

WEBSITE AUDIO TOUR OF THE TEXTILE MUSEUM, YUKARI

Hello! And welcome to the Textile Museum, Yukari.

The Textile Museum, Yukari brings Kiryu's weaving history to life by providing looms which can actually be operated by visitors. Viewing the materials exhibited in the showcases and operating the machines themselves gives you the opportunity to follow in the footsteps of Kiryu's textile history through the ages. If you wish to try the machines, please ask for assistance from one of the museum staff members.

The museum preserves, maintains and displays ancient to modern weaving implements, and showcases the techniques for the cultivation of silkworms and production of silk yarn. In addition, the museum provides opportunities to experience firsthand the traditional techniques of indigo dyeing.

Yukari also operates a school for dyeing and hand-weaving. Experienced artisans teach classes from introductory through advanced levels.

The museum shop sells items of clothing, traditional crafts, weaving supplies and other popular souvenirs.

NOW, PLEASE GO TO THE AREA LABELED #1 ON YOUR GUIDEMAP

This tour will start at the entrance of the museum. First, please purchase a ticket at the ticket window. If you would like to try traditional indigo dyeing, you should make your request at the ticket window. Various items are available for dyeing for a fee, which includes the dyeing process as well. It takes about 30 minutes to dye a handkerchief. The museum tour also takes about 30 minutes.

Now that you have your ticket, please go inside the museum and stop just inside the entrance at the place labeled #2 on your Guidemap.

Before we begin our tour, first close your eyes and try to imagine Kiryu during the heyday of the silk industry. From the end of the Edo Era, weaving looms and mass production techniques were quickly introduced in Japan. Not only did the domestic market for silk grow, but also, Japanese businessmen were eager to get a share of the growing international silk market. Kiryu silk weavers were astute in adapting local production techniques to meet the demands of overseas markets. They were also entrepreneurial in the creation of new weaving machinery, thrusting Kiryu to the forefront of the Japanese silk industry.

By the turn of the 20th century, the rhythmic sounds of looms emanating from weaving mills could be heard in every part of the city. Narrow channels were constructed along the roads, drawing water from Kiryu's two rivers. Waterwheels on the channels provided hydraulic power to operate silk throwing machinery in filature factories. Some of these channels can still be seen around the city, although most have been covered over to widen roads.

Every aspect of silk production could be found in the Kiryu area, from the growing of silkworms and the mulberry bushes to feed them, to silk throwing, dyeing and weaving. Even today, virtually every local family can in some way claim a role in Kiryu's silk weaving history. This was a town of master silk weavers and the rhythm of everyday life was synchronized with the three-quarter rhythm of the weaving looms found not only in the mills, but even in the private homes of the people.

Now, keeping this image of a very dynamic, silk manufacturing city in your mind, let's tour the textile museum! Please remain where you are.

SAWTOOTH ROOF

The building in which the Textile Museum, Yukari is located was at one time a working silk textile mill. Let's look at some of the unique features of a typical mill in the early part of the 20th century.

First, please look up toward the ceiling of the museum. What's unusual about the style of the roof?

No doubt you immediately noticed two characteristics: First, it is gabled, and second, there are windows on one side of the gables. What functions do these features serve?

Following the style of factories built in Europe and America since the Industrial Revolution, weaving mills in Kiryu were all constructed with this characteristic "sawtooth roof," also known as a "weave shed roof." The reasons for this are twofold.

First, the irregular shape helps diffuse the loud noise of the weaving looms. And second, the rooflights on the gables are always oriented to face north. Now, can you think of a reason for doing this?

It seems that the northern exposure allows light to enter the mill all day long as the sun travels from east to west. Having a natural source of indirect light also means less dependence on expensive, artificial sources of lighting such as electricity. In addition, the indirect light does not fade the delicate silk textiles being produced.

As mill owners prospered, it was easy for them to add another segment to their mill. One could estimate the wealth of a weaver by counting the number of sawtooth segments on the mill's roof.

Now, please look at the items displayed to the right of the museum entrance.

When you have finished looking at them, please go to the ancient warp-weighted loom just to the right of the entrance, labeled #3 on your Guidemap.

THE WARP-WEIGHTED LOOM

So, how did weaving begin? No one knows for sure when or how the first loom was invented, however, the one you are looking at now is the most primitive weaving loom discovered to date. It is a stone-weighted loom from Greece. This loom dates back to around the year 580 BC. Stones are attached to the end of the warp or vertical yarn. These stones are weights to provide the needed tension for weaving. The weft or horizontal yarn is interwoven by hand between the strands of warp yarn. Similar looms were used by some tribes of Native Americans.

Now, please move to the Izaribata Loom immediately to the left as you proceed on into the museum, labeled #4 on your Guidemap.

