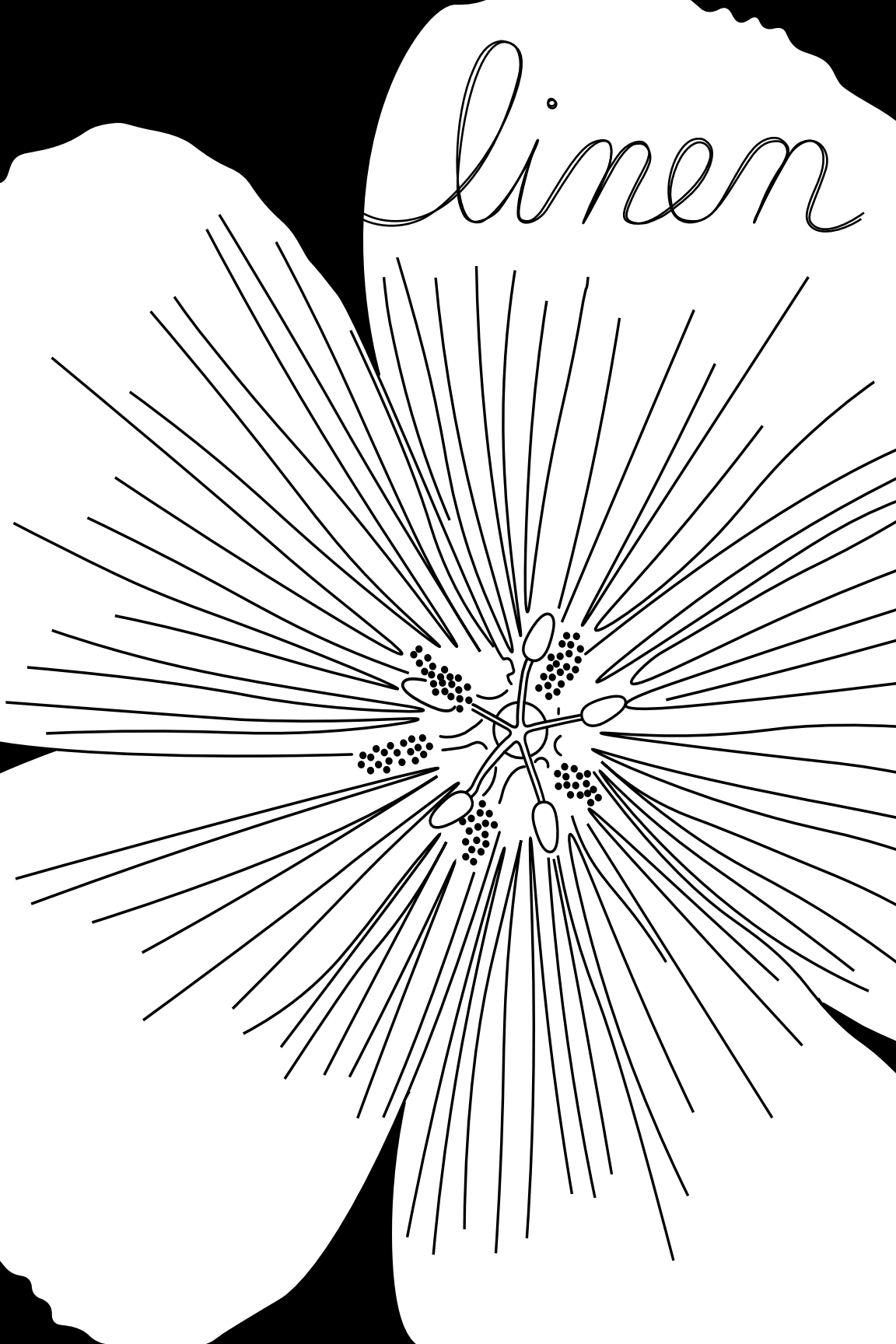
linen

Material Intelligence

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The day is stark and stiff as a linen shroud.
But it will soften; it will warm.

Virginia Woolf, *The Waves*

Like a lot of things that came to define European culture, linen came originally from the Middle East. It is the made from flax, one of the plants whose domestic propagation gave the Fertile Crescent its name. The most ancient textile remnants now known to exist, 30,000 years or so old, were found in 2009 in Georgia—not the one in the American South, but the country tucked just between Turkey and Russia, at the eastern edge of the Black Sea. They are nothing more than fragments of spun linen thread, which were probably braided into basketry or rope. What's especially interesting about them is that they are made not from wild flax, but its cultivated variant, *Linum usitatissimum*, the latter species term aptly meaning "most useful," and *Linum* being the etymological root for the English word linen. (This etymology is paralleled by "woolen" and "silken," but "cotton" has a different derivation, from the Arabic *qutn.*) The oldest actual garment known, a dress found by archaeologists in Tarkhan, Egypt in 1913, is also of linen. Having been buried for five millennia, it sat in storage for a further sixty-four years before a group of conservators were asked to clean it, and realized that it was a bodice, complete with pleats. Now at the Petrie Museum of Egyptian Archaeology in London, the Tarkhan Dress has been radiocarbon dated to between 3482 and 3102 B.C.

When linen did come to Europe, it became central to life and culture, so much so that (paradoxically) it can easily be forgotten. The beautifully carved drapery on classical statuary represents linen fabric. So were the sails of trading ships: Pliny the Elder marveled, in his commentary on the flax plant, that "out of so small a seed springs a means of carrying the whole world to and fro." (*Natural History* XIX, 1:6) Linen is often mentioned in the Bible, both in connection with holy garments, (*Proverbs* 31:24, in the King James translation), and as a way to tell a virtuous woman: "she maketh fine linen, and selleth it." In later centuries, not just the fiber of the plant but its seed oil would take on an im-

portant role in art history. "Oil on canvas," a phrase that appears on a million museum labels, simply describes two of its products in combination: linseed oil used as a binder for pigment, applied to a canvas woven from linen threads. In the nineteenth century, it also gave its name to Linoleum; that's just the Latin for "flax oil," which was one of its primary ingredients.

Technically linen is a "bast fiber," like hemp, jute, and ramie (the last of which is common in East Asia). This means that it is taken from the interior lining of the plant stalk, the layer just beneath the skin; chemically, it is composed of about 70% cellulose. Prior to spinning it into a workable yarn, the stalk must first be dressed, which consists of three processes: retted, scutched, and heckled, three of the most delightful words in the vocabulary of materials. Retting is a soaking of the fibers, which rots and softens the pectin-based bonds between the stalk's parts. Historically, this was often done in rivers, to the dismay of downstream fishermen, for the process is highly polluting. Scutching is the mechanical process of beating the fibers into their separate parts: the line, which is the best for weaving; a coarser, more broken-up fiber called tow; and the boon or shives, which are the waste, woody parts. The usable parts of the flax are fine and bright white, hence the terms that the blondes among us will have heard, "towheaded" and "flaxen haired." Finally, the fiber is heckled—straightened out and split into finer fibers by pulling it through a many-toothed comb.

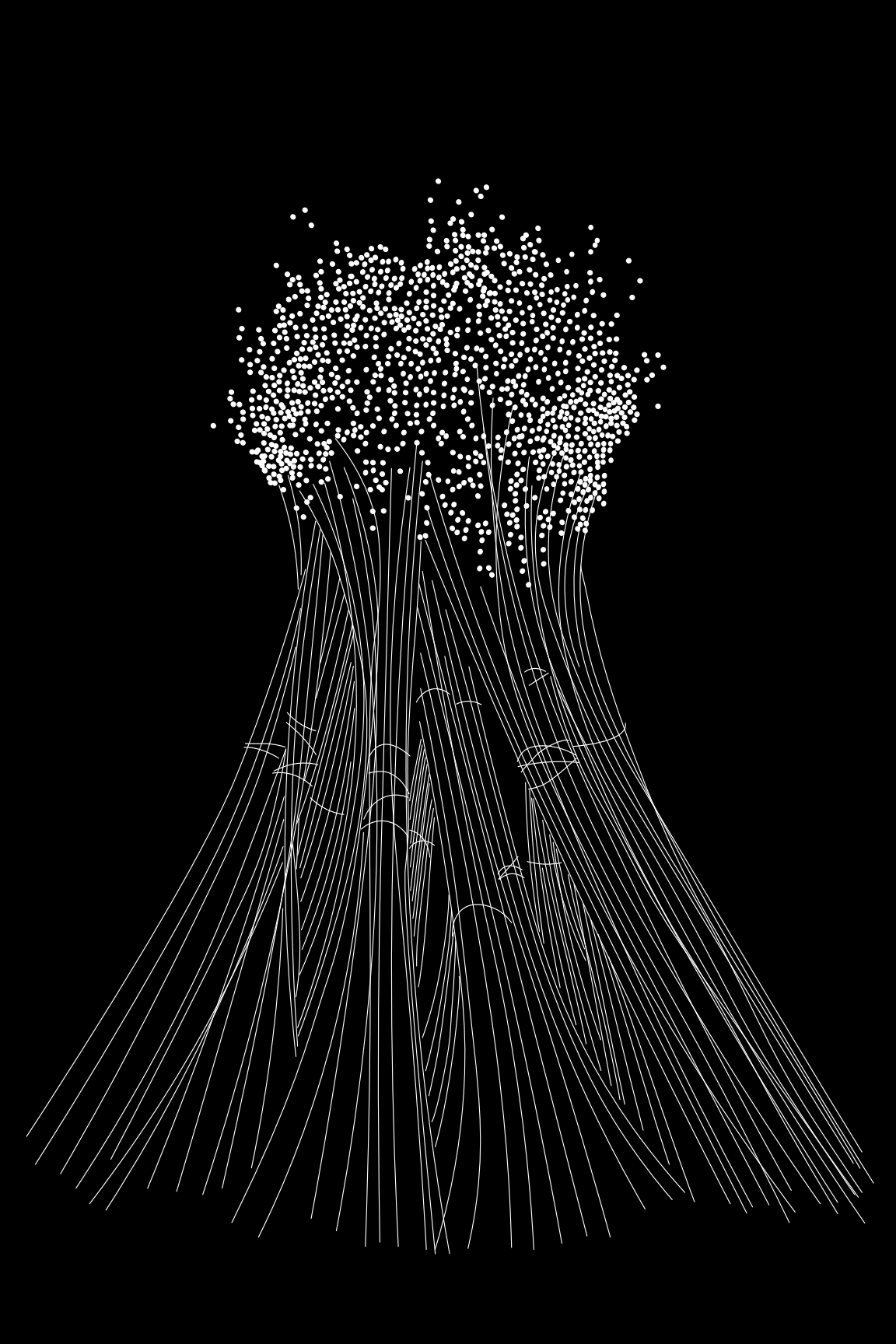
The fiber is then ready to be spun, a process historically done on a distaff and drop spindle, or using a spinning wheel, but of course now mechanized. Like any yarn, it can be spun either clockwise (Z-twist) or counter-clockwise (S-twist), the latter most common in ancient textiles, for this is the direction that results when a right-handed person spins by hand. To encourage regularity in the yarn, and also to reduce the considerable "fly" (loose dust) that comes off the material, flax is usually spun wet—using water, linseed

oil, or simply a bit of spit. It is a good deal easier to spin the long flax line than the shorter fibers in tow.

