. They express all the contradictions of the contemporary crowd: its opportunism, narcissism, desire for autonomy and creation, its inability to focus or make up its mind, its constant readiness for transgression and simultaneous submission.[9] Altogether, poor images present a snapshot of the affective condition of the crowd, its neurosis, paranoia, and fear, as well as its craving for intensity, fun, and distraction. The condition of the images speaks not only of countless transfers and reformattings, but also of the countless people who cared enough about them to convert them over and over again, to add subtitles, reedit, or upload them.

In this light, perhaps one has to redefine the value of the image, or, more precisely, to create a new perspective for it. Apart from resolution and exchange value, one might imagine 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. But they also express a condition of dematerialization, shared not only with the legacy of Conceptual art but above all with contemporary modes of semiotic production.[10] Capital's semiotic turn, as described by Felix Guattari,[11] plays in favor of the creation and dissemination of compressed and flexible data packages that can be integrated into ever-newer combinations and sequences.[12]

This flattening-out of visual content—the concept-in-becoming of the images—positions them within a general informational turn, within economies of knowledge that tear images and their captions out of context into the swirl of permanent capitalist deterritorialization.[13] The history of Conceptual art describes this dematerialization of the art object first as a resistant move against the fetish value of visibility. Then, however, the dematerialized art object turns out to be perfectly adapted to the semioticization of capital, and thus to the conceptual turn of capitalism.[14] In a way, the poor image is subject to a similar tension. On the one hand, it operates against the fetish value of high resolution. On the other hand, this is precisely why it also ends up being perfectly integrated into an information capitalism thriving on compressed attention spans, on impression rather than immersion, on intensity rather than contemplation, on previews rather than screenings.



**Comrade, what is your visual bond today?**

But, simultaneously, a paradoxical reversal happens. The circulation of poor images creates a circuit, which fulfills the original ambitions of militant and (some) essayistic and experimental cinema—to create an alternative economy of images, an imperfect cinema existing inside as well as beyond and under commercial media streams. In the age of file sharing, even marginalized content circulates again and reconnects dispersed worldwide audiences.

The poor image thus constructs anonymous global networks just as it creates a shared history. It builds alliances as it travels, provokes translation or mistranslation, and creates new publics and debates. By losing its visual substance it recovers some of its political punch and creates a new aura around it. This aura is no longer based on the permanence of the "original," but on the transience of the copy. It is no longer anchored within a classical public sphere mediated and supported by the frame of the nation-state or corporation, but floats on the surface of temporary and dubious data pools.[15]

By drifting away from the vaults of cinema, it is propelled onto new and ephemeral screens stitched together by the desires of dispersed spectators.

The circulation of poor images thus creates "visual bonds," as Dziga Vertov once called them.[16] This visual bond was, according to Vertov, supposed to link the workers of the world with each other.[17] He imagined a sort of communist, visual, Adamic language that could not only inform or entertain, but also organize its viewers. In a sense, his dream has come true, if mostly under the rule of a global information capitalism whose audiences are linked almost in a physical sense by mutual excitement, affective attunement, and anxiety.

But there is also the circulation and production of poor images based on cellphone cameras, home computers, and unconventional forms of distribution. Its optical connections—collective editing, file sharing, or grassroots distribution circuits—reveal erratic and coincidental links between producers everywhere, which simultaneously constitute dispersed audiences.

The circulation of poor images feeds into both capitalist media assembly lines and alternative audiovisual economies. In addition to a lot of confusion and stupefaction, it also possibly creates disruptive movements of thought and affect. The circulation of poor images thus initiates another chapter in the historical genealogy of nonconformist information circuits: Vertov's visual bonds, the internationalist workers' pedagogies that Peter Weiss described in *The Aesthetics of Resistance*, the circuits of Third Cinema and Tricontinentalism, of nonaligned filmmaking and thinking. The poor image—ambivalent as its status may be—thus takes its place in the genealogy of carbon-copied pamphlets, cine-train agit-prop films, underground video magazines and other nonconformist materials, which aesthetically often used poor materials. Moreover, it reactualizes many of the historical ideas associated with these circuits, among others Vertov's idea of the visual bond.