THE IZARIBATA LOOM

What about the origins of weaving in Japan? The “Izaribata,” or sitting backstrap loom, is the oldest type of weaving loom found in this country. It is a horizontal warp loom as opposed to the warp-weighted, vertical loom from Greece.

In the 5th century AD, Chinese weaving looms were introduced in Japan, replacing the more primitive “Izaribata” of the Yayoi Era (around 300 BC). The Izaribata is still used in Japan.

To operate this loom, the weaver sits in front, donning the backstrap and foot ropes to control the warp yarn. The amount of tension applied to the warp yarn is controlled by the weaver through pressure on the backstrap. The texture of the resulting fabric is unique to each weaver since both the warp and weft yarns are controlled by the action of the weaver’s body. At the same time, this method of weaving is slow and laborious, and physically challenging for the weaver. At present, some 7- to 8,000 bolts of Etchigo-chiji and Yuki Tsumugi, both considered high quality silks, are woven on Izaribata Looms yearly. It takes from 50 to 90 days to weave one bolt of silk on this loom, enough to make just one kimono.

Now, please proceed to the right side of the museum where you will find a display of silk cocoons, labeled #5 on your Guidemap.

TYPES OF SILKWORMS

Have you ever seen a silkworm? No one can fail to be amazed by the gossamer fibers they excrete from their mouths! We don’t know for certain when the cocoons of silkworms were first used to make silk yarn. Archeological excavations in China have revealed the use of silkworms more than 4,000 years ago. Today, silkworms are commonly cultivated on farms and spin white cocoons. The cultivation of silkworms is called “sericulture.” One cocoon can produce as much as 1,200 meters of

fiber. About 3,000 cocoons are required to weave enough fabric to make one kimono.

But this is not the only sort of silkworm. Have you noticed the yellowish-green cocoon in the display? Wild silkworms found in the mountains produce pale green cocoons. Wild silkworms feed on the leaves of oak trees in the forests, whereas cultivated silkworms eat mulberry leaves exclusively. This difference in diet accounts for the variation in color of their respective cocoons.

After having been bred in captivity for generations, wild silkworms evolved into the commonly known white cocoon silkworms we find today. Domestic silkworms in Japan are predominantly the species known as *Bombyx mori*. Silk yarn produced from wild silkworm cocoons is fantastically expensive and is sometimes used to weave high quality silk textiles.

Now, please proceed to the silk fiber display in the center of this area, labeled #6 on your Guidemap.

REELING SILK COCOONS

So, how is a tightly spun cocoon unraveled? Obviously, the fine silk fibers woven by the silkworms must be unwound from the cocoons. To do this, the cocoons are first boiled in water to soften them. Next, using a small broom-like whisk, a few fibers from the cocoons are caught on the straws of the broom and pulled up onto a spool. The spool is attached to a fiber-winding machine with a handle. As the handle is rotated, the spool turns, pulling the fibers from the cocoons. These silk fibers are extremely fine and fragile. Before the fiber, known as raw silk, can be used for weaving, however, it must first be twisted together with other fibers to make it stronger and more pliable.

If you would like to try pulling some fibers from a cocoon, please ask for assistance.

By the way, what happened to the silkworm chrysalis that was boiled inside the cocoon? Traditionally, after the cocoon had been unraveled, the remaining chrysalis was eaten! Nothing was wasted in this industry.

Now, please take a look at the items on display around this section of the museum and wait at the Hacho Nenshiki Filature Machine, labeled #7 on your Guidemap.

THE HACHO NENSHIKI FILATURE MACHINE

In order for Kiryu to enter the modern age, however, it had to progress from a town of master hand-weavers to a town of silk weaving mills. This required not only the introduction of modern machinery, but also, the ready availability of large quantities of silk yarn. How did this happen?

In 1783, a native of Kiryu, Kichiemon Iwase, invented the Hacho Nenshiki silk filature machine.

Silk “throwing” refers to the process of twisting together the fine silk fibers of raw silk pulled from cocoons, while simultaneously spooling the resulting yarn. The Hacho Nenshiki filature machine enabled Kiryu silk throwers to mass produce silk yarn. The machine was driven by hydraulic power provided by water wheels operating on the many small water channels flowing through the city.

As a result of this machine, Kiryu silk throwers produced a ready supply of silk yarn to the city’s weavers. This machine is directly related to the boom in Kiryu textile manufacturing during the 18th and 19th centuries. Correspondingly, the city of Kiryu grew and prospered as a major textile manufacturing area, rivaling the renowned weavers of the Nishijin district of Kyoto. Kiryu weavers had hit the big time!

Now, please proceed to the Takahata Loom on the left side of the museum, labeled #8 on your Guidemap.