Linda Heinrich, author of a full-length book on flax and linen, records a Swedish "what am I?" style riddle that elegantly summarizes these various procedures, culminating in the use of linen in both life and death:

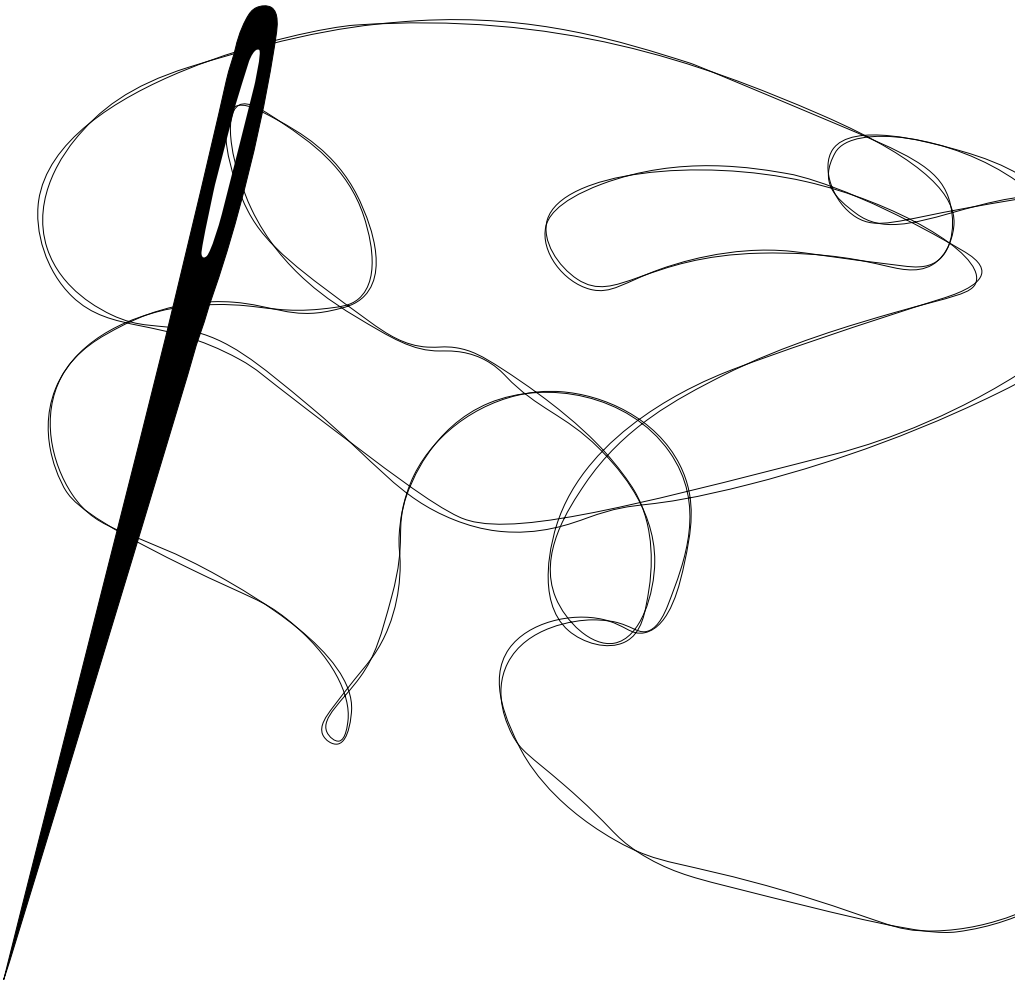
First they put me down in the soil
Then I grew to a long stem with flower
Then I was hung until my back got stiff
Then they threw me out on the ground
And there I had to lay until I got pale
Then I could sit with the great at table
And then I followed the dead to their grave.

It is worth meditating on this last line for a moment. Linen and death have been closely acquainted for most of human history; one of the earliest known paintings on a textile substrate is the Shroud of Hori, another discovery from ancient Egypt. Likely dating ca. 1295–1070 B.C., it has a trapezoidal shape, and curvature in the horizontal threads. When it was acquired, a museum curator suggested it may have been wrapped around a vessel, like the black-topped jars shown under the table in the picture. This is an exceptional example from the tomb of an elite, but whatever a person's station, no matter what course they took through their lives, it's quite likely—particularly if they lived in the Middle East and Europe—that they wound up at the same destination, a linen shroud. Jesus Christ himself was buried in linen, according to scripture, the textile rubbed with myrrh and aloe. The controversial Shroud of Turin, which many have believed to be this very wrapping, is actually a fourteenth century fake. The "blood" that stains its fibers is actually tempera paint, containing red ocher, vermilion, and small amounts of rose madder, a typical medieval red pigment blend. About the only thing accurate about it is the material; it's made of



linen, as is another false relic, the Sudarium ("sweat cloth") now in the Cathedral at Oviedo. Long believed to have been used to wrap the face of Christ after he died, scientific analysis has established that it actually dates to about 700AD.

People continued to be buried in such shrouds right through the middle ages and beyond—the great modernist architect Carlo Scarpa, thinking of his medieval forebears, directed that he be buried upright and wrapped in linen in a Cemetery which he himself designed. By that time, such a



funerary practice counted as highly unusual. Linen shrouds had gone by the wayside, along with many other historic uses of the fabric: glued together in layers and used as armor (*linothorax*) among the ancient Greeks; used for wicks in oil lamps; as the base for pictorial embroidery; and perhaps most importantly, for paper-making. This key technology was first developed in China during the Han dynasty, and in that context was made using mulberry and other barks, as well as hemp. But when paper began to be manufactured in the Arabic and Christian lands, it was made from pulped rags—fabrics that had outlived their useful life. Cotton would be used for this purpose eventually, once imports from Asia and America made that fiber more widely available; but in the early explosive years of the European print revolution, paper was almost exclusively made of recycled linen. Most copies of Gutenberg's Bible, for example, were printed on high-quality linen rag paper imported to Germany from Northern Italy.

Around this same time, linen was becoming an increasingly important global commodity. A unique but indicative moment was 1613, when a ship called the *New Year's Gift* sailed from London all the way to Japan, carrying diplomatic tokens of esteem. As historian Timon Screech explains in his forthcoming book on the voyage, included in this cargo were some 120 pictures, including portraits, some of which were painted on wooden panels as was the medieval custom, but others of which were mythological subjects on linen canvas. It made sense to include these technically innovative artworks for such a long journey. Canvas would not warp or crack en route; it was also much lighter, and a large canvas could be rolled and sealed for easy transport. These properties of scale and portability helped make oil paintings a tradable commodity, and also—equally importantly—allowed painters like Peter Paul Rubens to dramatically expand the scale of their art, far beyond the size easily achieved using multiple joined panels.

Art was only one tiny part of the expanding linen trade of the 17th and 18th centuries, when it really came into its own as a global commodity. Appropriately, given that fabric itself is a matrix of crossings, the shape of this commerce was dispersed and anchored at many different sites. The names of linen-producing centers are preserved in the terminology for various types of fabric: *damask*, a textile with a woven-in pattern, associated with Damascus; *lawn*, a plain weave linen from Laon in northern France; *fustian*, a heavy fabric with a linen warp and a cotton weft, from Fustat, the capitol of Muslim Egypt; and *ozenbrigg*, a tough and durable textile from Oznabrück, Germany. *Cambric*, a fine white linen, often used to make the spectacular pleated ruffs immortalized in Dutch portraiture, got its name from the Flemish town of Kamerijk (in Dutch) or Cambrai (in French). You may know it from the traditional English ballad "Scarborough Fair," in which a bitter ex delivers an impossible list of demands to his former lover:

Tell her to make me a cambric shirt
Without no seam nor needlework
Then she shall be a true love of mine

In an age before brands, these terms were generalized beyond their geographic origins, as a way to conceptually organize the wonderful diversity of woven textiles.

The legacy of the linen trade still lies palpably upon the European landscape, anchoring the local identity of such towns as Kortrijk, Belgium, which has a whole museum devoted to the history and techniques of linen production; as well as the politics of whole regions, including Northern Ireland. It is impossible to fully understand the vexed history that led to the Troubles—the devastating conflict between Catholics and Protestants that unfolded in Belfast and beyond in the late twentieth century—without knowing that England had long manipulated the Northern Irish economy to maximize profit from linen.

This story began somewhat inadvertently, when Irish wool was suppressed through duties and outright export prohibition, as a way to protect English wool producers from price competition. Assisted to some extent by newly arrived Huguenots—an exemplary figure was Louis Crommelin who himself hailed from near Cambrai—the Irish threw themselves into making linen, which put them into competition with continental producers instead. The British government, realizing the potential, passed a Parliamentary Act in 1696 removing all duties from Irish and Scottish linen exports to the Americas and Caribbean. The result was that, a century later, linen from Northern Ireland accounted for fully half the value of all Irish exports. It was, among other things, to protect this lucrative trade that the British retained such a tight grip on their nearby colony.

The most tragic consequence of the trade was the Great Famine of the 1840s, which was significantly exacerbated by the dominance of linen production. The diversified agriculture that had once typified the island was disrupted twice, once by the widespread adoption of flax as a cash crop, and then again with the industrialization of linen spinning and weaving, which put many rural artisans out of work. They turned to potatoes as their sole source of income, and when the blight came, had no foodstuff to fall back on. Desperate Irish, many of them children, went into lace-making as a way to make ends meet—lace, of course, that was made from linen—and charitable English aristocrats patronized this manufacture, congratulating themselves that they were doing such good things for the poor. Little of this history is remembered, when lace is celebrated as an emblematic craft of Ireland; even so, it is densely woven into the fabric of the nation's history.

Throughout the British empire—which was itself powered by linen sails, flown from ships manned by linen-wearing sailors—there are similarly unsettling stories to confront. The USA is no exception. Kathleen Brown, in her

book *Foul Bodies: Cleanliness in Early America*, has described linen as "a crucial prop in the European performance of civility." Wearing bright white linen was considered a reliable indicator of social refinement; it was out of animal skin garments and into linen that indigenous Americans were coaxed, when they were aggressively compelled to assimilate to white culture. The color of linen was also indexed to the color of skin, with the wealthy wearing the finest-spun fabrics, laboriously laundered, and enslaved people forced to wear rough "Negro Cloth," also called "brown linen," as our contributor Jonathan Square describes in this issue of *Material Intellgence.*

For white people in the eighteenth and nineteenth century, the maintenance of clean linen was a correspondingly charged affair—a way to indicate status, demanding considerable labor by servants or, for the vast majority of the population, their own hands. This is stressed in no uncertain terms in period advice books such as Catharine Beecher's *Treatise of Domestic Economy* (1841), which counseled its largely female readership: "buying linen, seek for that which has a round close thread, and is perfectly white; for, if it be not white, at first, it will never afterwards become so."

