A BROCADE JACKET FROM QUEEN SIRIKIT MUSEUM OF TEXTILES : CREATING A CONCEPT OF CONSERVATION FOR A FRAGILE THREE-DIMENSIONAL COSTUME

By

MISS Nuchada PIANPRASANKIT

An Independent Study Submitted in Partial Fulfillment of the Requirements for Master of Arts CULTURAL HERITAGE CONSERVATION AND MANAGEMENT

Silpakorn University

Academic Year 2023

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นางสาวนุชาดา เพียรประสานกิจ

การค้นคว้าอิสระนี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรศิลปศาสตรมหาบัณฑิต

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แผน ข ระดับปริญญามหาบัณฑิต

มหาวิทยาลัยศิลปากร

ปีการศึกษา 2566

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Field of Study	CULTURAL HERITAGE CONSERVATION AND MANAGEMENT
Advisor	Thanya Lunchaprasith, Ph.D.

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MISS Nuchada PIANPRASANKIT : A Brocade Jacket from Queen Sirikit Museum of Textiles : Creating a Concept of Conservation for a Fragile Three-Dimensional Costume Thesis advisor : Thanya Lunchaprasith, Ph.D.

A Brocade Jacket from Queen Sirikit Museum of Textiles

Creating a Concept of Conservation for a Fragile Three-Dimensional Costume

A men's gold brocade jacket from the Queen Sirikit Museum of Textiles (QSMT) collection, Bangkok, is being conserved. The jacket was previously in possession of Professor Smitthi Siribhadra, Her Majesty Queen Sirikit's senior adviser on artistic affairs and a significant figure in establishing the Queen Sirikit Museum of Textiles. Currently, it is stored in QSMT's storage.

The gold brocade jacket is part of the history of the Siam court dress code from the late 19th century until the early 20th century. '*Yierabab*' (Thai: เยียรบับ) gold brocade contains a high percentage of gold threads in the fabric and indicates the high status of the wearer. The tailoring style also reflects the influences of Westernisation during that period.

Conservation and restoration was carried out by the Department of Conservation and Registration, QSMT, in 2012. However, the treatment had not been finished yet. The jacket's condition is fragile because of the deterioration of the primary fibre and lining fabric as a result of weighting materials that have been added during the production process. It weakens the structure. The loss of blue silk fabric, the exterior fibre, causes horizontal tears, which generally appear all over the jacket. The deformation of the structure occurs at the fold lines and creases. The lining fabric also shows extensive damage from insect infestation.

Thus, conservation and restoration goals are developed to stabilize the object's condition for long-term storage. The main measures applied on the jacket can be divided into; removing the previous restoration, dry cleaning and stabilisation.

ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to Silpakorn University International College, Institute of Conservation, University of Applied Arts Vienna and Queen Sirikit Museum of Textiles for giving me a valuable opportunity to fulfil the knowledge of preservation and conservation of cultural heritage. I had a wonderful time during the study of this programme.

I would also like to extend my gratitude to my teachers for their guidance and suggestions in completing the study.

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Nuchada PIANPRASANKIT

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Introduction

The gold brocade jacket of a male belongs to the collection of Queen Sirikit Museum of Textiles (QSMT), Bangkok. The object was previously owned by Professor Smitthi Siriphadra before being donated to the museum in 2008 [1]. It might have been purchased from the antique market near the Grand Palace, Bangkok. The jacket was registered in the QSMT collection in 2009. The history of the jacket is unclear because there is no written record before the conservation process was finished in 2012.

In 2012, the Conservation and Registration Department of QSMT started working on conservation and restoration. The aim of the conservation project was to reduce the rate of deterioration. The object's condition was examined. Conservation measures were implemented in three steps: surface cleaning, reconstruction, and stabilisation. The stabilisation process is still under process. The conservation project continued in 2022 under the author's guidance. To present a new conservation concept, the condition and previous conservation are reexamined.

The jacket is made of gold brocade fabric. Gold metal threads [2] form the elevated pattern on a background of blue silk satin fabric. The brocade implies a significant story of the Siam court dress code from the late 19th century until the early of 20th century. Yierabab (Thai: เยียรบับ) gold brocade, which is the brocade that contains a high percentage of gold threads in the fabric, indicates a high status of the first owner. A western tailoring style also reflects influences of the Westernization during that period of time. The jacket used to be entirely lined with yellow quilted lining. Instead, cotton batting covered in a yellow silk fabric serves as the quilted lining.

The jacket is in fragile condition. It has significant losses of blue silk fabric all over it. The blue silk fabric is shattered. Losing of blue silk fabric causes raveled lines and structural deformations. Cotton batting and silk lining are lost due to insect

[1] Professor Smitthi Siribhada served as Her Majesty Queen Sirikit's senior adviser on artistic affairs and was instrumental in establishing the Queen Sirikit Museum of Textiles (Queen Sirikit Museum of Textiles 2013). He passed away in 2008.

[2] Gold metal thread or gold thread refers to a golden metal wrapping thread. The metal can be made in different material such as gold, silver, and copper.

infestation. The yellow silk lining is also shattered. The cause of the shattered silk has not been identified.

As a result of the fragile condition such as the shattering of the silk fabric, a goal of conservation and restoration is developed in order to propose the conservation concept for long-term storage. The concept of conservation covers three worksteps: removal of previous restoration, cleaning, and stabilisation. Since the old restoration covers the unclean region, it must first be removed. Second, surface cleaning should be carried out using dry mechanical cleaning locally. If the dry cleaning is ineffective, solvent cleaning may be done. Finally, stabilisation can be accomplished through the stitching technique. Each technique will undergo a test series before. The stitching has to interact with the structure less due to the weakened structure. As a result of the time constraint, the selected area will be used as a model for the future conservation of the entire jacket.

1. A brocade jacket from Queen Sirikit Museum of Textiles, Bangkok

A gold brocade jacket was made for a male. It has long sleeves and it is fitted at the torso. The collar is a band collar with four metal hooks. The jacket has seven buttons. The buttons are made of cellulose-based fabric and covered with the same gold brocade fabric as the jacket. The jacket is trimmed with metal threads at the collar, lower part of the sleeves, and border. There are two metal belt holders at the back of the jacket.

