

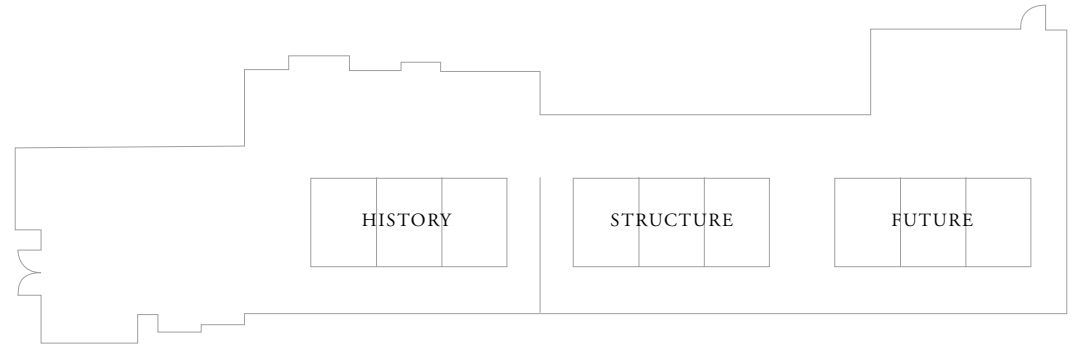
KUMIHIMO

The Art of
Japanese
Silk Braiding
by

DOMYO

December 11, 2021–March 6, 2022

Presented by JAPAN HOUSE Los Angeles
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KUMIHIMO | The Art of Japanese Silk Braiding by DOMYO

Kumihimo are braided cords made by tying off three or more strands of thread at one end and diagonally overlapping the strands in a consistent, uniform fashion. Complex braiding can contain more than 140 strands of thread; the simplest form is the so-called “French braid”—the well-known three-strand gathered plait often used to braid long hair. Braiding differs from weaving, in which a warp and weft intersect and alternately overlap at right angles to form a flat piece of material, and from knitting, in which stitches are made with yarn in consecutive rows to similar effect. Braided cords are both strong and elastic due to the structure of the braid and the tying methods employed. For centuries, they have been highly valued in many parts of the world as tools to bind and hold objects.

In Japan, pottery from the early Jōmon period (five to six thousand years ago) decorated with impressions of a primitive form of *kumihimo* has been excavated in Tokyo, and an actual cord of braided tree bark from the same period was discovered in the Sannai Maruyama site in Aomori prefecture. However, *kumihimo* craft in Japan experienced its greatest growth and refinement from the Asuka period (592–710) onward.

The nation of Japan was founded in the sixth century, and as the country took its place in the international community of East Asia, a variety of cultures, faiths, advanced technologies, and techniques for braiding high-quality *kumihimo* were introduced from the continent. For some 1,400 years, the Japanese have used silk thread in the conception and production of the world’s most complex braided cords, featuring them in a wide range of contexts, from furnishings for arms and armor to ceremonial court dress and the performing arts to decorative elements on portable shrines and other religious objects.

Many Japanese people today will recognize the type of *kumihimo* called *obijime*—the cord that secures the sash of a traditional woman’s kimono. Less well known are the industrial applications of cords that incorporate the *kumihimo* structure and leverage the variability in fiber orientation angles to maximize strength and rigidity. By replacing silk with carbon fiber, designers are employing *kumihimo* techniques in aerospace, architecture, athletic equipment, and medical devices, such as artificial limbs.

This exhibition not only offers a broad overview of the historical development and beautiful designs of *kumihimo* in Japan, but it also explains the complicated structure and production process of *kumihimo* and explores future possibilities that build on and break free from tradition.

Yusoku Kumihimo Domyo

Yusoku Kumihimo Domyo, planner and organizer of this exhibition, was founded in 1652 in the city of Edo (modern-day Tokyo) and today has a shop located in the Ikenohata area of Ueno. As a cord merchant in the Edo period (1603–1868), Domyo primarily produced cords for sword scabbards and handles, and from the Meiji period (1868–1912) onward, it focused on *obijime* for kimono sashes and *haorihimo* for tying the open-chested *haori* jacket. To this day, all of the company's products are hand-dyed and braided by its in-house artisans. Another important aspect of Domyo's work is to survey, research, restore, and reproduce historical *kumihimo*, both at the behest of the Office of the Shōsōin, Imperial Household Agency, and for various temples, shrines, and museums throughout Japan. These activities have yielded a broad wealth of *kumihimo*-related techniques, knowledge, and documentation that is proving useful in the academic study, preservation, and advancement of *kumihimo* technology.