Imagine somebody from the past with a beret asking you, "Comrade, what is your visual bond today?"

You might answer: it is this link to the present.

Now!

The poor image embodies the afterlife of many former masterpieces of cinema and video art. It has been expelled from the sheltered paradise that cinema seems to have once been.[18] After being kicked out of the protected and often protectionist arena of national culture, discarded from commercial circulation, these works have become travelers in a digital no-man's-land, constantly shifting their resolution and format, speed and media, sometimes even losing names and credits along the way.

Now many of these works are back—as poor images, I admit. One could of course argue that this is not the real thing, but then—please, anybody—show me this real thing.

The poor image is no longer about the real thing—the originary original. Instead, it is about its own real conditions of existence: about swarm circulation, digital dispersion, fractured and flexible temporalities. It is about defiance and appropriation just as it is about conformism and exploitation.

In short: it is about reality.




This page gives a brief resume of basic data on the square of a binomial $(x-y)^2$ with the code for pages on the square of a binomial being AXB-2-X = plus type of weave.

Ada K. Dietz' idea of using an algebraic equation as the basis of her drafts for handwoven textiles opens up completely new vistas for weavers. Everyone using this draft book or her ideas will have the stimulating excitement of pioneering mentally in an unexplored field of textiles. New weavers will find the idea has the added value of being helpful in learning different techniques and in learning to transpose.

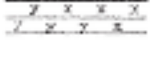
Techniques and equations can be handled by different methods. Later pages will explore the differences. For this page, however, we will list some of the more frequently used techniques and methods. The square of a binomial $(x-y)^2$ breaks down to $x^2 - 2xy - y^2$.

The resulting equation – xxxy x yyy – is an eight unit one, and is the basis for the draft in plain weave, overshot, twill, lace or linen, crackle, double, summer-and-winter, or other weave.

and in turn to xx xy xy yy

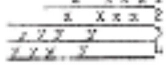
or regrouped to xxx y x yyy

code: AXB-2-2-PW



If the equation is applied to a plain weave, x is given one color or texture value, and y is given another. Color principles will be used in selecting colors. One thread is substituted for each x or y with the pattern repeat being 8 threads.

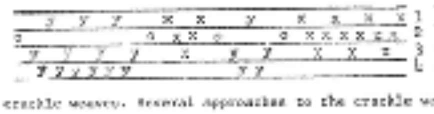
code: AXB-2-2-O



The overshot weave is one of the more familiar weaves. The x may be given the value of two harnesses as 1-2; y the value of 3-4. As many as four unknowns may be used with 1-2,2-3,3-4, and 1-4 being the harness pairing assigned. As two threads have been used for each part, a 16 thread pattern repeat results. The threading draft may be used for overshot; or a twill, opposite, or other treadling may be used. An excellent range of pattern variants are possible.

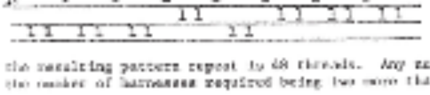
code: AXB-2-2-C

The crackle weave may be drafted from a 4 or 3 thread base for each x or y. The draft at the left gives x the value of 1-2-3-2-1; and y the value of 3-4-1-4-3, with an extra thread used to connect. The resulting pattern repeat requires 40 threads. Four terms may be used for crackle weaves. Several approaches to the crackle weave will be given on other pages.



code: AXB-2-2-L

This basic lace can be woven on two harness with a 3rd harness for the 6th thread or it can be threaded on a multiple harness loom with two harnesses being required for the weave construction with an additional harness needed for x and one for y. With 6 threads for each part, the resulting pattern repeat is 48 threads. Any number of unknowns may be used with the number of harnesses required being two more than the number of unknowns used.