The main fabric of the jacket is made of gold brocade with blue ground. The motifs are made by using metal thread as a supplementary thread. The pattern shows a four-petaled flower with a dense blossom called *Kudan* (Thai: กุดั่น). The flower is located in an indented square shape[3] and surrounded by petals. Each *Kudan* flower is surrounded by a square floral vine similar to the shape of *Kudan* flower. This motif is called *Karn Yaeng* (Thai: ก้านแย่ง).

The jacket is lined with various fabrics. At the stand collar, undyed bast fibre fabric is used as the lining. The outer portion of the collar interlining is just partially covered with brocade fabric. The detachable collar, which is typically made of cotton fabric, may be fastened to protect the wearer.

At both two front sides of the jacket, the cellulose-based fabric is used as a lining. The fabric was cut in a design that resembles the bodice front pattern. The jacket has a yellow quilted lining at the upper portion. It might have been added to warm the wearer. It is constructed from cotton batting that is covered with yellow twill silk fabric. The quilt work is sewn using a zigzag pattern. The yellow twill silk fabric also lined at both sleeves. Over the yellow lining, a blue silk strip lines the waist. It might be added to attach the additional inner belt. At the front of the left side of the jacket, there is a hidden pocket which is made of cotton fabric. The slit of the jacket is at the chest part area.

[3] A square shape with indented corners is typically found in Thai architecture since the early *Ayutthaya* (Thai: อยุธยา) period (1350– 1767) until now. It usually decorates the base and body of the stupa. The indented corner or recessed comer may be derived from Indian architecture before being adapted to Khmer architecture and Thai art (Santi Leksukhum, *งานช่าง คำช่างโบราณ: ศัพท์ช่าง และข้อคิดเกี่ยวกับงานช่างศิลป์ไทย.* (Bangkok: Matichon, 2015), 52.).

Gold metallic embroidery is used to decorate the collar, plackets, and cuffs. The metal coil is twisted in a braided cord-like pattern. At the waist line of the back of the jacket are two metal belt holders and two buttons.

Inv. Nr.:	2009.2.565
Artist/Tailor:	Harry A Badman & Co
Title/Description:	A gold brocade jacket
Material:	Silk, Cotton, Bast fibre, Metal
Dimensions: (h x w x d)	64.5 x 71 x 9 cm
Dating:	Late 19th century– early 20th century
Provenance:	Queen Sirikit Museum of Textiles
Donated:	2008

Fig. 1: The front of the jacket (late 19th century – early 20th century), 64.5 x 71 x 9.

Fig. 2: The back of the jacket (late 19th century – early 20th century), 64.5 x 71 x 9.

1.2 Cultural and arthistorical background

1.2.1 The pattern *Kudan* and *Karn Yaeng* in Siam gold brocade

The traditional patterns of Siam brocade textiles were inspired by the culture with aspects like beliefs and religion as well as nature. Some patterns were reserved for high-ranking members. Those forbidden patterns usually depicted deities and mythical creatures in *Himavanta* (Thai: หิมพานต์) forest [4]. The wearers resemble gods or deities in heaven, where mythological creatures and deities surround them [5]. For example, the Hindu god *Garuda* (Thai: ครุฑ) is depicted as half bird, half human that serves as *Vishnu*'s mount [6] (Fig 3), a legendary creature called *Singha* (Thai: สิงห์) that resembles a lion (Fig 4), *Thepphanom* (Thai: เทพพนม) which is depicted as a human figure using *Anjali Mudra* (Sanskrit: अंजली मुद्रा) or *Namaskar Mudra* (Sanskrit: नमस्कार) hand gesture [7] (Fig 5). Additionally, one of the prohibited patterns was the abbreviation of the royal family's name (Fig 6).

[4] *Himavanta* forest is a mythical forest in Buddhism. It is located near the *Himalayas* mountains (Department of Cultural Promotion, "รู้ไว้ใช่ว่า ตอน ป่าหิมพานต์ ป่าในตำนาน,", accessed Jun 12, 2023, http://www.culture.go.th/culture_th/ewt_news.php?nid=5617&filename=i.)

[5] The forbidden pattern implies the concept that the wearer can be interpreted as God or Lord Buddha who is respected by deities (Thirabhand Chandrachareon, *Brocade Textile* (Bangkok: Amarin Printing and Publishing, 2017), 102.)

[6] Traditional Thai believe that *Garuda* is a symbol of the royal family (Queen Sirikit Museum of Textiles, *In Royal Fashion: The Style of Queen Sirikit of Thailand* (Bangkok: River Books Press, 2013), 48.)

[7] *Anjali* or *Namaskar Mudra* is a hand gesture joining two hands between the chest part area. The gesture indicates respect, salutation, and praying (Handicraft Association of Nepal, *Short Description of Gods, Goddesses and Ritual Objects of Buddhism and Hinduism in Nepal* (Nepal: Subhash Printing Press, 2000), 28.)

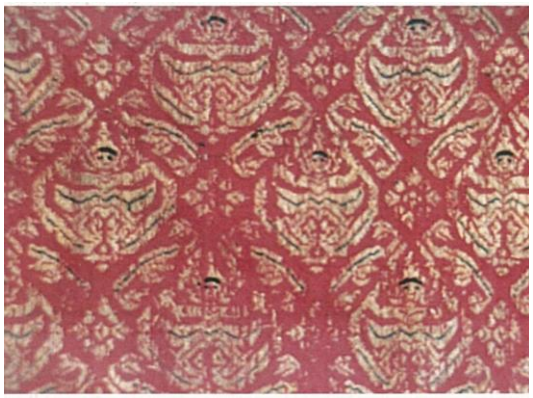

Fig. 3: Detail of Garuda motif in gold brocade (around 18th – 19th century).

Fig. 4: Detail of Singha or lion motif in gold brocade (around 18th – 19th century).

Fig. 5: Detail of *Thepphanom* motif in gold brocade (around 18th–19th century).

Fig. 6: Detail of abbreviation of King Chulalongkorn 'จ . ป . ร . ' in gold brocade (around late 19th – early 20th century).