THE TAKAHATA WEAVING LOOM

At one time in Kiryu, nearly every household had a takahata loom, also known as a Horizontal Foot-Treadled Loom, to weave silk textiles. This was the most commonly found loom in Japan prior to the Industrial Revolution. The weaver sits on a narrow wooden ledge in front of the loom, controls the warp yarn with foot treadles, and passes the weft yarn attached to a shuttle between alternately raised strands of warp yarn, known as the shed. The Takahata loom was introduced to Japan from China and is still used by many weavers for hand-weaving. The Takahata loom weaves material the standard width for making kimonos.

If you would like to try weaving on this loom, please ask a museum staff member to assist you.

Now, please proceed to the Kiryu Jumbo Takahata Loom to the left of the museum, labeled #9 on your Guidemap.

THE KIRYU JUMBO TAKAHATA LOOM

Is bigger really better? The loom you are looking at is a modification of the Takahata loom you just saw. Why would Kiryu weavers invent such a huge loom?

Well, let’s consider the commercial environment of the time. As Kiryu entered the Meiji Era (around the turn of the 20th century), local weavers wanted to be able to export their silk overseas, but they faced a big problem. Foreign markets required fabric made much wider than the local market for kimonos. So, despite its high quality, Kiryu silks were just not suitable for export. The weavers needed a very wide loom! What you are looking at now is a Kiryu innovation to meet the needs of Western markets.

It takes some 4· to 5,000 strands of warp yarn to make fabric sufficiently wide to be used for interior goods such as draperies and furniture coverings or western-style clothing. Fabric of such

width is difficult to weave, however, the Kiryu Jumbo Takahata loom, by its special design and width, employed the tension of the greatly elongated warp yarn to produce very wide and long fabrics.

Around 1882, Kiryu began to export a fine, light silk material known as “habutae” to the United States. This fabric was specially woven on the Kiryu Takahata loom. It took 3 women to operate this loom. One woman stood at the center to control the warp treadles and reed, while the other two stood to the left and right sides of the loom to manually propel the shuttle along the race from one side to the other. The production of silk habutae and other fabrics wide enough for export contributed significantly to the success of Kiryu textile weavers.

Now, please proceed to the Braid Loom located on the left side of the museum, just behind the Kiryu Jumbo Takahata loom, and labeled #10 on your Guidemap.

SATIN BRAID LOOM

This loom was used to weave satin braid and tape or ribbon using multiple colors of weft yarn. The loom could also weave raised designs on the tape or braid. Ribbon woven on this machine had the look of satin damask. To produce gold or silver braid, gold or silver weft thread was interwoven with silk warp thread.

Sometime between 1596 and 1615, the technique of weaving braided tape was introduced in Japan from India, at the time under the control of the Dutch and English. By the end of the Edo Era, or mid 19th century, braid was often employed on women’s obis or kimono sashes.

In Japanese, braid is referred to as Mo-ru, which is an aberration of the Indian word “Mogul,” the region of India which is the source of this technology.

Now, please proceed to the Draw Loom located on the right side of the museum, next to the Jacquard Loom, labeled #11 on your Guidemap.

THE DRAW LOOM

The Draw Loom was introduced in Japan from China sometime during the 5th century A.D., but was not widely used until the Heian Era. This loom was used to weave designs directly into the fabric. The method involves attaching the warp yarn to heddles which, when lifted, allow the weaver to pass colored weft yarn through the shed. Depending on the pattern, different colors of weft yarn are woven between specific warp yarns. On a draw loom, a “draw boy” sits at the top of the loom and, when instructed by the weaver, manually lifts the heddles to pull up the appropriate warp yarn for the area being woven. This procedure is extremely labor-intensive and time-consuming. Elaborate brocade designs took months to weave. The material produced was so costly it could be used only by the very rich!

Now, please proceed to the Jacquard Weaving Loom, next to the Draw Loom, and labeled #12 on

your Guidemap.

THE JACQUARD LOOM

Kiryu is best known for its breathtakingly beautiful silk brocades and damask, known as “Kiryu Omeshi.” But weaving elaborate motifs into fabric is a painstakingly slow procedure, as we have just seen with the Draw Loom. The Industrial Revolution, however, opened a new chapter in the history of weaving. It all started in France...

In 1804, a Frenchman, Joseph Marie Jacquard, invented a machine that could be attached above a weaving loom that would “automate” the weaving of patterns in textiles such as brocades, etc.

In this process, the design to be woven is first transferred to cards in the form of holes punched in the cards, corresponding to the locations of the various weft yarn colors employed in the pattern. The cards are stitched together in order and attached to the Jacquard machine. Each card represents one row of the fabric. The holes in the cards control which heddles lift the warp yarns as the variously colored weft threads are interwoven.

The weaver, sitting in front, observes the pattern being woven in a mirror placed under the warp yarn being woven. Once a row is completed, the weaver presses a lever and the next card moves into place, causing the appropriate warp yarns to be lifted, ready for weaving the next row.