Space does not permit basic datum on other weaves so they will be given on the pages devoted to each textile. Briefly, a binomial may be used for the lace or linen weave commonly known as the M's and O's with 8 threads for each part or for 64 threads in the pattern repeat. A summer-and-winter will require a minimum of 32. A double weave or double face weave will also require 32. A twill will vary widely – 24, 28, 32, etc.

Robert Kirkpatrick

McNeeley-Helzer

Ruth E. Foster suggested a color application of Ada K. Dietz' idea. There was not time to try it out last summer while Misses Dietz and Foster were at the Little Loomhouse. Soon members had tried out color values and got wonderful results. The equation best liked was the cube of a binomial $(x+y)^3$.

KENTUCKY WEAVERS used the idea at several fall meetings. New weavers in the group were surprized to find how easily they could apply the idea in color. Soon letters were coming to tell of colorings tried and liked.

The top picture shows KENTUCKY WEAVERS drafting the equation for the first time. The lower picture shows a few of the
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ALGEBRAIC EXPRESSIONS
Ada K. Dietz-2-3-D-3

The cube of a binomial $(x+y)^3$ can be expanded and used, or it can be used in combination. On this page, Miss Dietz has used it in combination. As Miss Dietz was formerly a math teacher, don't you imagine she was really gleeful when she wrote the equation leaving it an extra xy, and then - as that man on the radio was spelling something backward about this time - writing the equation backward. Wrong answer? No! Joking aside, Miss Dietz shows four of the possibilities to be found in the cube of a binomial.

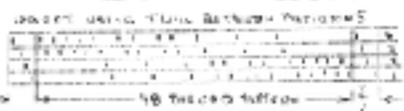
The twill 1-2-3-4 (or extra xy) is thrown between each pattern repeat. It is used for a small border, and for the center. For the study pieces, Miss Dietz has tried a number of treadlings and very diverse yarns.

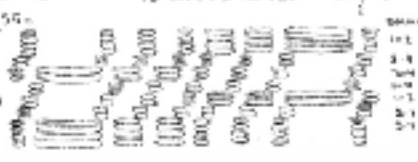
55a. The pattern is woven by the threading draft and then reversed. An allover richness is given the fabric by the sheen of the rust rayon pattern yarn used on 1-2, 3-4 and by the glitter of the gold metallic tabby on 1-3, 2-4. The spacings could well be used for drapery or smaller pieces.

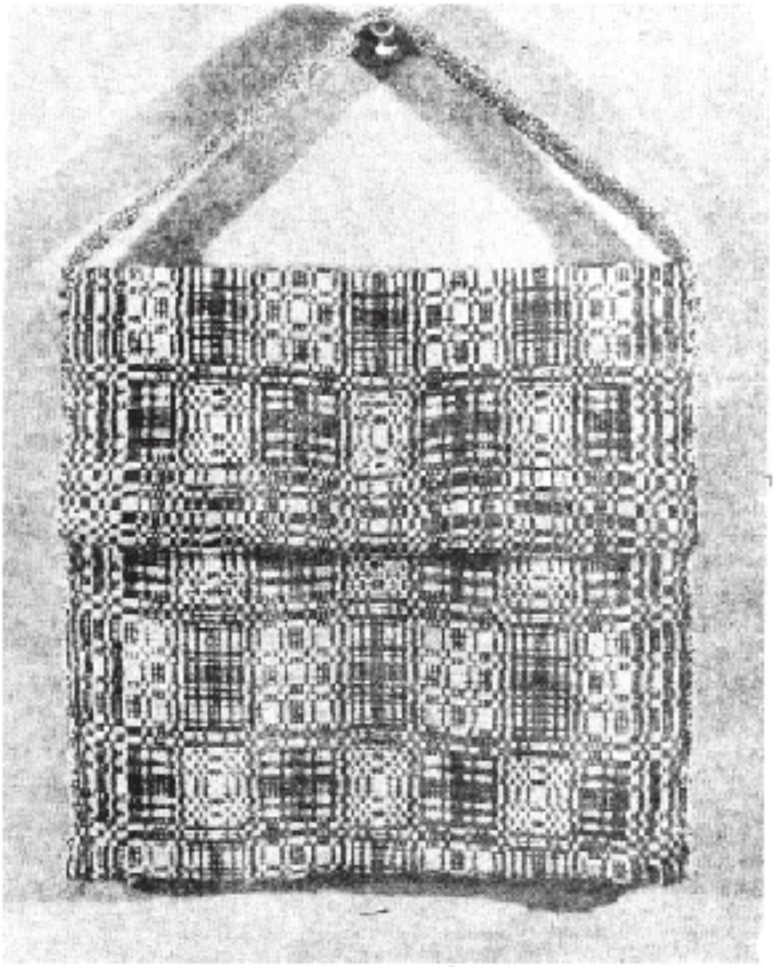
55b. On this piece, the pattern is woven with 1-2 and 3-4 being given the same values- starting with two pattern threads and gradually increasing the number. The pattern yarn is a blue wool and rayon ratine with a very fine white chenille tabby. The texture obtained by this combination is eye-catching.