In contrast, the floral motif can be used by common people. These designs represent aesthetic values rather than social status. They were inspired by natural elements such as trees, vines, branches, leaves, and flowers [8]. *Kudan Karn Yaeng* is a floral pattern that is depicted in a square shape (Fig. 7-10). The term *Kudan* refers to a pattern of a group of four-petalled flowers. It is also known as the accessories decorated

[8] Chandrachareon, *Brocade Textile*, 93-107.

with diamonds, precious stones or glass [9]. The motif, also known as *Pra Cham Yam* (Thai: ประจำยาม), is a four-petaled flower that has a round shape at the centre of the flower. It was inspired by the nutmeg flower. Each flower can be made in four or six petals [10]. *Kudan* might be originated from Indian *Kundan* (Sanskrit: कुं दन) and refers to goldwork or jewellery design, that is typically crafted in floral designs [11].

Karn Yaeng is a connected vine that resembles a net. It encircles the main motif which is typically done in a flower motif [12]. *Kudan and Karn Yaeng* are traditional patterns typically used in textiles (Fig. 11-14) as well as decoration in sculpture and architecture [13] (Fig. 15-17).

[9] The Royal Institute Dictionary 2011 Edition, "กุดั่น," accessed Aug 28, 2023, https://dictionary.orst.go.th.
[10] Sane Tanaratsarit, *ตำราลายไทย บรมครูแบบเบสิค* (Bangkok, 1994), 86.
[11] Kornkit Disthan, "กุดั่นคืออะไร? ชื่อโกศไทยที่มาถึงอินเดีย,", last modified May 27, 2019, https://www.posttoday.com/international-news/590377.
[12] Setthaman Kanjanakul, *เส้นสายลายไทย ชุดลายไทยฉบับสมบูรณ์ ๒ พื้นฐานวิธีการเขียนลวดลายไทย กรวยเชิง ก้านต่อดอก เถา เฟื่องอุบะ* (Bangkok: Setthasilp, 2004), 4.
[13] Chai Tiemsilpchai, *สมุดตำราลายไทย* (Bangkok: Suksapan, 2003), 1-14.

Fig. 7: Detail of Kudan Karn Yaeng motif in gold brocade jacket (around late 19th – early 20th century).

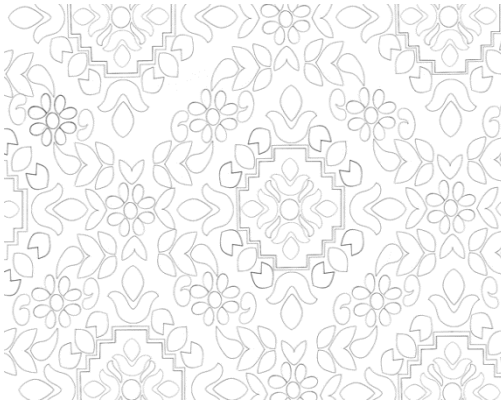

Fig. 8: Illustration of Kudan Karn Yaeng motif.

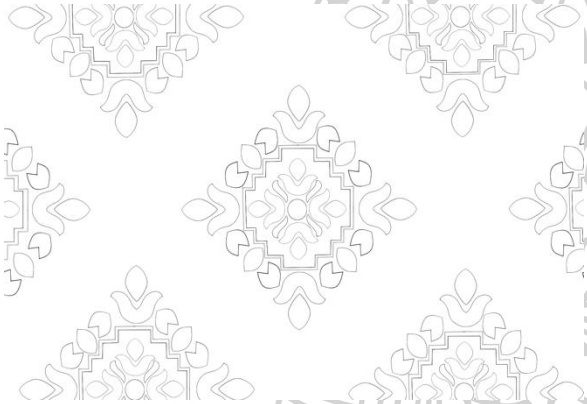

Fig. 9: Illustration of a four-petaled flower *Kudan* motif.

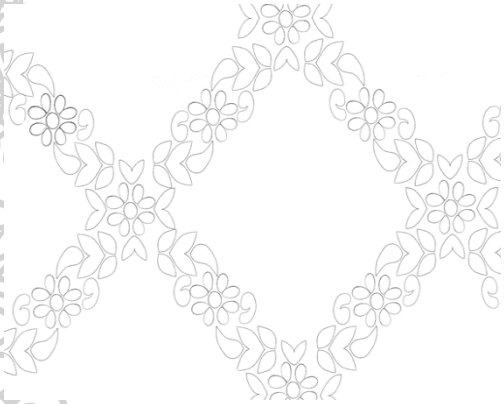

Fig. 10: Illustration of a connected vine *Karn Yaeng*.

Fig. 11: Gold brocade fabric (around late 18th – 19th century).

Fig. 12: Kudan Karn Yaeng pattern of gold brocade fabric (around late 18th–19th century).

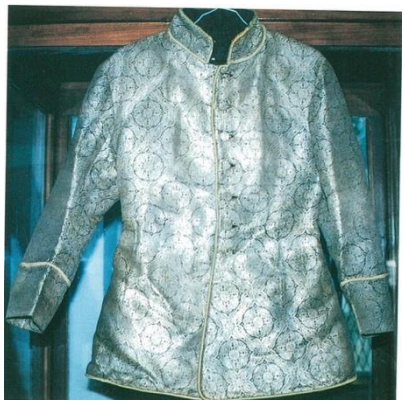

Fig. 13: Gold brocade jacket for royalty wearing in a ceremony (around 19th century).

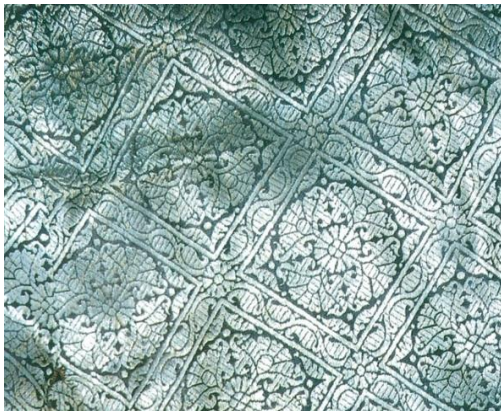

Fig. 14: Detail of *Kudan* flower in a round shape that is surrounded by *Kan Yaeng* vine in a square form (around 19th century).

Fig. 15: Four-petaled flower motif at wrapped trousers of *Garuda*, mural in *Ubosotha*, *Yaisuwanaram* temple, Phetchaburi (20th century).