Some help was provided by innovations like the detachable collar, purportedly invented by a woman named Hannah Montague in Troy, New York, in 1827. Tired of the frequent laundering of her husband's shirts, she had the thought that she could simply unpick the collar, which soiled most frequently, wash it and reattach it. A local entrepreneur saw the commercial possibilities, and a local industry was born: to this day, Troy carries the nickname of "Collar City." A further improvement was the disposable 'Linene' collar a laminated produce composed of starched paper with linen cloth on the inner and outer face by the Reversible Collar Company of Cambridge MA. Cheaper and much easier than laundering, they were a huge hit, with that one firm manufacturing over three million annually. With the decline in

fashion of the separate collar (a development linked to the invention of the washing machine), this business plummeted until it was only the military and clergy who continued buying.

A poignant portrait of the psychological weight that working-class people attached to the ideal of "clean linen" is found in a story by that title by the British writer Llewelyn Powis. Written sometime in the early 1930s, though not published until later, it tells of an ancient woodsman of considerable material intelligence: "with deftly adjusted wedges," we read, "he could regulate the final fall of the timber to within an inch." He is hardly a model of elegance, knobby kneed, with "ancient animal feet with hooked and blackened nails that had for so many long years been confined in rough hobnail boots." But he sets great store by his dress nonetheless. Discovering one morning that he is without a decent collar—his were all frayed from continual washing—he steals one from another tradesman. It is too tight, however, a fact that he discovers only too late: "At last by pulling and wrenching he got the stiffly starched button hole over the knob of the stud. It was too tight. He felt as though he was being throttled. For desperate minutes he sat before the window, trying to tear the white band from off his neck." Ultimately, the tale ends with the woodsman lying dead of strangulation, "the loops on the back of his polished boots pricked up like the ears of a listening cat." The story conveys through grotesque exaggeration what historians such as Victoria Kelley have demonstrated through their research: clean linen was both a Sisyphean task for servants and an important aspect of working class self-fashioning in the Victorian era and early 20th century.

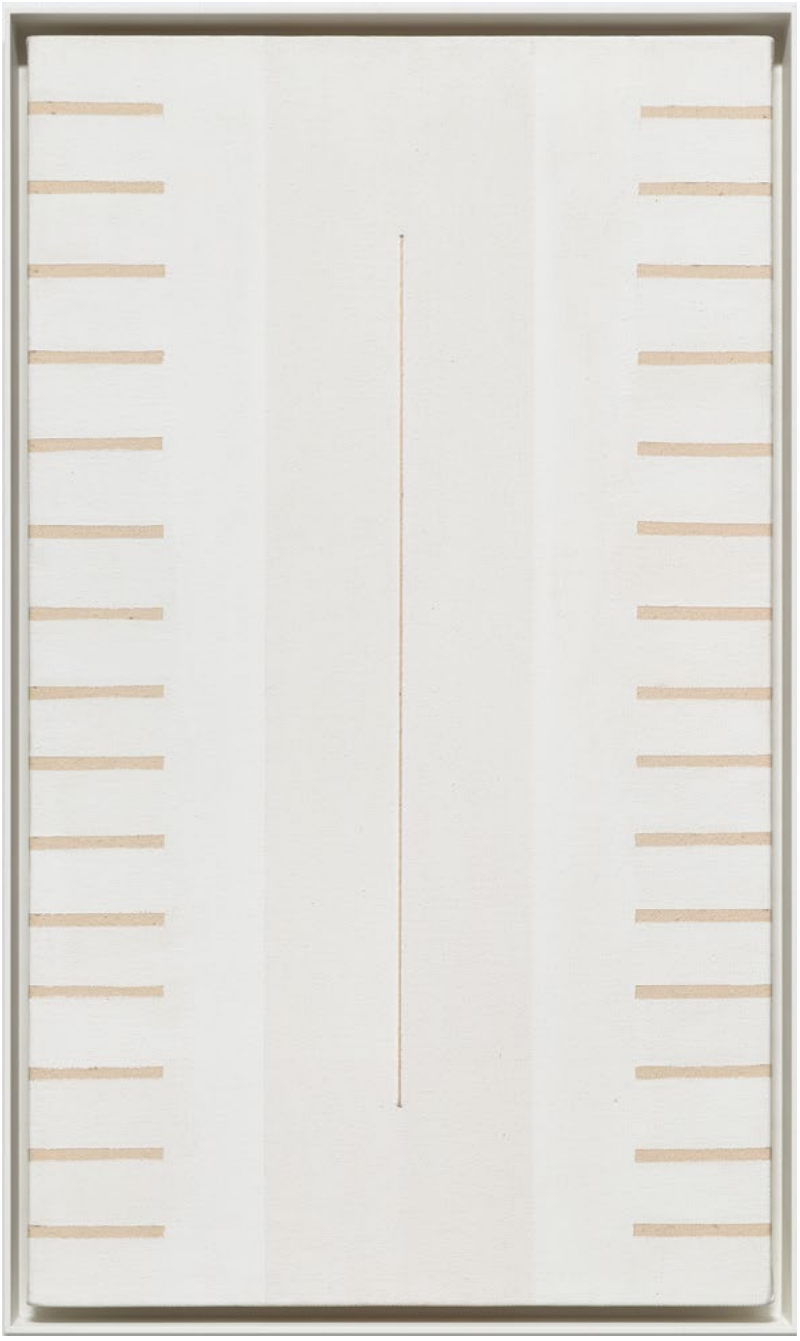
For all that the history of linen is bound up with specifically Euroamerican narratives of aesthetics, race, and class, it is also—like most any material—a topic best viewed through a global lens. When one thinks of the Indian subcontinent, for example, cotton is doubtless the first textile

that comes to mind (though flax has been grown there since ancient times). So one might not expect Britain's colonial involvement there to have much impact on the story of linen. Yet it did, partly because linen was less in demand once Indian calicos (cotton textiles) began to be important *en masse*, and also because mixed fibers could be woven together into a single fabric. To this day, cotton/linen blends are commonplace because the two offset one another's characteristics: cotton is limper, linen stiffer; cotton more flexible, linen less clingy. The distinctive hand feel of a US dollar bill is thanks to its mix of the two fibers, about 25% linen and 75% cotton. The interwoven nature of this history is curiously reflected in the linen and cotton garments offered by a company called BritishIndia, which makes an explicit appeal to colonial nostalgia in its branding, but is based in Malaysia, while sourcing its materials from Italy and Ireland.

Complicating the geographical picture still further is the recent global spread of the flax industry. The current leader in production is not the Netherlands, as in centuries past, or even Canada which dominated the market in the late twentieth century, but Kazakhstan—a very recent development, as the country was not even in the top ten as of 2006. It's also a significant industry in South Africa, Argentina, and—of all places—North Dakota, which recently accounted for about 90% of US flax production. These new centers are primarily dedicated not to producing linen fiber, but linseed oil, which is in turn manufactured into paints and varnishes, and used for livestock feed.

These days, according to the CFDA (Council of Fashion Designers of America) Materials Index, linen accounts for less than 1% of textiles fibers manufactured worldwide. Because it consumes far less water than cotton agriculture, though, it's a more ecological option, and it also is claimed to have superior sanitation properties, being naturally antibacterial. The Dutch designer Christien Meindertsma,

motivated both by her own country's deep involvement with linen, and its inherent sustainability, recently developed a chair made almost entirely of flax combining woven and felted structures. It's made from a single 60 x 100 cm sheet, and is entirely biodegradable. Will linen be the fabric of the future, as well as the deep past? Only time will tell.



Leaving the fold

Elaine Reichek

I am old enough to have been taught how to stretch and prime a canvas in the traditional way. You began by selecting the fabric. Cotton duck was cheaper, but linen was the gold standard because that's what the Old Masters used. We were told it was more resistant to wear than cotton duck, and it came in a variety of weaves, graded by weight and refinement, and a choice of shades from pale flax to dark tan. Once you pulled the linen taut over a set of four squared-off stretcher bars—no wrinkles, please—you applied a thin coat of rabbit-skin glue. This foul concoction was heated and stirred over a small burner and carefully applied with a wide flat brush. Now the linen was sized and ready to be primed. You brushed on one thin coat of oil-based gesso and sanded it in preparation for the second coat. And then, after completing this daunting amount of labor, you were expected to cover it all up with paint. I always wondered why the discussion of "painting as object" took so long to come into vogue. By the time your canvas was prepared for paint, you had certainly constructed an object.

I based my first solo exhibition, in 1975, on an exploration of these basic ingredients for preparing a canvas. No surprise that I settled on such minimal means, since my painting teacher in college in the early 1960s was Ad Reinhardt, nicknamed the "Black Monk" for his limited, dark-hued palette and stringent geometric compositions. In critiques, Reinhardt always asked you to account for your choices; if anything was extraneous, you had to take it out. So, by the early 1970s I found myself, to quote Reinhardt, "starting over at the beginning."

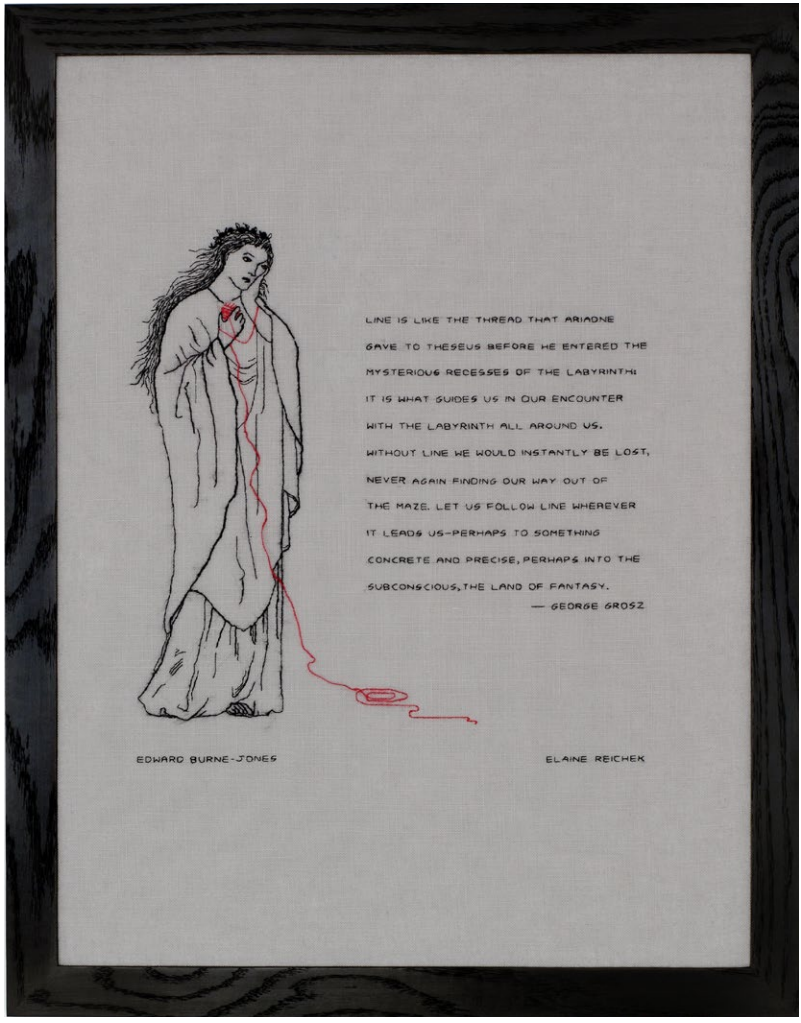
To canvas and acrylic gesso I added graphite, tape, and thread as drawing materials. After the exhibition was installed I looked at my work in the gallery and thought, "Who made this? What am I looking at?" What I noticed first was the thread, which I had used to draw lines that pierced the canvas support, looped around the back, and came through the surface again to make other lines. I thought I was inching my way out of the narrow mode of formalism that viewed painting as entirely self-referential, anti-illusionistic, and only concerned with the material aspects of its own making. But what I saw, standing in the gallery, was embroidery on linen. Believe me, the idea that I was sewing was terrifying! And this was an OMG moment that I could either bury or embrace. What's funny to me now is that this eureka happened only after I had made twenty-six paintings and hung them in a show.