55c. All four pairings of the pattern harness are used with the pattern proportions being maintained on the 1-2 and 3-4 pairings. The yarns used, as well as the treadling used, suggest the idea being applied to drapery. For a flowing line in your drapery, you may want to add repeats of the pattern with the twill for 32 threads to overall pattern. It will make handsome material on a fairly heavy warp set 10 to 20 threads to the inch. Wefts should be of weights in keeping with the warp weight used.

55d. The twill treadling has been used for several study pieces - with a 1-2-3-4 form used. This piece has a weftface with 3 harnesses down- 1-3-4, 1-3-4, 2-3-4 in chartreuse, 1-2-4, 1-2-3, 1-2-4 in warm brown. The yarn is fine chenille. The idea is the basis for the rug. In summer-and-winter weave, one upholstery material is given. The material in this study piece will make good upholstery in a fine warp - either with the pattern being reversed at intervals or being a continuous repeat.

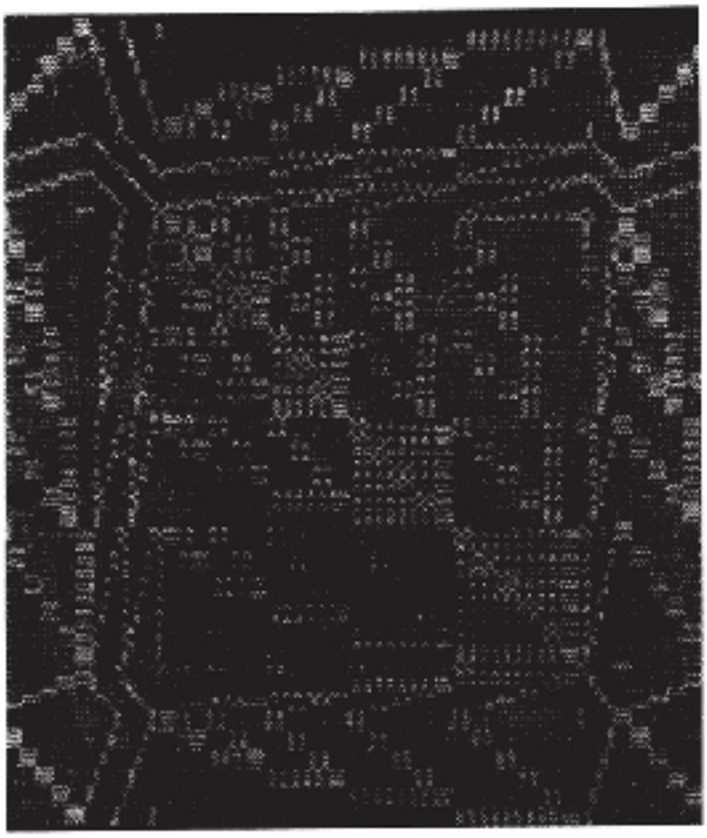






This photograph show the square of a trinomial $(x+y+z)^2$ woven in the overshot weave. The warp and tabby weft is rust colored cotton. The pattern weft is gray teal in a wool and rayon mixture. 23

AKDietz-6-7-SW-1



Robert Kirkpatrick

Ada K. Dietz' idea of applying equations to textiles has spread rapidly. This textile was the entry of Miss Dietz in the 1960 COUNTRY FAIR exhibition and has been the means of introducing the algebraic approach to many handweavers thru'out the U. S.- many of whom have been immediately inspired to explore in the algebraic unknowns. It is the square of a six term polynomial in summer-and-winter weave, used on a navy blue warp with lilac tabby and soft yellow cotton pattern weft.