Kumihimo of the World

Beyond Japan, braided cords have been made and used in many parts of the world. Created from locally sourced materials such as silk, hemp, or animal hair, the cords have been employed in a variety of forms, from the ornamentation of clothes and household items to slings for throwing stones to ropes for securing livestock. There is a particularly long history of using *kumihimo* in South America. In fact, a textile fragment discovered in the Guitarrero Cave of Peru and carbon-dated to 8650–5780 BCE is the oldest known section of a flat *kumihimo* cord.

- Sling braid (Tibet, present day)
- Yak neck ornament (Bhutan, present day)
- Braid decoration (India, present day)
- Skirt braid decoration (Russia, present day)
- Mat braid for wrapping the dead (Ainu people, Japan, present day)
- Sling braid (Peru, 10th century)

| HISTORY

In Japan, the history of *kumihimo* began with the importing of techniques from continental Asia. Through technical innovations, an advanced, uniquely Japanese phenomenon evolved with highly refined, sophisticated designs. One early development is the standard square cord (*kakugumi*), a thick type of *kumihimo* that is used as a base element to create more robust and complicated patterns. Joining single cords to each other increases the width and depth of the final cord. These individual cords are not sewn together, as in the ancient *kumihimo* of Central Asia; instead, they are bound together using carefully devised braiding techniques that make the individual elements of a single *kumihimo* inseparable.

For example, one *kakugumi* cord (*kakuyatsugumi* or *Naragumi*) could be combined with a second *kakugumi* to produce a two-part *kakugumi* called a *kanmurigumi* or *Mitakegumi* cord. Combining four *kakugumi* cords produces the four-part *kakugumi* or *Chūsonjigumi*, while combining six produces the *Shitennōjigumi*, and combining eight produces the double-faced *kikkōgumi*.

The first section of this exhibition features replicas of well-known historical Japanese *kumihimo*, dating from the eighth to the nineteenth centuries. Whether used for mounts to hang swords from the hip or for tying handscrolls, *kumihimo* have been structured and designed for specific purposes throughout history.

Kumihimo throughout Japanese History

How have the structures and designs of *kumihimo* developed in Japan over time? Domyo has conducted detailed surveys of historical *kumihimo* that remain in temples and shrines, including the Hōryūji temple and the Shōsōin repository in Nara, as well as in museums throughout Japan. Replicas of these *kumihimo* are exhibited here.

Early Jōmon period (4000–3500 BCE)

During this time, simple, primitive *kumihimo* existed, made by braiding three to four strands of tree bark or plant fiber.

Asuka–Nara periods (592–784)

Numerous early Japanese *kumihimo* modeled on continental Asian cords remain in the Hōryūji temple and the Shōsōin repository in Nara. *Karakumi* and *sasanamigumi* braids composed of wool have been excavated from sites in Central Asia dating to 500–300 BCE, tracing the origins of these techniques to the Silk Road. These examples demonstrate that works that served as the foundation for more complicated braids of later periods all entered Japan at the same time. Techniques of simple, elegant color schemes with alternating light and dark tones were widely employed.

Flat cord types (*hiragumi*): *karakumi*, *sasanamigumi* (*nijōjiku ikkengumi*), *Andagumi* (*ikkengumi*), *Kōraigumi* (*nikengumi*), *sangengumi*, *yonkengumi*

Square cord types (*kakugumi*): *kakuyatsugumi*, *Naragumi*

Round cord types (*marugumi*): None

Heian–Kamakura periods (794–1333)

During the Heian period (794–1185), *kumihimo* were no longer modeled on Chinese examples, but were devised to suit Japanese sensibilities. More complicated braiding techniques appeared, and refined, uniquely Japanese *kumihimo* were produced in what could be called the golden age of *kumihimo*. *Kumihimo* were used in a variety of contexts, such as the clothing of court nobles, decorative interior furnishings, musical instruments, and religious implements for temples and shrines. From the mid-Heian period, as members of the warrior class attained aristocratic status and prominence, *kumihimo* also came to be widely used in arms and armor. Few of these cords remain, however, and it is primarily the items dedicated to temples and shrines that provide a glimpse of the forms and techniques of the time.