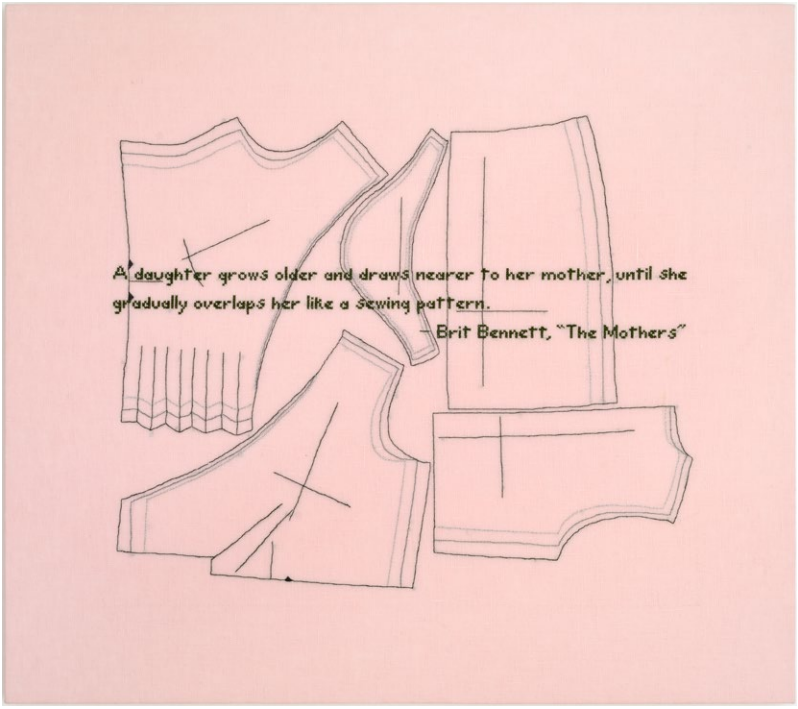
From that time on, thread became a basic element in my work, though for several years I segued into knitting and

photography, among other materials. Eventually I came back to embroidery on linen. And because so much of my interest centers on a dialogue between painting and other art forms that are often excluded from the high art canon, linen seemed ideal because it literally crosses the artificial boundaries between painting and embroidery, high art and low craft. Even the Greeks used woven linen to symbolize mutual accord. Statues were draped with linen when a peace

treaty was announced. Warp and woof had come together to weave a new fabric out of opposing points of view.

Of course the ancients wove their linen by hand—the warp-and-woof construction is prominent even behind vitrine glass in a museum. The linen I use, on the other hand, is manufactured to have an even weave. As a product it's much closer to the linens used for embroidered samplers in the seventeenth to nineteenth centuries in Europe and the US, despite the fact that much of this cloth was also hand-woven. The tightness of the weave is referred to as the count, and the warp and woof form an even grid that allows you to

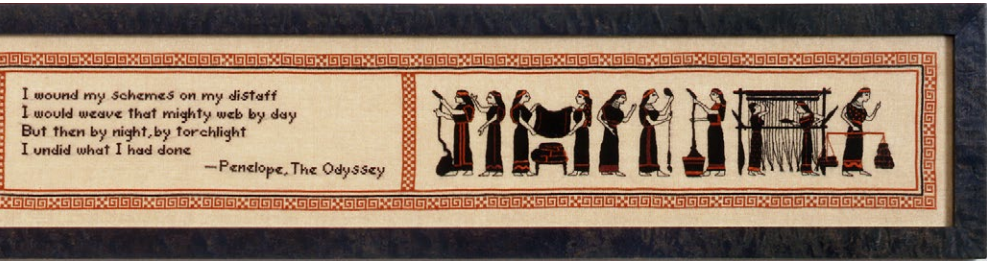




map out the composition and regulate the stitches as you go. Even here I must give the nod to Reinhardt. After all, the cruciform structure of his late compositions is like a deconstruction of the grid, an examination of its most fundamental components, which in turn directly invokes the woven fabric on which he painted.

The choice of linen for my work is also based on a love for the fabric itself. I love the way it takes a dye. The natural fibers absorb color in a way that synthetics can't match. I'm also attached to its haptic qualities. Refined linen has a dry "hand," and it's a pleasure to work with, unlike many syn-

thetic or blended fabrics, which can feel slimy or scratchy. It's also strong and wears well, which is very important to me because I've never used an embroidery hoop, which keeps the textile in tension—I hold the fabric in my hands as I sew, and I can work on the same embroidery for a very long time.



I've also used thread made from linen. It has a smooth, flat finish and is especially nice for embroidering text. And as an added conceptual bonus, several scholars have pointed out that the etymological roots for the words textile and text are the same, as are the roots for linen and line.

Although there were always other artists whose practices felt in sympathy with my own, within the broader art world I used to feel a bit isolated. In fact, my first solo exhibition was both my first and last painting show. I'm still in dialogue with painting, but I don't make paintings—I left the fold long ago. I remember one museum curator told me she

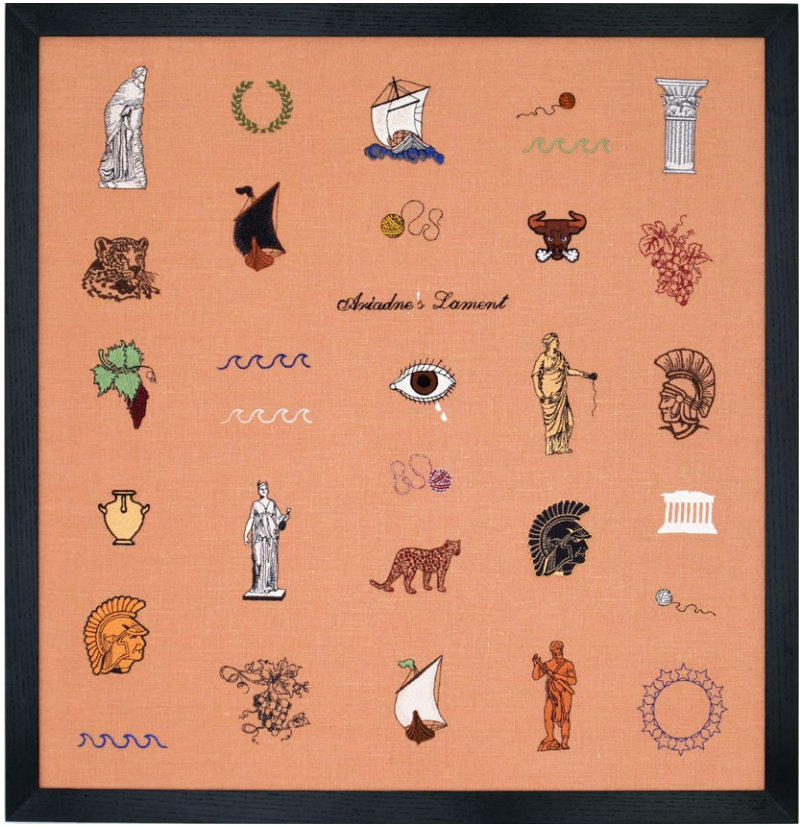
SHE HATH GOOD SKILL AT HER NEEDLE...

This rag of scarlet cloth assumed the shape of a letter. It was the capital letter A.... Each limb proved to be precisely three inches and a quarter in length.

The SCARLET LETTER, *so fantastically embroidered and illuminated upon her bosom, had the effect of a spell, taking her out of the ordinary relations with humanity and enclosing her in a sphere by herself.*

— NATHANIEL HAWTHORNE

found the work hard to relate to because she hadn't sewn a button on in years. But now that so many of the distinctions made between art and craft have all but disappeared, I find myself with lots of nice company. Much of the new scholarship has a more expansive view of material culture and of the interconnectedness of art with larger social, cultural,



and historical forces. This kind of social and political engagement was exactly what originally motivated me to go beyond that initial painting show. Eventually I found that in addition to the general art world audience, I had also attracted what one friend called an "alternative audience" of people steeped in craft histories and traditions.

But for me, someone who loves needle and narrative—the Oxford Dictionary and an affecting quotation—it's still all about the linen.

Armor made of linen and glue

Gregory S. Aldrete

15 years ago, Scott Bartell, one of my undergraduate students at the University of Wisconsin-Green Bay, decided to make himself a replica of the armor that Alexander the Great is shown wearing in a famous mosaic from the city of Pompeii. Known as a *linothorax*, this armor was apparently made just out of linen. Little did I realize that much of the next decade would be dominated by the quest to reconstruct and test that armor. When Scott asked me for advice, I confidently assumed I could dig up a few scholarly articles for him, but to my surprise, I discovered that there was no agreement on what the armor was made of, how it was constructed, or how effectively it protected its wearer.

Thus was born the UWGB Linothorax Project, which would eventually grow into a multi-year investigation involving professors in several fields and dozens of students, as well as community members ranging from traditional weavers to bowhunters.

The linothorax had been afforded relatively little attention by scholars, due to the highly perishable organic materials of which it was constructed; no specimens have survived. This contrasts with the many fine examples of ancient metal armor that can still be seen in museums around the world. If we wanted to understand the linothorax and assess its characteristics, we were left with no choice but to apply the methods of experimental archaeology and reconstruct full-size replicas using only materials that would have been available in the ancient Mediterranean world. In tackling this mystery, we had two main sources to draw upon: ancient authors who mention linen armor, and depictions of it in ancient art. We identified references from 40 different ancient authors, and my wife Alicia amassed a database of close to 1,000 images in ancient art, such as vase paintings and sculpture. This body of evidence attested that the armor was used by many civilizations, including the Egyptians, Persians, Romans, Carthaginians, Greeks, and Macedonians, and that it was employed from at least the 6th through the 2nd centuries BC.