"A California weaver - Ada K. Dietz - has approached drafting from algebraic equations. The more the Little Loomhouse goes into the idea, the more we realize its import on American folk art growth.

It is wonderful to see the enthusiasm for Ada K. Dietz' algebraic approach - not only an enthusiasm for the beautiful textiles but also an exciting mental stimulation of exploring a new idea. It is not at all uncommon to see a man muttering to himself or scribbling on an envelope and then to share his thrill as he ties the equation to the fabric.

Completely original ideas are mostly non-existent, unless we believe the fanciful imaginations of advertising experts. Those of us who are realistic welcome with open arms a new tangent or variant of an idea. Only occasionally is an original idea brought forth. Originality in a weaver often develops.

One idea which is in the rare group of originals is Ada K. Dietz' approach to weaving patterns thru algebraics as shown in her exhibition and book "ALGEBRAIC EXPRESSIONS IN HANDWOVEN TEXTILES". Look up the definition of 'original'.

Next look up the definition of 'originality'. Then consider the weavers you know, and the weaving ideas. How many are 'original'? How many show 'originality'? You will find only an occasional entry to put in the 'original' list with Ada K. Dietz' algebraic approach. Much in weaving ideas and trends are the outgrowth of many weavers who each show originality but cannot be considered as 'original' of any one person.

Miss Dietz and Miss Foster are examples of the terms 'original" and "originality". Miss Dietz had an original idea in applying algebraics to handwoven textiles. Her partner in Hobbylooms is Miss Foster. Miss Foster's weaving is most distinctive thru her handling of color, texture and design and shows wonderful originality."

Lou Tate, Kentucky Weaver

Each section can be read separately… But the whole reveals a greater pattern.

…critical dimensions that together… …pts, such as culture. …ists in time, with today's veritable… to exist when that continuity is br… Conversely, a civilization may evolve… cultures that make it up pass away…

enslave. The history of textiles reveals both aspects.

It also reminds us that technology means much more than electronics or machines. The ancient Greeks worshiped Athena as the goddess of *techne*: craft and productive knowledge, the artifice of civilization. She was the giver and protector of olive trees, of ships, and of weaving. The Greeks used the same word for two of their most important technologies, calling both the loom and the ship's mast *histos*. From the same root, they dubbed sails *histia*, literally the product of the loom.[5]

tion. The condition of the images speaks not only of countless transfers and reformattings, but also of the countless people who cared enough about them to convert them over and over again, to add subtitles, reedit, or upload them.

In this light, perhaps one has to redefine the value of the image, or, more precisely, to create a new perspective for it. Apart from resolution and exchange value, one might imagine 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. But they also express a condition of

"In weaving, art is largely a mathematical thing. It's understanding patterns, it's understanding structure," says Tien Chiu, a "recovered mathematician"—she dropped out of graduate school—and former Silicon Valley project manager now pursuing an artistic career as a weaver. Mathematically, she observes the threading for a satin poses the same question as what's known as the eight queens problem in chess: Given eight queens how do you place them on the board so that they share no row, column, or diagonal, thereby preventing any queen from capturing another? For satin, the queens are the places that warp and weft cross, holding the cloth together. "Visualizing a weave structure," says Chiu, "for me isn't that different from visualizing abstract algebra."[3]

Today's technologists like to recount how at the turn of the nineteenth century Joseph-Marie Jacquard used punch cards to select warp threads and how his invention inspired Charles Babbage's Analytical Engine, the digital precursor to the computer. "We may say most aptly that the Analytical Engine weaves algebraical patterns just as the Jacquard loom weaves flowers and leaves."