Flat cord types (*hiragumi*): *Itsukushimagumi*, *tobaraigumi*, *ichimai Kōraigumi danzome*

Square cord types (*kakugumi*): two-part *kakugumi* (*Mitakegumi*), four-part *kakugumi* (*Saidatjigumi*, *Chūsonjigumi*), six-part *kakugumi* (*Shitennōjigumi*), horizontal four-part *kakugumi* (*kikkōgumi*), eight-part *kakugumi* (double-faced *kikkōgumi*)

Round cord types (*marugumi*): *Chion-ingumi*

Muromachi period (1336–1573)

The demand for *kumihimo* extended from aristocrats and warriors to the common people, and technical progress stagnated. Vast quantities of arms and armor were required as civil unrest and war spread, resulting in the increased need for practical, robust *kumihimo* that could be braided quickly and easily.

Flat cord types (*hiragumi*): no new designs

Square cord types (*kakugumi*): *kanmurigumi*

Round cord types (*marugumi*): *maru Genjigumi*

Momoyama–Edo periods (1573–1868)

In the Edo period, a new type of *takadai* stand for braiding was invented, leading to the development of a rich variety of *kumihimo*. This advance was brought about by lower-ranking members of the warrior class, who, during this time of peace, did not need to engage in battle and were drawn to the techniques of *kumihimo* as supplementary sources of income. During the Edo period, *kumihimo* used in sword fittings, such as cords to mount scabbard, were in great demand.

Flat cord types (*hiragumi*): *ji-naikigumi*, *hon kainokuchigumi*

Square cord types (*kakugumi*): None

Round cord types (*marugumi*): None

Meiji period and beyond (1868–present)

After the newly founded Meiji government issued a prohibition on swords, the demand for *kumihimo* sword fittings all but disappeared. As a result, *kumihimo* were used in traditional Japanese dress as *obijime* to secure kimono sashes and as cords to close the open-chested *haori* jacket. However, as the shift toward Western clothing continued after World War II, the market for *kumihimo* diminished further.

Flat cord types (*hiragumi*): *kawari kainokuchigumi*

Square cord types (*kakugumi*): None

Round cord types (*marugumi*): None

Domyo conscientiously strives to transmit the techniques of the past, while searching for new possibilities for *kumihimo* that suit the modern world.

- Ornamental braid, from the Hōryūji temple (*Karakumi*, 7th century; reproduction)
- Beaded sash, from the Hōryūji temple (8th century; reproduction)
 - Replica of the original sash in its current condition
 - Beaded sash pattern
 - Color scheme
 - Bead color sample
- Braided sash, from the Shōsōin repository (*Andagumi*, 8th century)
- Braided sash, from the Shōsōin repository (*Andagumi*, 8th century)
- Braided sash, from the Shōsōin repository (*sasanamigumi*, 8th century)
- Braided sash, from the Shōsōin repository (*yonkengumi*, 8th century)
- Braided sash, from the Shōsōin repository (*Naragumi*, 8th century)
- *Konghou* harp cord, from the Shōsōin repository (*Naragumi*, 8th century)
- Braided sash, from the Shōsōin repository (*Andagumi*, *ichimai Kōraigumi*, 8th century)
- Braided *Hirao* court sash with space-dyed light blue threads (*karakumi*, 8th–12th century)
- Braided *Hirao* court sash with space-dyed yellow threads (*karakumi*, 8th–12th century)
- *Shutara*, a decorative knotted cord from the *kasaya* robe of Buddhist priest, from the Kyōōgokokuji temple (*kakuyatsugumi*, 8th–12th century)
- Braid found in the grave of Fujiwara no Hidehira, from the Chūsonji temple (*Chūsonjigumi*, 12th century)
- Scroll cord from a complete collection of Buddhist scriptures, from the Chūsonji temple (12th century)
- Scroll cord from the *Lotus Sutra*, from the Sensōji temple (*ichimai Kōraigumi*, 12th century)
- Decorative knotted braid from a portable shrine, from the Tomobuchi Hachiman shrine (*Tomobuchigumi*, 12th century)
- Cord for hanging a talisman, from the Shitennōji temple (*Shitennōjigumi*, 12th century)
- Cord for hanging a talisman, from the Shitennōji temple (*Shitennōjigumi*, 12th century)
- Tying cord for the protective cover of a Buddhist sutra, from the Jingoji temple (*ichimai Kōraigumi*, 12th century [1149])
- Scroll cord from a sutra offered by the Heike clan, from the Itsukushima shrine (*Itsukushimagumi*, 12th century [1164])
- Cord from a brocade scroll pouch placed inside a sculpture of the Buddha Sakyamuni, from the Saidaiji temple (*Saidaijigumi*, 13th century [1249])
- Cord from a brocade scroll pouch placed inside a sculpture of the Buddha Sakyamuni, from the Saidaiji temple (*Naragumi*, *Mitakegumi*, 13th century [1249])
- Curtain cords from a miniature shrine, from the Saidaiji temple (*Itsukushimagumi*, *tobaraigumi*, 13th century [1280])
- Braids representing internal organs placed inside a sculpture of Zendō Daishi, from the Chion-in temple (color-switch *karauchi*, 13th century)
- Belt from a set of laced armor, from the Bushū Mitake shrine (double-faced *kikkōgumi*, 13th century)
- Braid from a sacred costume, from the Kumano Hayatama shrine (double-faced *kikkōgumi*, 14th century)
- Scroll cord for a letter by Minamoto no Yoritomo, from the Tōdaiji temple (*Itsukushimagumi*, 14th–15th century)
- Scroll cord from the *Lotus Sutra*, from the Hyakusaiji temple (*Itsukushimagumi*, 14th–15th century)
- Cord from a small drum, from the Kasuga shrine (*karauchi*, 16th century)
- *Sageo* cord sword furnishing, pattern from the Mano family archive (*Genjiuchi*, 18th–19th century)
- Armor lacing, pattern from the Shikasūyō military encyclopedia (*odoshiitouchi*, 19th century)
- Patterned *sageo* cord sword furnishing (*ayadashi*, 18th–19th century)