Based on these sources, we "backwards-engineered" our own linothorax. The greatest challenge was locating historically authentic flax. As most linen these days is machine-made, we couldn't just go to the local fabric store. We required linen made from flax that had been grown, harvested, and processed by hand, using traditional methods. Eventually we found a weaver in Wisconsin who grew and harvested her own flax, and then spun and wove it into linen. Later, two fellow UW Green Bay professors—Heidi Sherman, a specialist in Medieval History including textiles, and Alison Gates, a textile artist in the Art Department—began a proj-

ect to plant, harvest, rett, dry, break, scutch, and hackle flax by traditional methods, spin the resultant fibers into thread, and weave them into linen.

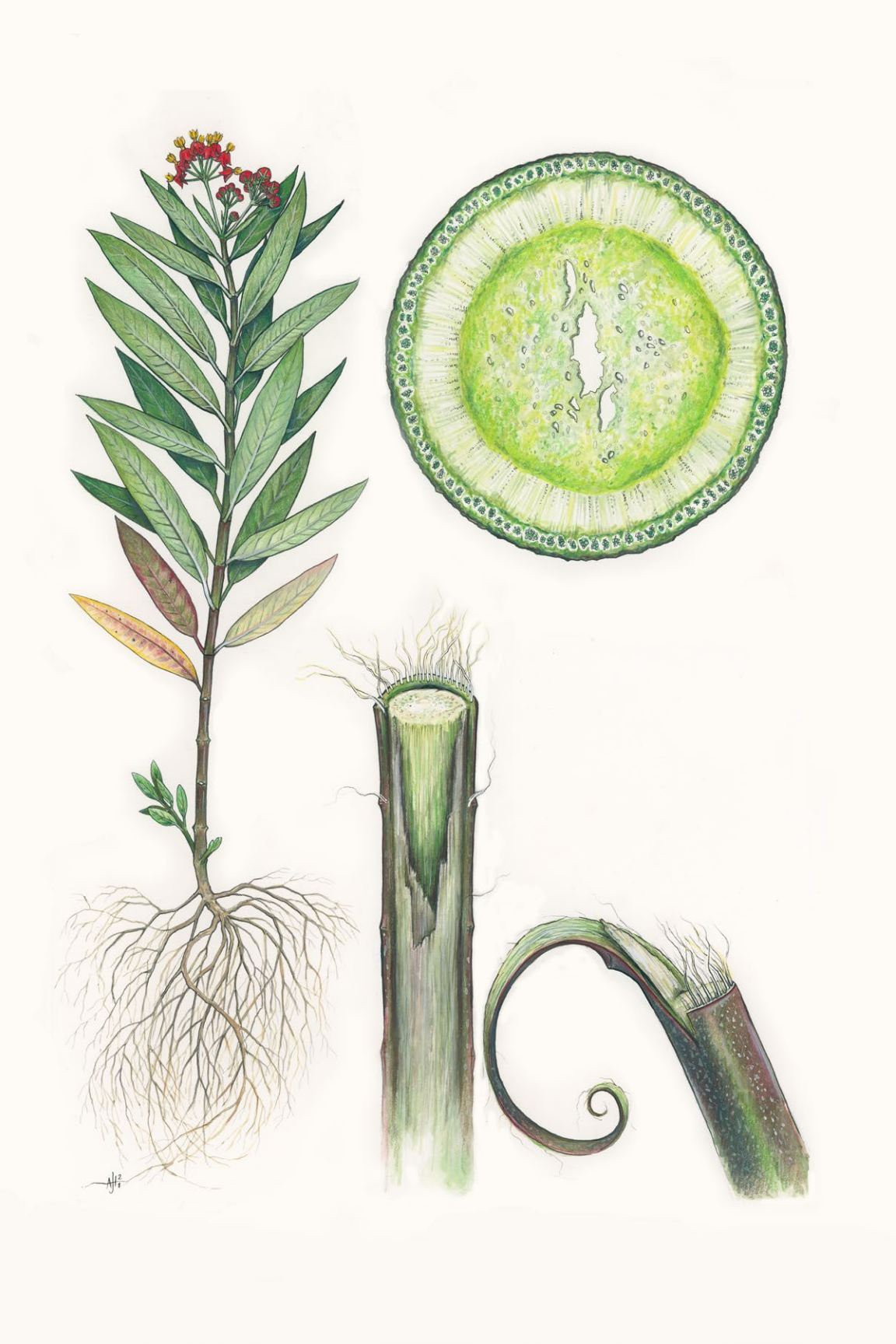
One standard construction method for linothorakes seems to have been to laminate together multiple layers of linen. We chose to work primarily with rabbit glue, an adhesive that would have been both cheap and widely available throughout the ancient Mediterranean. Our first full-scale replica linothorax, which had 17 layers and a thickness of 12mm, required a bolt of linen 16 meters long and 1 meter wide, and the lamination process consumed roughly 7.5 liters of glue. Our hands-on reconstructive methods revealed some interesting practical aspects of manufacturing the armor, such as the fact that it is vital to let each laminated layer dry thoroughly before adding the next, to prevent the armor from growing a nasty mold. It also showed that the most time-consuming phase of construction would have been spinning the flax

into thread, which would have accounted for about 575 of the estimated 715 total hours of labor needed to make one corselet (that is nearly 18 modern work weeks!). However, linen armor would still have been much cheaper than comparable bronze armor, which demanded expensive materials and a highly-paid specialist, a blacksmith. In contrast, almost any woman or girl in the ancient world (who typically spent much of their time engaged in textile production) would have possessed the essential craft skills to make this armor.

Next, to evaluate its battlefield utility, we made a number of test patches using various types of linens, glues, and weaves, and then subjected them to penetration tests by shooting them with replica arrows under controlled conditions. The arrow tests revealed that the linothorax would have provided excellent protection to its wearer. Our experiments showed that the linothorax was an extremely viable form of protection, and one that even offered some advantages over contemporary bronze armor. Compared to metal armor, a linothorax would have been cooler, lighter, cheaper, and more comfortable, while offering a similar level of protection, at least during the Classical and Hellenistic eras.

Scott, Alicia, and I ultimately co-authored a scholarly book describing our research. Several documentaries were even filmed about us. This led to another memorable experience. Since the film-makers wanted a more dramatic visual than merely shooting at test patches, Scott agreed to don the armor while I shot him at point blank range with an arrow. This was less hazardous than it sounds, because we had done over a thousand test shots, and knew exactly how the armor would perform. But it was certainly a compelling demonstration of the armor's effectiveness.

Our project not only brought attention to an underappeciated aspect of ancient military and textile history, but also illustrated the sorts of knowledge and insights that can only be gained by moving beyond books, crafting a physical object with your own hands, and then actually using it.



On milkweed

Andrew Hamilton

Flax (*Linum usitatissismum*) is not native to the Americas. The plant was introduced by colonists who sought to import European ways of making cloth to this "new" world. But this hemisphere had its own extraordinary fibers, especially in the Andes region of South America. Here, societies cultivated a superior species of cotton (*Gossypium barbadense*) in multiple colors, domesticated llamas (*Lama glama*) and alpacas (*Vicugna pacos*), and sheared wild vicuñas (*Vicugna vicugna*) for their fleeces. The co-existence of these world-class fibers—cotton and camelid fleece—was an engine of artistic innovation, giving rise to one of the most prolific and structurally complex textile traditions in the world. These fibers are well-known to scholars of the Andes, and they comprise most textiles in museums, including all the famous masterpieces.

A subset of Andean textiles—commonly fragments of rather plain cloth, nets, and cordage—were made from what

scholars term "vegetal fiber". The white or tannish threads tend to look stiff and scraggly, which makes them easy to recognize. If I'm being honest, they have not usually held my attention for very long. Often, their most remarkable quality is their age, with many examples dating to well before the domestication of cotton. In fact, the oldest known textiles from South America—found in Guitarrero Cave, and thought to be from around 8,000 BC—were made from vegetal fibers, which specialists have identified as agaves, bromeliads, and tillandsias. Other coastal archaeological sites have yielded textiles made from milkweeds and bulrushes. Nonetheless, for most scholars in the field, "vegetal fiber" is a largely undifferentiated category. The stories behind these fibers, how they were grown or processed, even the parts of the plants from which they derive, all remain underexplored.

A number of years ago, the topic propelled me to interrupt a dinner at the house of Marco Curatola Petrocchi, the director of the Program of Andean Studies at the Pontificia Universidad Católica del Perú in Lima. From my vantage point at his table, I could see an Andean milkweed (*Asclepias curassavica*) growing in his garden. The small, cheery, red and yellow flowers shone brightly in the light from the window. My unsuspecting host followed me out into the night so that we could examine it, all before dessert! He told me there was a copse of them flowering in a nearby park, and you can imagine the route I took home.

I had not previously considered growing them myself. My own experiments raising them on my roof in Chicago have allowed me to explore them first-hand. You might know milkweed for its canoe-shaped pods that burst open with clouds of white fluff, like dandelions, carrying seeds through the air. This "floss" gives the seeding plant an uncanny resemblance to cotton—but it is not the same fiber that ancient Andean makers used to make textiles. Rather, they obtained fibers from a far less obvious source—inside

the stems. If you snap one in half, you can see them around the broken edge like little white eyelashes. Looking at a cross-section of the stem under a microscope, the fibers are not so apparent, but as the sample desiccates they become visible as white-outlined bundles. While the floss might superficially resemble cotton, these bast fibers are more similar to flax.

Bast fibers, including flax and milkweed, are bound to the flesh of the stalk. If you pull or peel them, they break. So how did ancient Andean spinners harvest them? Unfortunately, I've never encountered anyone in Peru still working with this fiber. In North America, common milkweed (*Asclepias syriaca*) is also used for bast, and methods for processing it are well documented. Andean milkweed is morphologically different, though, due to the climate it grows in. At northern latitudes, milkweed stalks may be cut and wintered outside, using moisture and cold temperatures to decompose them—thereby freeing the fibers. However, this harvesting process would not work in the tropics. It is possible that the garúa, the fog that blankets Peru's coast much of the year, could have been used for dew retting, but the absence of sunshine during these same months might have stalled the process. Since freshwater is scarce in these coastal deserts, it seems most likely that spinners would have allowed the stalks to rot in brackish water or seawater.