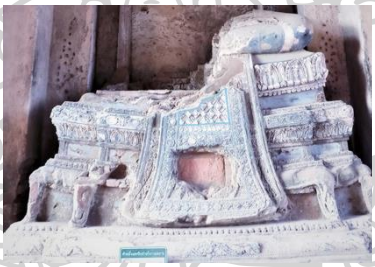

Fig. 16: Four-petaled flower and vine that are decorated on hanging cloth in front of the base of a Buddha image, *Chaiwatthanaram* temple, Ayutthaya (17th century).

Fig. 17: Four-petaled flower *Pra Cham Yam* at the door of *Vihara*, *Phukhao Thong* temple, Ayutthaya (16th century).

1.2.2 Indian textiles at Siam court

The gold brocade is called *Yierabab*. It might be derived from the Persian word *Zarbaft* [14], which means golden threads weaving [15]. *Yierabab* textile in Siam was once believed to be a type of gold brocade fabric woven with a greater amount of gold threads compared to others [16]. It was a high-priced fabric due to the metal material [17].

The original gold brocade in India, known as *Kinkhab*, has a distinctly different name, definition, and function. Both names of gold brocade *Yierabab* and *Kinkhab* were originally from Persian. *Kinkhab* is a heavy brocade. As a result, it was used for furniture instead of garments. It was greatly exported to Europe. The brocade is still being practised until now in Alaipura village of Varanasi city in Uttar Pradesh [18]. The city became the most famous for brocade manufacturers after the visit of The East India Company in 1764 [19].

The pattern of gold brocade is created by using supplementary metal threads. In India, the traditional gold thread is made by wrapping silk thread with silver wire[20]. The metal thread was prepared in a furnace by covering the real gold on a solid silver bar. Then, it is drawn into a fine thin wire. Finally, the wire is beaten to flatten by hammering before being wrapped around the silk thread [21].

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[14] Damrong Rajanubhab and Narisara Nuwattiwong, *สาส์นสมเด็จ เล่ม 10 พ.ศ. 2479* (Bangkok: Fine Arts Department, 2007), 77-79.

[15] Guity Novin, "Textile Designs of Zarbaft, Termeh, and Ghalamkari," accessed Jun 13, 2023. http://gdiran.blogspot.com/2011/03/textile-sesigns-of-zarbaft-termeh-and.html.

[16] There were three types of gold brocade textile; 1.) *Zarbaft* or *Yierabab* 2.) *Kimkhab* (Thai: เข้มขาบ) and 3.) *Atlad* (Thai: อัตลัด). They are different in the ratio of the gold thread in the fabric. *Yierabab* contains high percentage of gold threads compared to *Kimkhab* and *Atlad* (Damrong Rajanubhab and Narisara Nuwattiwong, *สาส์นสมเด็จ เล่ม 10 พ.ศ. 2479*, 78.)

[17] Duangrithi Claewplodtook, *"การศึกษาบทบาทและความสำคัญของผ้าเข้มขาบ ผ้าแยียรบับ ผ้าอัตลัด และผ้าตาดที่ใช้ในราชสำนักแห่งกรุงศรีอยุธยาตอนปลาย ถึงกรุงรัตนโกสินทร์ตอนต้น."* (BA thesis., Silpakorn University, 1996), 44-47.

[18] John Gillow and Nicholas Barnard, *Indian Textiles* (China: Thames & Hudson, 2008), 162-165.

[19] East India Company or English East India Company was a governor and company established to facilitate trading in the Indian Ocean region including East and Southeast Asia. It was founded in 1600 until 1874. During the mid 17th century until the early 18th century, the company controlled half of the world trade e.g. sugar, salt, spices, tea, opium, cotton, silk, and indigo dye. India was controlled by the company in 1757 (Britannica, T. Editors of Encyclopaedia, "East India Company," accessed August 13, 2023, https://www.britannica.com/money/topic/East-India-Company.).

[20] Moreover, copper can be used for making a gold thread as well as paper covered with gold sheet. These materials are less expensive than the gold thread or silver thread (Thirabhand Chandracharoen, *Brocade Textile* (Bangkok: Amarin Printing and Publishing, 2017), 126.).

[21] Gillow and Barnard, *Indian Textiles*, 103.

Siam court imported the gold brocade from India since the early 17th century, the *Ayutthaya* period [22]. Monopoly trading was controlled by the court. The fabrics were used in exchange for rice, ivory, wood, spices, etc. The court purchased the fabric before offering or trading it to the nobles and wealthy persons. Until the late 19th century, the *Rattanakosin* period, fabric trading started to decline.

Although Siam produced gold brocade since the early of 19th century, imported gold brocade was still demanded by the court due to the quality of the fabric. The local brocade textile called *Phaa Yok* (Thai: ผ้ายก) was produced in *Nakhon sithammarat* and *Suratthani*, which are provinces located in the south of Thailand [23] (Fig. 18-21). The local loom had two shafts that could only produce plain ground fabrics. In contrast, the satin fabrics called *Tuan* (Thai: ต่วน), were produced in India or China [24].

[22] The Ayutthaya Kingdom was a Siamese kingdom which existed from 1351-1767.

[23] Local brocade was produced by order of the Siam court. The court sent materials such as silk threads and metallic threads. Silk threads were imported from Northeast of Thailand, China and India. Moreover, the metallic threads were also imported from India and China (Chandracharoen, *Brocade Textile*, 125-127). At the end of the 19th century, the production had gradually reduced. There was only one weaving family in *Nakornsrithammara*t province continued to weave by the 1980s. In 1994, brocade weaving was revived by a request of Her Majesty Queen Sirikit. The foundation for the Promotion of Supplementary Occupations and Related Techniques (SUPPORT) was established to train local women in producing handicrafts such as weaving, embroidery, jute processing, and artificial flower making (Queen Sirikit Museum of Textiles, *For the Love of Her People: Her Majesty Queen Sirikit Creates the SUPPORT Foundation* (Bangkok: Plan Motif, 2012), 113-119.).

[24] Thirabhand Chandracharoen, "Royal Brocades in The Siamese Court," In *The Secrets of Southeast Asian Textiles: Myth, Status and The Supernatural*, ed. Jane Purananda (Bangkok: River Books Press, 2006), 182-185.