The earliest cloth was probably netlike, made by looping and knotting string. Later, sewing inspired new techniques such as *nalbinding*, where a blunt needle is used to pass thread through loops wound around the thumb. Although the resulting fabric looks like knitting, the process is quite diff…

…Each chapter can be read separately, just as a single strip of kente cloth can stand alone. But the whole reveals the greater pattern. From prehistory to our future, this is the story of the human beings who wove, and are still weaving, civilization's tale.

Ada K. Dietz' idea of applying equations to textiles has spread rapidly. This textile was the entry of Miss Dietz in the 1948 COUNTRY FAIR exhibition and has been the means of introducing the algebraic approach to many handweavers through the U. S.- many of whom have been immediately inspired to explore in the algebraic unknowns. It is the square of a six term polynomial in summer-and-winter weave, used on a navy blue warp with blue tabby and soft yellow cotton pattern weft.

The poor image thus constructs anonymous global networks just as it creates a shared history. It builds alliances as it travels, provokes translation or mistranslation, and creates new publics and debates. By losing its visual substance it recovers some of its political punch and creates a new aura around it. This aura is no longer based on the permanence of the "original," but on the transience of the copy. It is no longer anchored within a classical

products." The textile patterns depicted in Neolithic Aegean art, she writes, "reveal the abilities of the weavers in calculating, in conceptualizing and representing geometrical shapes, in creating hierarchies and in estimating sizes, volumes and values."[9]

Knitting, a recent arrival, is equally mathematical, particularly in its ability to create three-dimensional shapes. "Every Topological Surface Can Be Knit: A Proof" is the title of a scholarly journal article published in 2009. "Hidden within almost any knitting project," write two mathematicians who knit, "is not only the arithmetic of counting rows and stitches, but also structural problems which are best understood using abstract mathematics."

"Whether one creates cloth by inventing an elaborate machine, or by constructing the intellectual framework for complex mental computations," observes anthropologist Carrie Brezine, "the existence of cloth is evidence of mathematics at work in the tangible world." At dinner with a group of handweaving enthusiasts, I ask about the relationship between weaving and mathematics. "It's all math," they reply in unison.

Spinning trains the hands, but weaving challenges the mind. Like music, it is profoundly mathematical. Weavers have to understand ratios, detect prime numbers, and calculate areas and lengths. Manipulating warps turns threads into rows and rows into patterns, points into lines and lines into planes. Woven cloth represents some of humanity's earliest algorithms. It is embodied code.

Long before the dawn of mathematical science, weaving brought right angles and parallel lines into everyday life. "Textile patterns don't represent free nature, but they are symmetrically fitted," observes archeologist Kalliope Sarri. "Weavers could only reproduce motifs . . . if they were able to count, divide, and add up, if they were able to find the center of a circle, the middle of a line, to estimate how many colors to use, how much dye they

into a material problem. Focus is identified as a class position, a position of ease and privilege, while being out of focus lowers one's value as an image.

Weaving is the original binary system, at least twenty-four thousand years old. Warp-weft, over-under, up-down, on-off, one-zero.[4]

The poor image tends toward abstraction: it is a visual idea in its very becoming.

With its interlocking perpendicular threads, weaving represents a conceptual breakthrough, vastly multiplying the number of possible patterns. Although they come in an astounding variety of forms, every loom does two things: it keeps warp threads taut, and it allows the weaver to selectively raise or lower them, creating a *shed* through which the weft can pass.

or as a reminder of its former visual self. It mocks the promises of digital technology. Not only is it often degraded to the point of being just a hurried blur, one even doubts whether it could be called an image at all. Only digital technology could produce such a dilapidated image in the first place.

gave rise to financial institutions, and nurtured the slave trade.

In ways both subtle and obvious, beautiful and terrible, textiles made our world.

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Each section can be read separately… But the whole reveals a greater pattern.