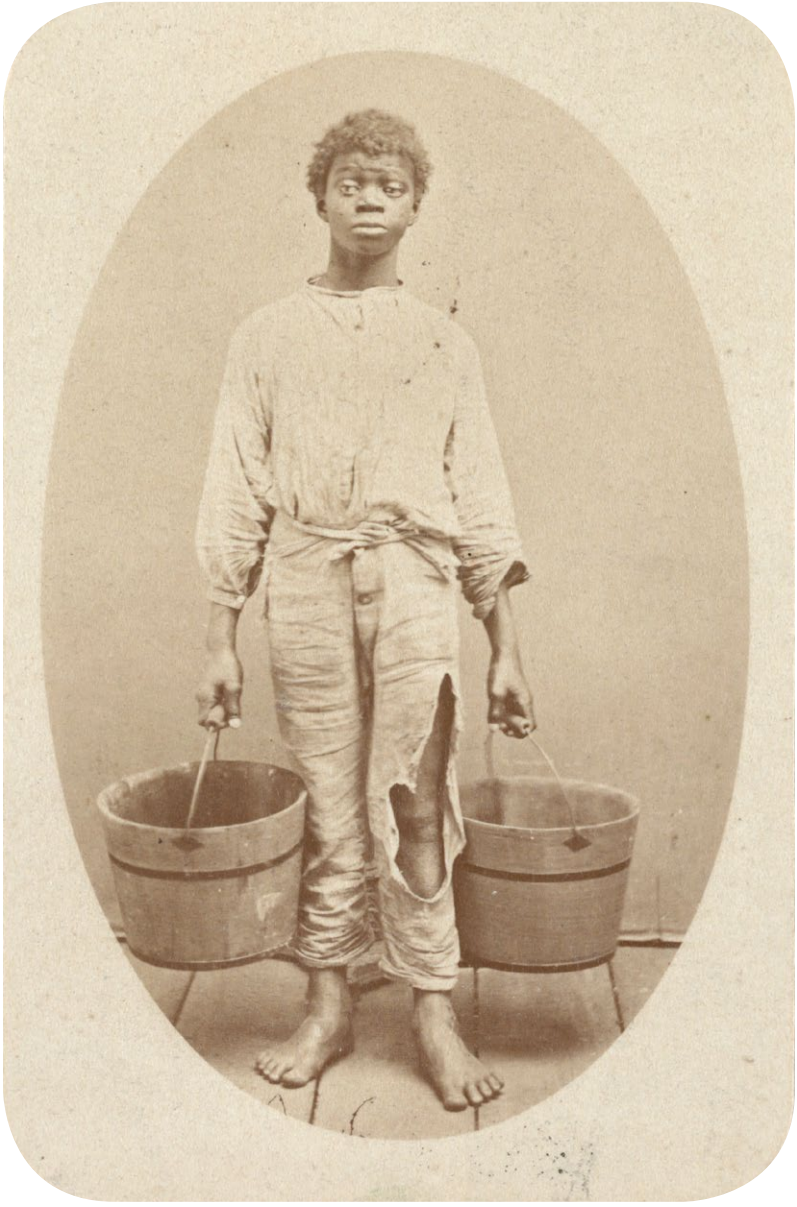
In my own experiments retting milkweed stalks in Chicago, this process took some two months from start to finish. (After three months, the fiber itself degraded.) Once the stems start putrefying, they can be easily peeled. The fibers come away with the skins and then can be stripped from them. Although the fine white strands still sometimes break—especially at nodes where leaves were attached to the stem—they can be harvested in 6 to 10-inch lengths, which makes it easy to spin the glossy filaments into threads. As they dry, the fibers fade to their characteristic dull appearance).

After working with milkweed, it became more apparent why the material was eventually eclipsed by cotton. Initially, the plant would have been a convenient fiber source because it grew abundantly in marshy areas near bodies of water, and thus close to sites where it might be used for things like fishing nets. Once cotton was domesticated in this same ecological zone, it offered fiber with the added advantage of many different colors, including white, tan, dark brown, sage green, and a pinkish gray. What my attempt at growing the plant made clear to me were the non-visual and ephemeral aspects of working with this material, which I could never have learned from a static object in a museum collection: the time it takes to ret the fiber, the labor of stripping the stems, and the truly awful smell.

What's passion but a battering of stubborn stalks,
Then a gentle combing out of fibres like hair

And a weaving of these into christening robes,
Into garments for a marriage or funeral?

Michael Longley, "The Linen Industry"



"The most trying ordeal"

Jonathan M. Square

A surviving *carte de visite* of a young black boy, archived at the Library of Congress, shows him in ragged clothing—not atypical for enslaved persons. We unfortunately do not know his name or history, but we can see that his threadbare attire was probably constructed from linen. We know, too, that clothing like his could be dreadfully uncomfortable, a little-recognized part of a dehumanizing and brutal reality. Cheap, coarse garments like these played a critical role in the experience of enslavement.

While cotton is the textile most associated with slavery, linen also played an important role in the day-to-day lives of enslaved people. Tracing this history is difficult due to indiscriminate terminology at the time. "Negro cloth" was used to describe any cheap textile intended for enslaved people's clothing, whether cotton, wool, linen, or some combination of these. But researchers like Eulanda Sanders have also gathered more specific evidence that African Americans wore a variety of low-quality textiles like osnaburg, a plain-weave textile sold unbleached or in white, blue, or neutral colors and named for the German city of Osnabrück where it was originally produced.

Most enslaved people received either allotments of "negro cloth," from which they were responsible for hand-sewing their own clothing, or ready-made garments, typically once or twice a year. Frederick Douglass reported that a field hand received a yearly allowance of "two coarse linen shirts, one pair of linen trousers . . . one jacket, one pair of trousers for winter, made of coarse Negro cloth, one pair of stockings, and one pair of shoes." Children too young to work received "two coarse linen shirts per year. When these failed them, they went naked" until the next year.

Wearing these inferior fabrics was often tortuous, as firsthand testimonies tell us. Harriet Jacobs was born into slavery in Edenton, North Carolina, in 1813. In her autobiography, *Incidents in the Life of a Slave Girl* published in 1861, she wrote: "I have a vivid recollection of the linsey-woolsey dress given me every winter by Mrs. Flint. How I hated it! It was one of the badges of slavery." Linsey-woolsey, as the name implies, was a strong but coarse fabric with a linen warp and a woolen or cotton weft. Jacobs well understood the use of coarse, uncomfortable clothing to mark her identity as an enslaved person.

Booker T. Washington included an especially long and harrowing description of wearing an unfinished linen shirt in his own autobiography, *Up from Slavery*:

> The most trying ordeal that I was forced to endure as a slave boy . . . was the wearing of a flax shirt. In the portion of Virginia where I lived it was common to use flax as part of the clothing for the slaves. That part of the flax from which our clothing was made was largely the refuse, which of course was the cheapest and roughest part. I can scarcely imagine any torture, except, perhaps, the pulling of a tooth, that is equal to that caused by putting on a new flax shirt for the first time. It is almost equal to the feeling that one would experience if he had a dozen or more chestnut burrs, or a hundred small pin-points, in contact with his flesh. Even to this day I can recall accurately the tortures that I underwent when putting on one of these garments.

> The fact that my flesh was soft and tender added to the pain. But I had no choice. I had to wear the flax shirt or none; and had it been left to me to choose, I should have chosen to wear no covering.
>
> In connection with the flax shirt, my brother John, who is several years older than I am, performed one of the most generous acts that I ever heard of one slave relative doing for another. On several occasions when I was being forced to wear a new flax shirt, he generously agreed to put it on in my stead and wear it for several days, till it was "broken in." Until I had grown to be quite a youth this single garment was all that I wore.

This passage is incredibly telling. One would not necessarily assume that an enslaved boy's "most trying ordeal" would revolve around the comfort of his clothing. Yet, this passage reveals the daily sartorial ignominies that enslaved people were subjected to. The uncomfortable flax shirt from his childhood was a grisly reminder of his former status as an enslaved person.

Self-emancipated enslaved persons certainly had more opportunities to buy and commandeer more extensive wardrobes. On July 3, 1784, an enslaved man named Alexander Lucas—his enslaver called him Ellick—left the estate of William Bernard Sears in Loudoun County, Virginia. An advertisement seeking his recapture described him as twenty-seven years old, five feet ten, and spoke Dutch. Like many runaway ads, the text uses disparaging language: escape, far from being viewed as rightful, is presented as a manifestation of bad character. Alexander is thus presented as "an artful cunning villain, very talkative at times, [who] will make any asservations to gain his ends."

The ad also preserves evidence of Alexander's extensive wardrobe: "The clothes he took away, are such as people of his condition do not generally wear." He absconded with "a new coarse green cloth coat, spotted with red and white intermixed; a new red striped linen coat, a new jacket nearly the same; with backs of plains, an old coarse *linen* ditto,

a pair of new white cloth breeches, a pair of yellow ditto twilled, an old pair blue cloth ditto, a new white linen shirt, cambrick neck band, two old brown shirts, a pair of black leather stockings, a pair thread ditto, an old fine hat, bound with black, an old coarse ditto, shoes and buckles and an old knapsack." One third of the ad is devoted to descriptions of fashion. The ad's emphasis on the number of garments and their quality reveals the importance of sartorial choices to the identity of free and enslaved people. In Alexander's case, the list of stolen garments can be interpreted as a direct reflection of his aspirations as a freeman.

Today, linen is valued not only for its comfort and breathability, but also for its durability. This is one reason it ended up on the backs of so many enslaved people. Clothing like Alexander's was the exception; most "negro cloths" were not refined or varied. They were durable and rough textiles that felt more like burlap. The quality and type of fabric used for enslaved people both reflected and reinforced their station on the bottom rung of the societies in which they lived. Enslaved people were reminded daily of their predicament by the very clothes on their bodies.


Old French proverb:
Il fault laver son linge sale en famille
“Don’t wash your dirty linen in public”

Scott Bodenner

My love of linen

My love of linen started around the time I was in art school. My mother-in-law, Betty Lou, held estate sales outside of Philadelphia. She typically had no luck selling Irish linen damask table cloths—they were way out of fashion—so they became my bed sheets. At first they were stiff, but after being machine washed and dried they became so magically supple. They would drape over me, in a way that made me feel sculptural.

I initially studied architecture but slowly and surely gravitated to the textile studio. One of my initial hand weaving projects involved heavy olive cotton army shoelaces as a weft, on a widely spaced warp of rough linen. During the weaving process the cloth was rigid and contained, but when washed the warps would travel and become irregular in their intervals. Once dry, both materials had enough grip that the trippy spacings remained stable.

Today I work as a designer with industrial mills and still seek to achieve those interesting effects of irregularity. Often my work involves the use of linen, a difficult fiber to work with. Any industrial weaving process creates dust, called "fly" and most modern mills have vacuum systems that ensure the fly will not build up on the work. However, linen warps and weft create much more fly than cotton does, so mills often place a long bar of beeswax across the warp at the back, to try to tamp down the fly just a little—of course, not enough to transform the warp into waxed cord. Even with the beeswax in place, a German mill I used to work for had to run its suction system double-time to keep up with linen's tons of fly.

Linen is also tricky to work with at large scale because the fiber changes with each harvest. I've been told the primary factor is differences in annual rainfall, which among other things can mean that the unbleached color is very different from year to year. The aforementioned German mill was aggravated to discover it had to reformulate its color formulas for each new lot of yarn. If they hadn't, the same dyestuffs would have resulted in wildly different colors.

The finishing of linen is also a challenge in an industrial context. Some materials, like cotton and wool, come off the loom ready to use, but freshly woven linen is stiff as a board. Washing lets the fibers relax and open up. After washing, linen feels great, although it looks rumply in a shabby chic way. To achieve a more tailored look the linen has to be stretched on a giant moving frame and steamed. This phased finishing gives us both the "hand" we love and the flatness we want. (The apt German word for this finishing process is *Voredelung*, literally, "pre-eleganting.")