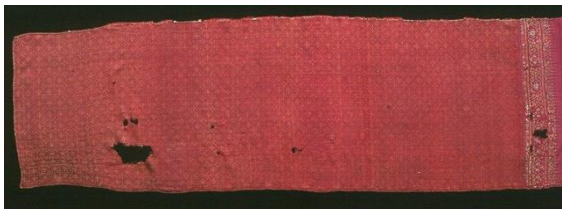

Fig. 18: Local gold brocade Phaa Yok used for hip wrapper or wrapped trousers, Nakhonsithammarat (around early 19th century).

Fig. 19: Detail of Phaa Yok, plain woven on ground fabric (around early 19th century).

Fig. 20: Gold brocade *Phaa Yok*, Nakhonsithammarat (2010).

Fig. 21: A group of weavers produces *Phaa Yok* on a two stories high loom, Nakhonsithammarat (2010).

According to the sumptuary laws, the dress code was defined by the rank and status of the wearer. Type of the fabric and pattern used in the garment determined the usage and purpose of wearing. Brocade was one of the fabrics generally used at that time since it was a valuable fabric. For example, gold brocade with a triangle motif at the wideness of the end of the border called *Kruai Choeng* (Thai: กรวยเชิง) was used as

a hip wrapper or wrapped trouser [25] (Fig. 22-25). Moreover, brocade can also be used for other purposes e.g., manuscript wrapper (Fig 26-27), decorating textiles, elephant rope, etc [26].

Fig. 22: Gold brocade with three Kruai Choeng, probably made in India (19th – 20th century).

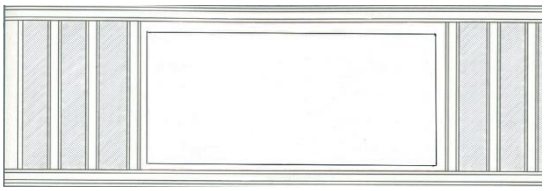

Fig. 23: Kruai Choeng is located at the end border which depicts the shaded part.

Fig. 24: Princess Ying Yaowalak Akkrarajasuda wore a brocade hip wrapper with shoulder cloth (around 19th century).

Fig. 25: King Chulalongkorn (King Rama V) wore brocade wrapped trousers on the first coronation (1868).

[25] The pattern layout most typically found on brocades worn as hip wrappers included a rectangular centre field framed by narrow borders on the long edges and borders at the shorter ends (Queen Sirikit Museum of Textiles, *In royal fashion: The style of Queen Sirikit of Thailand*, 58.).
[26] Chandracharoen, *Brocade Textile*, 32-49.

Fig. 26: Manuscript wrapper, *Rakhangkhositaram* temple, Bangkok.

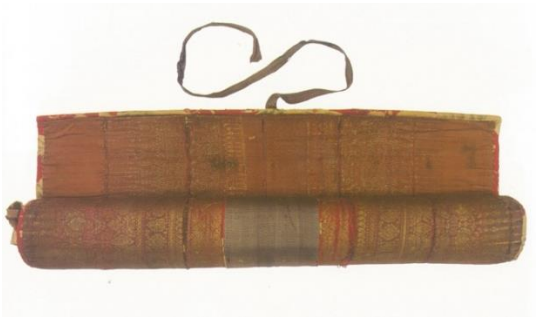

Fig. 27: *Yeirabab* brocade used as a manuscript wrapper, *Klangbangkaeo* temple, Nakhon Pathom.

1.2.3 Embroidery

The embroidery usually decorated garments and accessories such as jackets, robes, shoulder cloths, and waist sashes (Fig. 28-31). It was a symbol that reflected the rank and status at the Siam court since the embroidery distinguishes the special garment from the general. The design and pattern were influenced by India and Europe [27].

[27] Queen Sirikit Museum of Textiles, *In royal fashion: The style of Queen Sirikit of Thailand*, 59.

Fig. 28: Prince Asdang Dejavudh's robe (19th century).

Fig. 29: Part of a trousers Choeng Ngorn (Thai: เชิงงอน), sequins, beetle wings, metal strips and metal coil (19th century).

Fig. 30: Female shoulder cloth (1913).

Fig. 31: Detail of the embroidery of the shoulder cloth which is decorated with sequins and metal coil (1913).

Embroidery and needlework had been practised especially for the inner court women as well as royal craftsmanship called *Chang Sana* (Thai: ช่างสนะ) [28]. Traditional

[28] *Chang Sana* worked with different kinds of materials such as textiles, paper, and parchment. In the reign of King Rama V, it was registered to be a department of Royal craftsmanship. There are Thai and Chinese *Chang Sana.* The department was founded to make costumes and furniture used in the royal ceremonies of the twelve months called *Phraratchapithi Sip Song Duean* (Thai: พระราชพิธีสิบสองเดือน) (Prapaporn Trachuchat, "ช่างสนะ หนึ่งในงานประณีตศิลป์ ช่างสิบหมู่ คู่แผ่นดินไทย," accessed Aug 28, 2023, http://article.culture.go.th/index.php/layouts-modules-positions/3-column-layout-3/248-2021-04-21-07-20-45.

Thai embroidery is still being practised in royal garments and as masked dancing costumes called *Khon* (Thai: โขน) [29] (Fig. 32-34).

Fig. 32: A pair of trousers with embroidered Choeng Ngorn of Khon costume (21th century).

Fig. 33: Detail of embroidery (21th century).

Fig. 34: The costume of Khon performance is decorated with embroidery (21th century).

The brocade jacket treated in this thesis is decorated with embroidery at the collar, placket, button seam, and cuffed with a metal coil. The metal coil or purl is called *Din Mun* (Thai: ดิ้นมัน). The Purl threads have a hole through the centre which is used for inserting the embroidery. The design is drafted onto the ground before the sewing process. Sometimes, the metal coil is cut to the needed length (Fig. 35-37).

Purl is a material used for traditional Thai embroidery along with other materials e.g., silk thread, metal strips, sequin, precious stone, and beetle wings. The materials were usually imported from India and China [30].