Historical Documents (Domyo collection)

This selection of publications and documents from the Edo and Meiji periods offers instructions for braiding *kumihimo* and combining differently colored cords to bind platelets of armor.

- Braiding technique for a *Hirao* court sash
- Eight sets of armor in the Itsukushima shrine
- Instructions for braiding from the Mano family archive
- Instructions for braiding from the Mano family archive
- Lacing pattern samples for *Odoshi* armor
- Design for a custom-ordered sword handle braid
- Color samples for sword handle braid
- Encyclopedia of knot-tying techniques

STRUCTURE

From simple to complex, the structures and compositions of *kumihimo* developed in a unique way in Japan. The work is so fine and detailed that it is difficult to visually understand. These enlarged models of braiding frames help to highlight the structure and clarify the process.

- Installation
 - Marudai* (round stand)
 - Mitakegumi* braid
 - Glass weight

The *marudai* is a round disk mounted on legs that makes it easy to braid a variety of *kumihimo*, even for beginners. A cord is braided below the disk by passing thread spooled on bobbins through the center and crisscrossing the threads in a regular, predetermined order.

- *Yotsugumi* (four-strand braid)
- *Maruyatsugumi* (round eight-strand braid)
- *Karauchi* (round sixteen-strand braid)
- *Naragumi*
- *Kanmurigumi* (crown braid)
- *Maru Genjigumi*
- *Mitakegumi*
- Color-switch *Mitakegumi*
- *Karakumi* (old Chinese braid)

- Installation
 - Takadai* (tall stand)
 - Kōraigumi* braid
 - Glass weight

The *takadai* allows for the braiding of more complex *kumihimo*. It is particularly well-suited for the braiding of cords with a high row count, like flat cords. Threads are laid out to the right and left, and cords are braided by moving the threads over each other and beating them tightly together using a bamboo tool called a *hera*.

- *Sasanamigumi* (three-core strand, single layer 1-1)
- *Unegumi* (ribbed)
- *Honkainokuchigumi* (traditional seashell lip braid)
- *Kikkōgumi* (tortoise shell braid)
- *Kainokuchigumi* (seashell lip braid)
- *Kōraigumi* (double layer 2-2 twill)
- *Andagumi* (single layer 1-1)
- *Ji-naikigumi* (double layer 1-1)
- *Kamakuragumi*

FUTURE

Most people in Japan today recognize *kumihimo* in the form of the *obijime* cord used to bind the sash, or *obi*, of a woman's kimono. However, beyond this conventional perception—the adornment of traditional Japanese dress—the function and design of *kumihimo* can be applied to a variety of products and even architecture.