Now I put together my own collection of fabrics for interiors, some of which I have designed, and some selected

from existing mill product lines. One of the latter is called *Heaviest Linen* and it really is just that. It is cottage-woven in Italy and traditionally was used—in an era before waterproofed nylon or acrylic—to cover boat sails when they were furled. This linen is actually waterproof, because when the yarns of the warp and weft get wet, they swell so much that no more water can get through. Don't use this one for your swim trunks.

My collection also includes the sheers *Moonlight*, which includes a glow-in-the-dark plastic film yarn (if you write on it with a pen flashlight, the words will glow for a few minutes), and *Rainbow*, which incorporates hologram-etched

Lurex. Both of these materials are unabashedly synthetic. And you know what plastic really needs? Nature! I make these fabrics with an all-linen warp, and for wefts, mix more linen the sparkly materials. The result has the elegance we expect from handkerchief fabric, with an eerie shimmer and glow. As my friend Jesse says, this surprising dual character is "like salt and caramel."

There is one particular linen fabric I still think about as 'the one that got away.' I did prototype it: a simple damask, with an upholstery-weight linen warp and a weft of alpaca. This literally un-kosher combination—observant Jews are careful not to use mixed linen and wool fabrics—seemed unremarkable at first. The mill I was working with had a machine that softened fabric with steam and pressure. This process gave the linen the feel of my college era bed sheets, while causing the alpaca to felt and shrink, becoming fuzzy and soft. The whole thing had a deep, luscious drape and the areas of the damask became dimensional, puffing out where the unshrinking linen was on top, concave where the receding alpaca was on the surface. Unfortunately, this seemingly magical process also resulted in reduction in width to below the standard 54 inches, which made it a challenge to bring to market. The project was put on hold but I still hope to make it happen someday along with other unexpected materials centered around the creative use of linen.

Something I dearly love is seeing my fabrics land somewhere else, often through the thoughtful plans of an interior designer. Spotting them in a magazine, in a dear friend's bedroom (especially if his adult daughter writes playful obscenities in the glowing sheer), or in one instance—weirdly—in a fancy cell phone store in LA, it really is like seeing a dear friend again. It's great to see they are doing well out on their own.


I shop
therefore
I am

When linen remembers

Deborah Valoma

". . . the green flax is full of loveliness,
Inanna, the green flax is full of loveliness . . ."

The Bridal Sheets,
Sumerian poem, ca. 2800 BCE

Linen is difficult to weave. Not supple, not pliant—it is stately and proud. It does not bend freely to the will of others and is downright defiant at times. But as we dress our looms, we are enticed by linen's whispers. We hear its origin story, we understand its stalk-straight lineage. So we come to linen with honey and dates, herbs and leaves, water and smoke, and together play the loom in a rhythm of remembering. As we weave, its archaic memory flows into our hands, its golden seeds flood us with the gift of recollection. Memory is linen's mother tongue.

Linen remembers back a thousand generations when it was wild and tempestuous, when it was plucked by its throat from the earth in the Caucasus foothills and spun in a dizzying dance. It remembers when it was tamed and planted in the company of date palms along the great diluvial rivers—between the Tigris and the Euphrates, along the Nile and the Jordan. And it remembers when it nearly drowned in the watery stench of its own decaying body and took the beating when it was turned first into fiber and then thread—that moment when they changed its name from flax to linen.

Linen's body is sturdy, its back firm, its hand strong, its skin sleek. Its muscles relax in warm water and its beauty ripens in aging. It delights in its silvery-brown complexion and defies those who attempt to sully its earthbound flesh. Linen wears no adornment, no embellishment to detract from its plain-woven and plain-spoken radiance. It resists the whitening of tamarisk ash, oil, and sunlight—however insistent. And it does not thrill, like the commoner wool, to gaudy color—however seductive.

Linen is a second skin. Draped on human bodies, it gently wicks sweat to cool and lifts dirt to cleanse. It has the power to make the tactile visible: it memorializes movements, mapping gestures of sitting, bending, and lifting. But we are not always so kind to linen. We boil it over fire, soak it in lye, and press it with muscle and heat and stone in a futile attempt to obliterate our sometimes sordid deeds. But linen rebels against such acts of subjugation. It defiantly writes the next chapter of our memoirs with its creases and folds and stains, telling secrets whether we consent or not. Linen is a faithful storyteller.

Heavy with the pleasure of gravity, linen falls. It sinks into horizontality, it crumples into a topography of lion-colored hills and river-cut valleys, as if in commemoration of its indigenous landscape. There, linen's feet sink into warm, wet sediment, its waist-high stalks blow in the breeze, and its short-lived blue flowers ripple like water. Linen's rival

wool is coarse and impure, sheared from the backs of mindlessly bleating sheep, following their masters in the drylands. But linen bows to no one; servants laboriously tend it because it alone is worthy of draping sacred objects, spaces, and bodies—mortal and immortal.

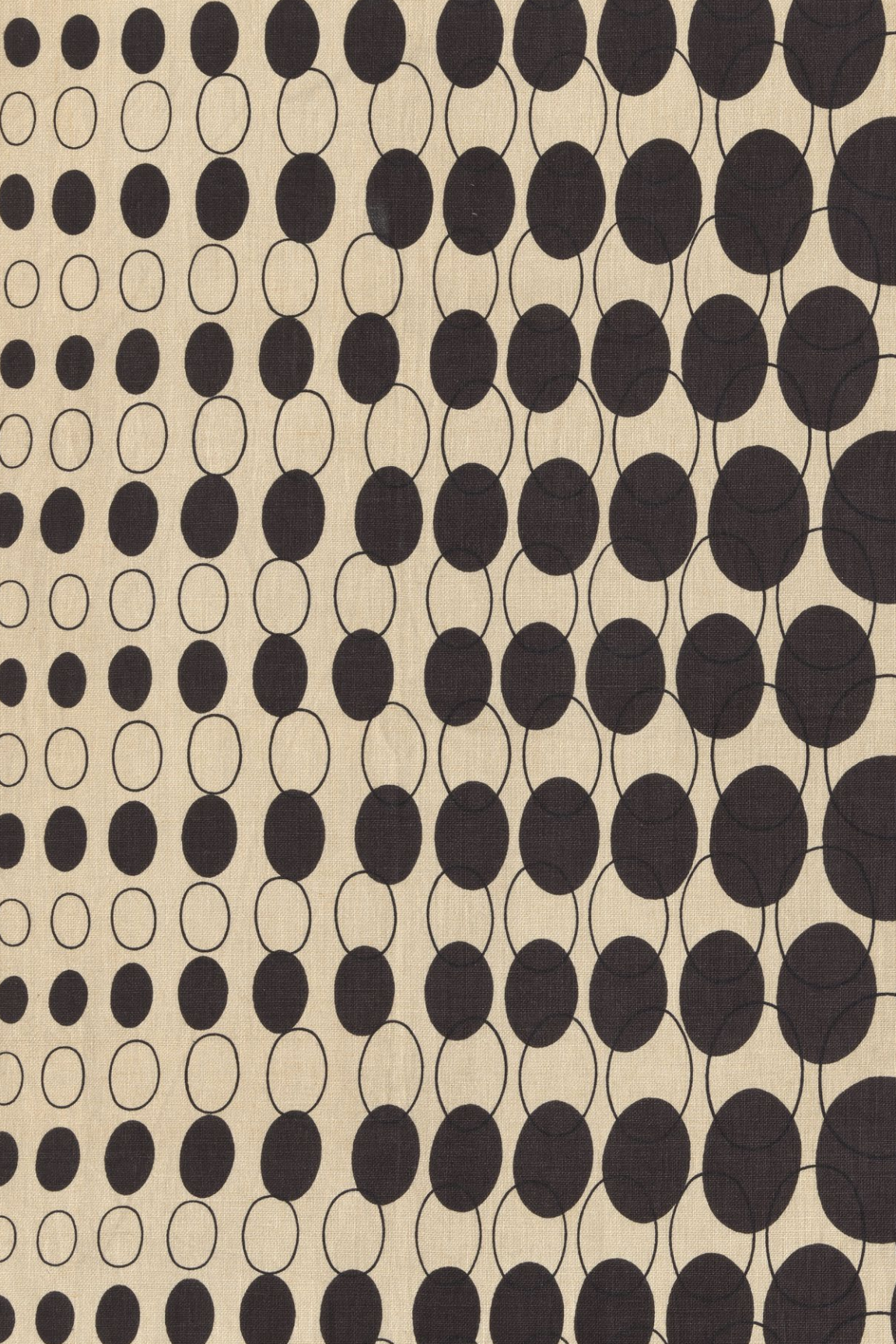
Linen has been called by many names in many homelands: eight in the Torah and twenty-six in ancient Egyptian. In Sumerian they called linen *gada*—the flaxen cloth of protection. There in the Land Between Two Rivers, it was divine cloth, woven by acolytes in sanctuary workshops. It, and it alone graced their exalted places and clothed Inanna, who walked flanked by lions. It alone adorned her mosaic temple at Uruk, the House of Heaven for the Queen of Heaven, with lengths of its sacred simplicity, perfumed with aromatics, mediating between the mundane and the divine.