[29] The Sustainable Arts and Crafts Institute of Thailand, "หัตถกรรมที่ใกล้สูญหาย: ปักสดึงกรึงไหม งานปักโบราณที่ใกล้สูญหาย," Accessed Aug 28, 2023, https://www.sacit.or.th/th/detail/2021-02-09-13-38-48#:~:text=การปักสะดึงกรึงไหม%20เป็นงานที่แสดงออกถึง,ใน%20การปักลวดลายที่.

[30] Queen Sirikit Museum of Textiles, *In royal fashion: The style of Queen Sirikit of Thailand*, 59

Fig. 35: Embroidery work is practised on a wooden frame (2013).

Fig. 36: Materials used for embroidery; silk threads and metal coils (2013).

Fig. 37: A metal coil is embroidered on a drafted paper (2013).

1.2.4 Western attire at Siam court in 1851–1910

In the early *Rattakosin* period, both men and women wore wrapped trousers called *Chong Kra Ben* (Thai: โจงกระเบน). Women usually wore breast cloth *Phaa Thaep* (Thai: ผ้าแถบ) or shoulder cloth *Sabai* (Thai: สไบ) whereas men were shirtless because of the hot climate (Fig. 38). Moreover, Siamese superstition believed that wearing the shirt before the winter season would bring drought to the land [31].

Until the reign of King Rama IV or King Mongkut (1851-1864) [32], Siam started to modernize as a result of Western expansionism. Technology and culture were influenced by the modernization. Traditional dress code started to change in the court before adapting for the general people [33]. For example, the men had to wear a long sleeve shirt when having an audience with royalty [34] (Fig. 39).

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[31] Poraminthra Krouethong, *King Mongkut: Photograps from the Reign of King Mongkut* (Bangkok: Matichon, 2004), 108.

[32] King Mongkut or King Rama IV was the 4th monarch of Siam (King Mongkut's University of Technology Thonburi, "พระราชประวัติ พระบาทสมเด็จพระจอมเกล้าเจ้าอยู่หัว กษัตริย์สยามฯ ผู้เปิดประตูสู่อารยประเทศ," Accessed Jun 14, 2023. https://digital.lib.kmutt.ac.th/king4/index.html.).

[33] Claewplodtook, *"การศึกษาบทบาทและความสำคัญของผ้าเข้มขาบ ผ้าเยียรบับ ผ้าอัตลัด และผ้าตาดที่ใช้ในราชสำนักแห่งกรุงศรีอยุธยาตอนปลาย ถึงกรุงรัตนโกสินทร์ตอนต้น,"* 32-38.

[34] Men had to wear long sleeved shirts. The style of the shirt was similar to the shirt of a Chinese male *Baba* (Thai: บาบ๋า) who lived in Batavia, Indonesia (Kham Bunnag, *พระราชพงศาวดาร กรุงรัตนโกสินทร์ รัชกาลที่ 4* (Bangkok: Thaprachan, 1934), 132.

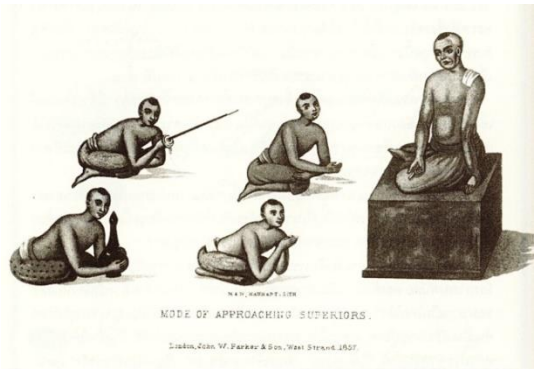

Fig. 38: The drawing shows Siamese wearing wrapped trousers for an informal occasion (1857).

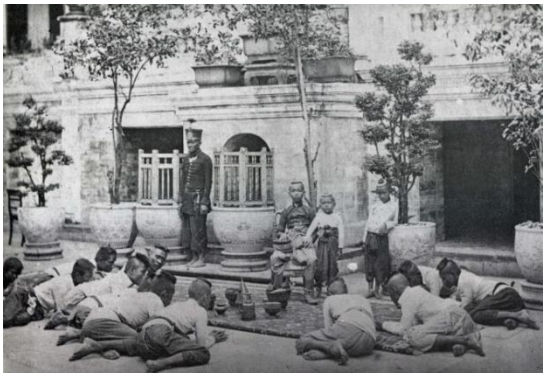

Fig. 39: Prince Chulalongkorn and Siamese nobles wearing shirts and wrapped trousers (1861).

The western style garments were generally used during the reign of King Chulalongkorn (1869-1910). When the King visited Singapore and Indonesia in 1870, the western garments were used by both civilians and the military e.g., shirt, jacket, trousers, socks, and footwear [35] (Fig. 40-41). Siam court dress code was adapted using the western style garment especially in the royal ceremonies such as tonsuring [36], ordination [37], *Kathina* (Thai: กฐิน) [38], etc.

The type and pattern of fabric used in the garment are equally as significant as the style of the outfit. It implies a hierarchical social system in Siam court. Valuable imported fabric such as *Yierabab, Kimkhab*, and *Atlad* brocade were used by royal families and nobles [39]. The fabric or garment which typically made of valuable fabric were given by the king. The *Yierabab* brocade jacket might be used by royal officials

[35] Anake Nawigamune, *Thai Costume in The Rattanakosin Period* (Bangkok: Muang Boran Press, 2004), 74.
[36] In the past, the children used to tie their hair up in a topknot. The topknot was a symbol of protection. It will be removed when the children reach adolescence. This ceremony is called *Kon Jook* (Thai: โกนจุก) (Nantawan Savanayana, *ประเพณีการไว้จุกและการโกนจุกของเด็กไทย* (Bangkok: Fine Arts Department, 1998), 1-8.).

[37] In Buddhism, there are two different kinds of ordination: one is the ordination of a novice, and the other is the ordination of a monk (Kalyanamitra, "วิธีการบรรพชาอุปสมบท," accessed Jun 14, 2023. https://kalyanamitra.org/th/article_detail.php?i=20891.).
[38] *Kathina* is a Buddhist ceremony where the robes are offered to the monks. The ceremony takes a month. It starts from the 11th month of the lunar calendar. The king supports the ceremony by attending or using representatives.
[39] Poraminthra Krouethong, *King Mongkut: Photograps from the Reign of King Mongkut*, 108.