Yusoku Kumihimo Domyo

For over one hundred years since the Meiji period, Domyo has conducted surveys of historical *kumihimo* throughout Japan and has completed the restoration and replication of nearly all *kumihimo* known in the country today. Building on the technological expertise gained from over 1,500 years of development in Japanese *kumihimo*, Domyo has created entirely new compositional structures.

Kumihimo with New Structures

100 percent silk, gold thread

The three *kumihimo* introduced here were designed in the twenty-first century, but they are technically based on the most complicated historical four-layered structures of *kumihimo*, such as *Chūsonjigumi* and *Shitennōjigumi*. They were made to have the grace and structural beauty of classical cords but with contemporary designs and functionality that will lead to new endeavors in the future.

The cross-sectional profiles of *kumihimo* are determined by the number of lateral rows and the number of vertical layers. Cross-sectional diagrams make it easier to understand the structure of each cord. In the diagrams, the points where the squares contact one another indicate the points in the cord where threads are hooked in the braiding process and linked together.

Shiho

2014

6 rows, 4 layers (*sangengumi*)

This is a four-layered *sangengumi* braid with alternating sections of deep blue and white visible on the faces, between which run gold and two-colored threads that only appear on the faces where the blue and white sections alternate. However, these differently colored threads form a beautiful composition on the sides of the cord. This presents a new aesthetic in *kumihimo*, where beauty is expressed not only on the faces but also on the sides.

Kizahashi

2014

12 rows, 4 layers (*nikengumi*)

This cord is composed of four layers of varying widths braided in the *Kōraigumi* fashion—lined up on one side and braided together. Due to the nature of the tools needed to make *kumihimo*, only cords with bilateral or point symmetry have been produced. By adjusting the number of bobbins placed on the sides of a *takadai* stand, however, for the first time a cord with a trapezoidal cross section has been created. The name “*Kizahashi*” refers to a wide set of stairs used to ascend a special platform or podium in classical architecture.

Yonsō Seikaiha

2016

18 rows, 4 layers (*ikkengumi*)

One of the best-known designs produced by Domyo is a two-layered cord with alternating sections of color that terminate diagonally. This new cord adds two more layers to the original design. However, although it is a four-layer construction, the cord is wide, and its cross section shares the same aspect ratio as an ordinary flat cord. On its surface, the different colors of each layer appear in alternating sequence.

Akira Hasegawa

Born in Ibaraki prefecture in 1989, Akira Hasegawa is a garment modelist who incorporates *kumihimo* into his work with antique Western garments. For many years, he worked as a modelist for an apparel company but has been independent since 2016.

“I am working to convey the emotions of one hundred years ago, one hundred years later. What moves me is the structural beauty and feeling of comfort found in old clothes. To uncover the source of this beauty, I deconstruct garments and create models that make their inner structures visible. And from these individual parts, I draw out patterns and make reproductions to know how they feel when worn. To share the results of this investigation, I organized a solo exhibition titled *Demi Deconstruction*, which I would like to bring overseas in the future.”

Clothes and Reconstructing *Kumihimo*

Medical Officer Tunic

Antique linen, melton wool, *kumihimo*

2021

This tunic was worn by a French medical officer around 1890. The characteristic decorations on the chest area are known as “Russian braids,” but to the Japanese eye this type of clothing would be called “ribbed.” Russian braids were originally employed to protect the internal organs of cavalymen fighting on the frontlines, but Napoleon Bonaparte broadened the use of the design. It is said that Napoleon’s army was the first to have an organized emergency medical unit. These officers would sort wounded soldiers according to their injuries and administer the appropriate treatments. The main color in their uniforms was purple, so this color was used for the collars and cuffs. One hundred-year-old linen from France and Belgium is incorporated into the medical officer tunic made for this occasion, and the overall form is created with a patchwork of antique and contemporary textiles, using thread extending from the *kumihimo*.

Victorian Dolman

Antique linen, melton wool, *kumihimo*
2021

The Victorian dolman was an outer garment worn by women in the nineteenth century, and the shape of its eye-catching sleeves is a characteristic feature. In pattern books such as *The Self-Balancing System of Cutting Ladies’ Garments*, published in the United States in 1891, these sleeves are referred to as the “Japanese Sleeve,” suggesting that they may have been inspired by the Japanese kimono in the time of Japonisme. The sleeve extends from the back and incrementally shapes to the arm, creating a beautiful, timeless form.