...copic characteristics, he can ...
scales and feather fragments. And
... of Marie-Hélène Moncel, exam...
...alled Abri du...

civilization.

"So powerful, in fact, is simple string in taming the world to human will and ingenuity that I suspect it to be the unseen weapon that allowed the human race to conquer the earth," writes textile historian Elizabeth Wayland Barber. Our distant forebears may have been primitive, but they were also

...aterial culture, political organization,
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...tern civilization.
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the simplest of elements. In *The Odyssey*, when Athena and Odysseus scheme, they "weave a plan." *Fabric* and *fabricate* share a common Latin root, *fabrica*: "something skillfully produced." *Text* and *textile* are similarly related, from the verb *texere*, "to weave," which in turn derives—as does *technology*—from the Indo-European word *teks*, meaning "to weave." *Order* comes from the Latin word for setting warp threads, *ordior*, as does the French word for computer, *ordinateur*. The French word *métier*, meaning a trade or craft, is also the word for loom.

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Ada K. Dietz' idea of using an algebraic equation as the basis of her drafts for hand-woven textiles opens up completely new vistas for weavers. Everyone using this draft book or her ideas will have the stimulating excitement of pioneering mentally in an unexplored field of textiles. New weavers will find the idea has the added value of being helpful in learning different techniques and in learning to transpose.

KENTUCKY WEAVERS used the idea at several fall meetings. New weavers in the group were surprized to find how easily they could apply the idea in color.

This photograph show the square of a trinomial $(x+y+z-)^2$ woven in the overshot weave. The warp and tabby weft is rust colored cotton. The pattern weft is gray

tive audiovisual economies. In addition to a lot of confusion and stupefaction, it also possibly creates disruptive movements of thought and affect. The circulation of poor images thus initiates another chapter in the historical genealogy of nonconformist information circuits: Vertov's visual bonds, the

or stultification. Poor images show the rare, the obvious, and the unbelievable—that is, if we can still manage to decipher it.

...were literally intertwined. Early hu...
...to handles, creating axes and spears
...aiting to be excavated by archaeolo...
...es invisible to the naked eye. Schl...

tive microscopes, it got even more exciting. Three distinct bundles of fibers, each twisted in the same direction, had been twisted together in the opposite direction to form a three-ply cord. Using fibers from the inner bark of conifer trees, Neanderthal people had made string.

Like the steam engine or the semiconductor, string is a general-purpose

knowledge and efforts embodied in every scrap of fabric.

For the story of textiles is the story of human ingenuity.

Agriculture developed in pursuit of fiber as well as food. Labor-saving machines, including those of the Industrial Revolution, came out of the need for thread. The origins of chemistry lie in the coloring and finishing of cloth; the beginnings of binary code—and aspects of mathematics itself—in weaving. As much as for spices or gold, the quest for fabrics and dyestuffs

online circulation as poor images.[4] Poor images are poor because they are not assigned any value within the class society of images—their status as illicit or degraded grants them exemption from its criteria. Their lack of resolution attests to their appropriation and displacement.[5]

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In Defense of the P...

images, I admit. One could of course argue that this is not the real thing, but then—please, anybody—show me this real thing.

The poor image is no longer about the real thing—the originary original. Instead, it is about its own real conditions of existence: about swarm circulation, digital dispersion, fractured and flexible temporalities. It is about defiance and appropriation just as it is about conformism and exploitation.

In short: it is about reality.

What we usually ... were literally intertwined. Early human Age, the two prehistoric technologies were literally intertwined. Early humans used string to attach stone blades to handles, creating axes and spears.

The blades survived the millennia, waiting to be excavated by archaeologists. The cords rotted away, their vestiges invisible to the naked eye. Scholars named prehistoric ages after the layers of increasingly sophisticated stone tools they found: Paleolithic, Mesolithic, Neolithic. *Lithic* means "of or pertaining to stone." Nobody thought about the missing threads. But we get a false picture of prehistoric life and of the earliest products of human ingenuity when we imagine only the hard tools that easily endure the passage of time. Today's researchers can detect the traces of softer stuff.

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