Khunnang (Thai: ขุนนาง) with the rank *Phraya* (Thai: พระยา)[40]. This style of jacket is similar to a military jacket (Fig. 42-43). It was modified to be worn with traditionally wrapped trousers *Chong Kra Ben* (Fig.44-45).

Fig. 40: King Chulalongkorn visited Singapore (1870).

Fig. 41: King Chulalongkorn wears a military-style jacket with wrapped trousers (1874).

Fig. 42: A military-style jacket custom made by Ramsay & Co Bangkok (1884).

Fig. 43: The back of the jacket is decorated with metal embroidery, buttons and belt holder (1884).

[40] Samuel John Smith, *จดหมายเหตุสยามไสมย เล่มที่ 3* (Bangkok: Kitwattanatham, 2006), 493.

Fig. 44: Chao Phraya Surabandh Bisudhi (Thet Bunnag) wears a *Yierabab* brocade jacket with an attachable white collar.

Fig. 45: Chao Phraya Surabandh Bisudhi (Thet Bunnag) wearing a *Yierabab* brocade jacket with wrapped trousers *Chong Kra Ben*.

1.2.5 Western attire store in Siam

As a result of Westernization, the Western style garment was adapted to Siam court dress code. The royal family and upper class were the first group who adapted before the middle-class [41].

In the past, the garment of the king and royal families had to be made at the Siam court only according to Siamese's superstition [42]. Around 1885, the *Songdharma* (พระที่นั่งทรงธรรม) throne hall which was located in the Grand Palace was used as a court garment factory [43]. Queen Savang Vadhana, the consort of King Chulalongkorn (King Rama V), was assigned to be responsible for this. The factory had to produce textiles, garments, costumes, and uniforms for people who worked in the Grand Palace. The foreigners were hired to teach about Western tailoring in the court [44].

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[41] Claewplodtook, *"การศึกษาบทบาทและความสำคัญของผ้าเข้มขาบ ผ้าเยียรบับ ผ้าอัตลัด และผ้าตาดที่ใช้ในราชสำนักแห่งกรุงศรีอยุธยาตอนปลาย ถึงกรุงรัตนโกสินทร์ตอนต้น,"* 33-34.

[42] To protect the king from the black magic, the garments had to tailored by trusted person, as the stuff might hidden in the seams or buttons (Sansanee Veerasilpchai, *หอมติดกระดาน เรื่องเล่าชีวิตสาวชาววัง* (Bangkok: Matichon Publishing House, 2010), 39.

[43] Songdharma throne hall was built in 1854 (King Rama IV). It used to be a royal theater before it was turned into a court tailor house (King Rama V). Later the throne hall was demolished.

[44] There were 20,000-30,000 customers which was the royal family and the ladies who worked in the inner court (Veerasilpchai, *หอมติดกระดาน เรื่องเล่าชีวิตสาวชาววัง*, 40.

Apart from the court garment factory which produced western style garments, there were several department stores that were selling and tailoring western garments. For example, Ramsay & Company was located at *Bamrung Muang* (Thai: บำรุงเมือง)Road in Bangkok. The store was founded in 1872 by Richard Harris Ramsay (Fig. 46-47). Mr. Ramsay decided to move his store from Kolkata, India to Bangkok after the state visit of King Chulalongkorn in India between 1871-1872. The store sold western garments and uniforms e.g., coats, collars, hats, socks, etc.[45]

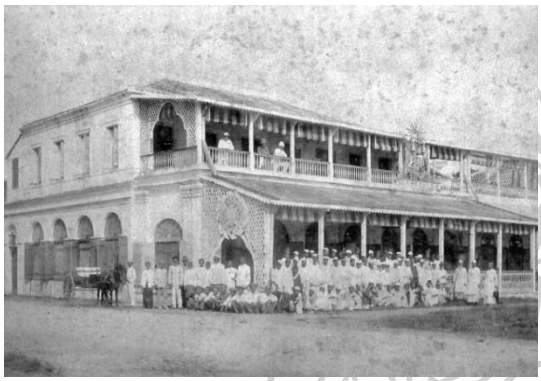

Fig. 46: Ramsay & Company department store (1880).

Fig. 47: Richard Harris Ramsay (1888).

Another western garment store which was the biggest store at that time was Harry A. Badman & Co. The store was founded in 1879 by Mr. Harry Badman, a British businessman. Mr. Badman used to be a partner of Ramsay & Company (Fig. 48). It was originally located near Chang Rong Sri (Thai: ช้างโรงสี) bridge which is near the Ministry of Defence. Then it moved to the area near Phan Phiphop Lila (Thai: ผ่านพิภพลีลา) bridge 46 (Fig. 49-51). King Chulalongkorn opened the new store on December 9, 1907. The store imported products from Europe and the U.S.A. e.g., alcohol, medicine, plants, etc. There was a tailor shop and a military uniform shop in the

[45] Anake Nawigamune, *The Siam Recorder*. (Bangkok: 959 Publishing, 2006), 166-177.

[46] After closing the business in 1932, the builder was used as an office of Department of Public Advertisement (The Public Relations Department). Then the building was demolished and turned into public parking (Narisa Chakrabongse, *A Pictorial Record of the Fifth Reign* (Bangkok: Riverbooks, 1992), 60.).

building. Badman's store was popular among the nobility and upper class during that time [47].

The brocade jacket might have been made in Siam between 1879 – 1907 by Harry A. Badman & Co, according to the label at the inner collar, which shows the former location of the store's *Chang Rong Sri* bridge.

The label attached to the inner collar depicts a bee entangled with the A and H alphabet. In the outer circle, the name of the company and location Badman department store, *Chang Rong Sri* bridge in Thai language is depicted (Fig. 52).

[47] Silpawattanatham, "กำเนิดแบดแมน อดีตห้างดัง ใหญ่ที่สุดในกรุงเทพฯ ฮิตในหมู่ขุนนาง ชนชั้นสูง," accessed Jun 13, 2023, https://www.silpa-mag.com/culture/article_11767.


THE SIAM WEEKLY ADVERTISER.

NOTICE.

RAMSAY, LAWRY & Co.

RAMSAY AND COMPANY.

PRELIMINARY NOTICE.

Ramsay, Badman & Co.