Example of a Disassembled Medical Officer Tunic

(Left half of a late 19th-century military uniform)
Canvas, 2021

Why do military uniforms project such bravery? Through disassembly, the sturdy construction of the framework around the chest is revealed. The brown textile extending from the chest area is made of hemp fiber. It begins at the navel and covers the entire chest before splitting into two parts, one going over the shoulder toward the shoulder blade and the other passing under the arm toward the shoulder blade. The stitching of this area is also fascinating, upon careful inspection it appears as a single, continuous stitch. Looking inside, there is a thick, cushion-like layer of cotton in place. A full and striking chest was built up by concealing this layered interior.

Example of a Disassembled Victorian Dolman

(Left half of a late 19th-century woman’s garment)
Canvas, 2021

The unique construction of the sleeves that extend from the back of this garment can be understood in great detail through disassembly. The pattern is complicated, and the sewing process difficult. While the sleeve of a Victorian dolman is indeed just that, the pattern must also include the structure of the back. It is laid out so that a single piece of material runs from back to front, allowing the hands to clasp around the navel area. The pattern for the front of the sleeve is made by taking measurements with the elbow bent. The body of the garment is also made in a fascinating way and does not include the area under the arm. Instead, elastic bands run from both sides of the body and converge in the back, supporting the entire front of

UTokyo Tachi Lab × Yusoku Kumihimo Domyo

Seri Nishimoto, Fuki Ono, Tomohiro Tachi, Kiichiro Domyo

Tachi Lab researchers at the University of Tokyo create deployable structures and cellular materials with unique properties based on the geometries of origami, linkage, differential geometry, polyhedral packing, and so on. Through both the observation and the creation of a variety of phenomena, they attempt to understand the nature of form and function.

Seri Nishimoto

Department of Architecture, Graduate School of Engineering, The University of Tokyo
Nishimoto’s research is focused on the creation of three-dimensional structures using the mathematics of geodesics.

Fuki Ono

Department of Architecture, Graduate School of Engineering, The University of Tokyo

Ono's research is focused on the generation of surfaces with negative curvature through the shear deformation of grids.

Tomohiro Tachi

Associate Professor, Graduate School of Arts and Sciences, The University of Tokyo

Tachi specializes in computational origami, structural morphology, and computational fabrication, and has developed origami design software such as Origamizer and Freeform Origami.

Branching and Merging of *Kumihimo* Based on the Geodesics of the Tetrahedron

Flat silk cords of six different colors

2021

In a cord braided in the *karauchi* manner, the simplest form of round braid, constituent strands pass from one end to the other in both a clockwise and a counterclockwise spiral. This strand movement can be seen as the geodesics of a cylindrical surface (i.e., the generalization of a straight line drawn on a curved surface).

Here, a taut, curved structure floats in space, in which twelve flat cords of six different colors are further braided into cylindrical *karauchi* braids that merge into and branch out of one another. These *karauchi* braids come from four directions and converge to form a tetrahedron, created with a *kagome* weaving technique based on geodesic division. Each cord enters the tetrahedron via one *karauchi* braid and leaves through another. This collaboration between Domyo and Tachi Lab mathematically expands the potential of *kumihimo* to create new graphical patterns, three-dimensional structures, and functional systems.

A regular tetrahedron can be triangulated along its geodesics. In this case, the grid can contain a twist, and the division can be expressed as a pair of non-negative integers (a,b). If the equilateral triangles of the geodesic division are substituted by a *kagome* weave pattern, a closed tetrahedral basketry is created. By the nature of geodesics, each constituent cord does not intersect itself but cycles around and back. In particular, when two integers (a,b) are prime to one another, the tetrahedron can be made with only three cords.

This work is composed of *kagome* tetrahedrons with *karauchi* braids connecting at each corner. What if a single cord in the *kagome* tetrahedron becomes four cords that connect the vertices: two cords spiraling clockwise and two cords spiraling counterclockwise. This work is a curved structure that employs a small tetrahedron (3,1) and a large tetrahedron (2,7) to merge and branch *karauchi* braids coming from six directions. The paths around the tetrahedrons change depending on the integer pair (a,b), but a single cord always passes from one vertex to another without intersecting itself or coming back.