This machine revolutionized the weaving industry by vastly speeding up the weaving process and eliminated the need for a draw boy.

As an aside, the cards used for the Jacquard device were a source of inspiration for Charles Babbage who used the idea of cards for data input for his Analytical Engine, a 19th century prototype of our modern-day computer. From the 1950's onward until the use of various magnetic devices, cards were the major source of data input for the computer industry.

Next, please look at the machine to the left of the Jacquard loom, labeled #13 on your Guidemap.

CARD PUNCH MACHINE

This machine was invented to accompany the Jacquard device for weaving designs into fabric. Each card represents one row of weft weaving. The original design is first transferred to graph paper, and then the portion of the design on each row of the graph paper is translated into holes on a card which are punched by the card punch machine operator as he/she reads the graph. The cards are then stitched together to form one complete set from the start of a pattern to its end.

Now, please proceed through the doors into the next room and wait at the Flying Shuttle loom labeled #14 on your Guidemap.

THE FLYING SHUTTLE

In 1733, an Englishman named John Kay invented the “Flying Shuttle” which helped to speed up the weaving of weft yarn. When the weaver jerks the cord attached to a box containing the shuttle, a mechanism in the box shoots the shuttle along the race to the other side of the loom. The shed is closed and the reed is used to batten the row. Then the operation continues from the

opposite direction. This invention enabled the production of large quantities of fabric in a short time. The “flying shuttle” is still commonly used on hand looms and is operated rhythmically in 3/4 time, for each row, counting one stroke for the flying shuttle and two strokes for battening.

Please proceed to the next room to observe the tools and techniques used for indigo dyeing. This room is labeled #15 on your Guidemap.

AIZOME OR INDIGO DYEING

What makes blue jeans blue? Indigo, of course! And did you know that the strong repellent odor of indigo is said to have protected American cowboys from rattle snake bites, contributing to the popularity of blue jeans in the American Old West? This may be an urban legend, but even so, indigo has been in use in Japan for centuries.

This dark blue dye comes from the indigo plant. After the plant is harvested, its leaves and stems are first dried and then allowed to ferment. Sodium bicarbonate and other chemicals are added to the fermented leaves which are then compacted into hard balls. The dye is stored in this form in large vats in the ground, but since it tends to weaken over time, it must be periodically augmented with new dye.

To use the dye, several balls are placed in deep vats containing lukewarm water where they release their color. Some sake or Japanese rice wine is added to feed the bacteria so that it will continue to grow and ferment. The mixture must remain warm in order to sustain the bacteria. Foam, referred to as “flowers” in Japanese, forms on the surface of the mixture, indicating that the solution is active.

After material has been dipped in the dye mixture and exposed to the air, the color is oxidized and changes from green to blue. The longer the material is held in the dye-mixture, the deeper the color will become.

Aizome articles are popular craft items in Japan. Products such as “noren” (Japanese-style curtains), aprons and other articles of clothing are commonly produced. Aizome-dyed fabrics are usually made of cotton. Tie-dyeing is often used to produce interesting, beautiful patterns.

If you are planning to try indigo dyeing, please follow the instructions of the museum staff person who will demonstrate various techniques of tie-dyeing and the use of the dyeing vats.

Now, please proceed out the door of the indigo-dyeing room and walk towards the back of the property, to the factory labeled #16 on your Guidemap.

On the left hand side you will find a working weaving mill. Please go in the doors to see material being woven according to modern weaving techniques. This weaving mill belongs to the Morishima family which operates the museum.

MORIHIDE WEAVING MILL

Now that you have seen how beautiful silk textiles have been woven in Kiryu for centuries, you may be wondering how it takes place now.

The first power looms were invented in 1785 during the Industrial Revolution in England by Edmund Cartwright. The first of these to come to Japan arrived in Satsumahan, Kagoshima Prefecture where two were imported in 1858. Power looms allowed for great flexibility in both the size and type of fabrics to be woven.

The looms you see operating in the Morihide weaving mill are power looms, driven by electricity. The Jacquard devices installed over the looms are computer-operated. Jacquard devices are no longer controlled by punched cards, but rather by computer programs in which the design has been stored. This sort of power loom can be found in other weaving mills all over the city. The looms here are used to weave calendars and textiles with school emblems, etc. You can see an image of the design of the material being woven next to each weaving loom. Products woven here are available for sale in the gift shop at the entrance to the museum.

That is the end of the tour. Now, please return to the ticket office, labeled #1 on your Guidemap, where you can buy souvenirs and gift items.

Thank you for visiting the Textile Museum, Yukari. We hope you have enjoyed the tour and have learned something about Kiryu's distinguished textile weaving history. Please come again!