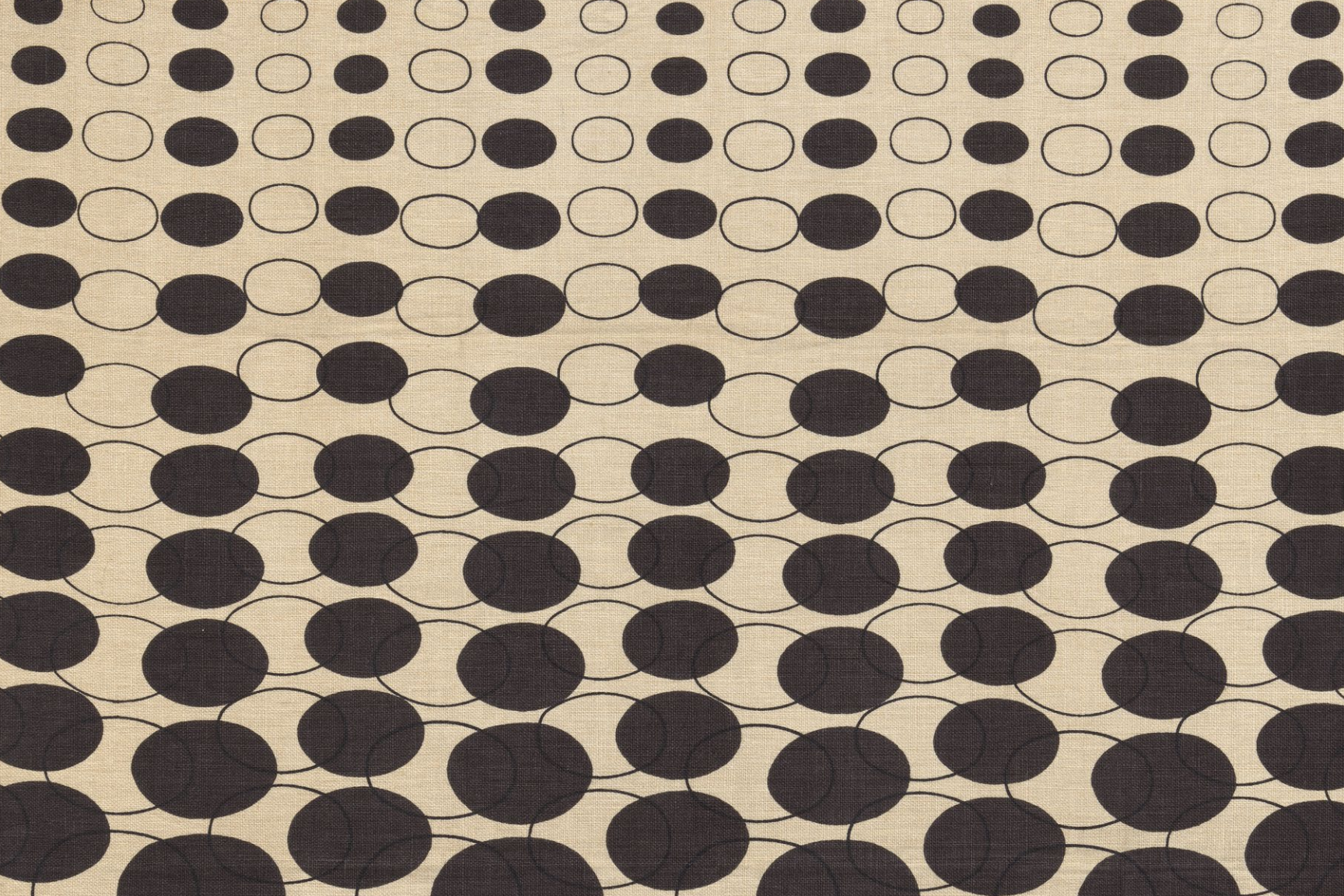
Further west in the Land of Milk and Honey, linen alone draped the statues of the Canaanite Asherah, goddess of weaving and the sacred palm. It was woven along the marshy Jordan and its tributaries in the fertile valley of the springs. There it grew green; it swayed to the pulse of buzzing bees and was nourished by the rotting sweetness of fallen dates. Following the meandering river downward to the salty blue basin, it alone covered the holy scrolls and enfolded the dead in caves tucked in the goat-trodden cliffs above the western shores of the Dead Sea.

And further west, in the Land of Linen, it bound the bodies of the departed with boundless lengths of its own body because it alone was ritually clean. With the help of Egyptian Tayet, the cloth-carrying goddess of funerary rites who carried the dead to heaven, linen alone purified remains for entombment—winding extremities, wrapping organs, filling cavities. Linen circled the lifeless with Book of the Dead incantations to deify the deceased and ensure recollection of their own names.

Recalling the dead, calling in the dead: linen has held postmortem bodies in an intimate embrace for millennia. At Çatalhöyük it swaddled an infant, rocking tiny bones in a sooty grave for nine thousand years. In the heights west of Jericho, linen cradled the warrior in his cave for six thousand years. At the necropolis at Thebes under the reign of the Egyptian queen Hatshepsut, it enfolded the embalmed remains of Hatnofer, and folded within a chest, kept company with her in the afterlife for more than three thousand years. And in the stony hills of Jerusalem, where the scent of warm wind blows through pines, linen enshrouded the corpse of Jesus with spices as was the custom two thousand years ago.

Linen wraps, winds, binds mortal bodies—skin to skin, flesh to flesh. It merges with decomposing, darkening tissue and absorbs seeping bodily fluids. It is up to what some might regard a gruesome task because it unflinchingly accepts its mission. It does not retreat to purposeful forgetting, the balm of the inconsolable. Linen sings out remembrance—the song of the dead.





Contributors

Elaine Reichek is prominent feminist and conceptual artist known for her exploration of the embroidered needlework sampler. Working by hand and machine for over five decades, she has remained committed to media traditionally associated with women, using thread as a core element in her work. Reichek lives and works in New York and has exhibited extensively in the United States and abroad. Her work is in various collections, including New York's Museum of Modern Art, The Jewish Museum, Whitney Museum of American Art, Museum of Arts and Design, and the Brooklyn Museum; the Museum of Fine Arts, Boston, among many others.

Gregory S. Aldrete is Professor of Humanistic Studies and History at the University of Wisconsin, Green Bay. Both at his university and nationally, he has been presented many awards for his research and teaching of the ancient world. Aldrete has published several important books in his field, including *Unraveling the Linothorax Mystery: Reconstructing and Testing Ancient Linen Body Armor* (with S. Bartell).

Andrew Hamilton is an educator and scholar of the material culture and built environment of the Americas, specializing in the Andes. Currently Associate Curator of Arts of the Americas at the Art Institute of Chicago, he is interested in artifacts of all media, but especially ones made from biological materials that trace the intersection of art history and natural history. As a practicing artist, he frequently illustrates his own publications.

Scott Bodenner is a textile artist and designer based in Brooklyn, New York. Known for using craft-based techniques to design woven prototypes for manufacturing, he has collaborated with numerous industrial firms. Now he makes for his own fabrics, The Bodenner Collection, weaving together traditional and unconventional materials. From textiles that use recycled fibers to discarded materials like recycled cassette tape ribbon, all are unique and some even glow in the dark.

Deborah Valoma is an artist, writer, and professor. Her work considers textiles through multiple theoretical lenses including embodiment, materiality, ephemerality, and indigeneity. Deborah is currently working on The Armenian Postmemory Project, a multi-year interdisciplinary project that began when she inventoried a collection of heirloom textiles inherited from her grandmother—most made by her foremothers in villages in Ottoman Turkey and the Armenian diaspora. Combining research, archiving, and responsive making, the project addresses the role of textiles as signifiers of identity and agents of cultural continuity.

Jonathan M. Square is a writer and historian specializing in fashion and visual culture of the African Diaspora. His current book project, provisionally titled Sartorial Resistance and the Politics of Redress in the Black Atlantic, frames how dress and adornment served as a form of radical self-determination and resistance among enslaved peoples. He is currently a faculty member in the Committee on Degrees in History and Literature at Harvard University.

Credits

IV. *"La Toile de Penelope—Penelope at Her Loom, 1731"* by Bernard Picart. Private Collection.

14. Flax Field, Debb Collins.

16. Elaine Reichek, *Untitled #12.* 1973. Gesso, acrylic, thread and graphite on canvas. 24 x 14". Photograph by Tom DuBrock. Private Collection.

18. Elaine Reichek, Detail of *Sampler (Starting Over).* 1996. Hand embroidery on linen. 8.75 x 67.5". Photograph by Adam Reich. Collection of the Museum of Modern Art, New York.

19. Elaine Reichek, *Line Is Like the Thread*, 2008, Hand embroidery on linen, 24.5 x 19". Photograph by Paul Kennedy, Collection of Ellen Susman, Houston, TX.

20. Elaine Reichek, *A Daughter (Brit Bennett)*, 2019, Hand embroidery on linen, 23 x 26". Photograph by Paul Kennedy, Private collection.

20-21. Elaine Reichek, *Sampler (Starting Over).* 1996. Hand embroidery on linen. 8.75 x 67.5". Photograph by Adam Reich. Collection of the Museum of Modern Art, New York.

21. Elaine Reichek, *Sampler (Ovid's Weavers),* 1996, Hand embroidery on linen, 19.25 x 35". Photograph by Adam Reich, Whitney Museum of American Art, New York; gift of the Estate of Melva Bucksbaum.

22. Elaine Reichek, *Sampler, (Scarlet Letter),* 1996, Hand embroidery on linen 26.5 x 12". Photograph by Paul Kennedy. Museum of Fine Arts, Boston; The Hayden Collection—Charles Henry Hayden Fund.

23. Elaine Reichek, *Ariadne's Lament*, 2009. Digital embroidery on linen, 27.5 x 26.5".

24. Linen day dress, ca.1901–1902. Made by Sarah Leonard and Minnie Leonard, Minnesota Historical Society, 6396.36.1A-B.

25. Stays, ca. 1730–1750, England, linen and cane, Noel Paton Collection, National Museums Scotland. A-1905.983.

26. Detail of Achilles on the Eponymous Attic Amphora of the Achilles Painter, copyright, Smith Archive / Alamy Stock Photo.

29. Gregory S. Aldrete.

30. Detail of Alexander Mosaic, Museo Archeologico Nazionale di Napoli, photo copyright Adam Eastland / Alamy Stock Photo.

32. *Milkweed*, 2021. Andrew Hamilton.

37. Homegrown, hand-processed, handspun milkweed thread. Photo, Andrew Hamilton.

38. William Hincks, 1752–1797, Plate IV: *representing the common Method of Beetling, Scutching and Hackling the Flax*, 1791, Stipple engraving. Courtesy, Yale Center for British Art, Paul Mellon Collection.

40. *African American boy, possibly a slave, holding two buckets*, Isaac Haas, photographer & dealer in stereoscopic views, Green Cove Springs, Fla. Courtesy, Library of Congress, prints and Photographs Division, [LC-DIG-ppmsca-53047].

43. *George Washington's Cook*, attributed to Gilbert Stuart, ca. 1795–97. Copyright Museo Thyssen-Mornesmisza, Madrid. His name was Hercules.

47. Woman Worker And Various Styles Of Arrow Collars, United States. Photographed by Geo R. Lawrence Co., 1906, Wallach Division Picture Collection, The New York Public Library.

48. From left to right: Heaviest Linen 1002, Moonlight 1000, Rainbow 1012, Moonbeam 1001, and Ottoman Ikat Velvet 1007, The Bodenner Collection. Photograph by Fabio Toblini.

50, 51, 53. Scott Bodenner weaving Mix Tape in Greens. Photograph by Graham Friedman.

53. Detail of Rainbow 1012, The Bodenner Collection. Photograph by Graham Friedman.

55. Deborah Valoma, shroud, 2019, plain weave, unbleached linen, 3 x 10'. Photograph by M. Lee Fatherree, courtesy of the artist.

57. Remains of a linen shroud with a knot above the right shoulder of the deceased, Ein Gedi, ca. 2nd–1st centuries BCE, 13 x 9 cm. Photograph by Clara Amit, © Israel Antiquities Authority.

58. Wooden chest filled with folded linen, tomb of Hatnofer, ca. 1492–1472 BCE, height of chest 17 5/16". Metropolitan Museum of Art, Rogers Fund, New York. Photograph courtesy of Creative Commons.

60, 61. Joel Robinson (1915-2012). Ovals textile, ca. 1951. Manufacturer: L. Anton Maix Fabrics, New York, N.Y. Screenprinted linen. 34 x 50". Committee on Architecture and Design Funds. The Museum of Modern Art, New York, NY, U.S.A. Digital Image © The Museum of Modern Art/Licensed by SCALA / Art Resource, NY.

64. Common Flax (*Linum usitaissimum*), Bulgaria, Europe. Alamy Stock Photo.

68. *The monuments of Egypt and Nubia designed by the Tuscan scientific-literary expedition in Egypt*; distributed in order of subjects interpreted and illustrated by Doctor Ippolito Rosellini—Lasinio, Carlo, 1759–1838 is the engraver.

Illustrations, Wynne Patterson.