Fig. 48: Ramsay, Badman & Co., the advertisement on the Siam Weekly Advertiser (1880).

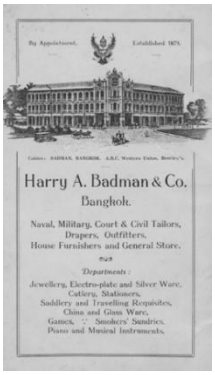
Harry A. Badman & Co.
Bangkok.
Naval, Military, Court & Civil Tailors, Drapers, Outfitters, House Furnishers and General Store.
Departments:
Jewellery, Electro-plate and Silver Ware, Cutlery, Stationery, Saddlery and Travelling Requisites, China and Glass Ware, Games, Smokers' Sundries, Piano and Musical Instruments.

Fig. 49: Harry A. Badman & Co., the advertisement depicts the new store which was opened in 1907.

Fig. 50: The new store of Harry A. Badman & Co., located near *Phan Phiphop Lila* bridge (1907).

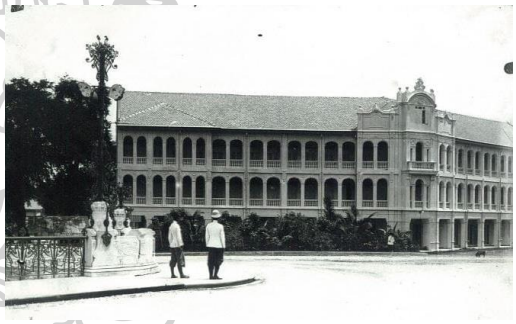

Fig. 51: The new store of Harry A. Badman & Co., located near *Phan Phiphop Lila* bridge.

Fig. 52: The label bee entangled with the A and H. The outer circle is surrounded by the name of the company and location *Chang Rong Sri* bridge.

2. Technological survey

The exterior of the jacket is made of gold brocade. It is lined with different types of fabric. The fibre analytical report reveals three main types of fabric used in the lining; bast fibre, cotton, and silk. The jacket is decorated with metal embroidery at the collar, placket, and cuffs.

2.1 Main fabric

The main fabric of the jacket is made of brocade. Brocade is a woven fabric which repeated raised patterns. The ground is typically woven in a plain, twill or satin weave. The patterns appear at the front of the fabric [48].

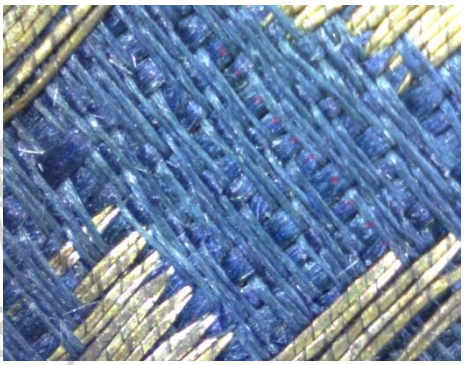

Fig. 53: Detail of the blue silk brocade.

The ground of the jacket is woven in a satin weave. Satin is a smooth and glossy woven fabric. The weft threads float over several warp threads, giving a lustrous appearance [49]. It is a 5-end satin. The warp thread is untwisted. Whereas, the weft thread is in the S-twisted form (Fig. 53). The analysis of fibres indicates that the blue fibre is silk and dye with indigo (Fig.54). The blue silk satin was treated with the weighting agents during the finishing production [50].

The metal threads are used to make the pattern of brocade fabric. The metal strip twisted around a thread core in S-formation [51]. The strip is made of copper and plated on the outer side with silver-gold alloy (Fig. 55). The core fibre is cotton (Fig. 56) [52].

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[48] Britannica, T. Editors of Encyclopaedia, "brocade," Accessed Aug 31, 2023, https://www.britannica.com/technology/brocade.

[49] Karn Finch and Greta Putnam, *Caring for Textiles* (New York: Watson-Guptill Publications, 1977), 100.

[50] The analysis of fibres was carried out by Dr. Tatjana Bayerova at the Institute of Conservation (headed by o. Univ.-Prof. Mag. Dr. Gabriela Krist), University of Applied Arts Vienna.Appendix – Scientific Investigations.

[51] Metal thread morphology is divided into four categories: 1). a strip 2.) a strip wrapped around a core thread 3.) a wire 4.) a wire wrapped around a core thread (Agnes Timar-Balazsy and Dinah Eastop, *Chemical Principles of Textile Conservation* (London: Routledge, 1998), 128-129.).

[52] The SEM-EDS analysis was performed by Dr. Tatjana Bayerova at the Institute of Conservation (headed by o. Univ.-Prof. Mag. Dr. Gabriela Krist), University of Applied Arts Vienna. Appendix – Scientific Investigations.

Fig. 54: Silk fibre, micrograph 200x, transmitted polarized light, parallel polars.

Fig. 55: The layer of metal thread, micrograph, cross section.

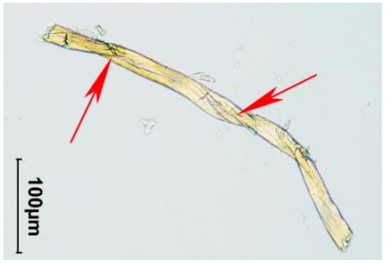

Fig. 56: The arrows mark the characteristic of convolutions of cotton fibre, magnification 200x, transmitted polarized light, pararell polars.

2.2 Lining

2.2.1 Bast fibre

The collar is lined with undyed cellulose-based fabric. The analysis from optical microscopy in transmitted light indicates the lining fabric is made of bast fibre. The specification was limited since the short length of the selected sample. The thread is twisted in Z-formation. There are six warp threads and six weft threads in a square centimeter (Fig. 57-58).

Fig. 57: The bast fibre lining at the collar.

A starch test was carried out using Iodine and Potassium Iodine and the testing of proteins with p-Dimethylbenzaldenhyde. The result reveals that the fibres are treated with starch and protein. Presumably the collar was shaped and hardened in a desired state with adhesives (Fig. 59)[53].

[53] The fibre analysis was performed by Dr. Tatjana Bayerova at the Institute of Conservation (headed by o. Univ.-Prof. Mag. Dr. Gabriela Krist), University of Applied Arts Vienna. Appendix – Scientific Investigations.

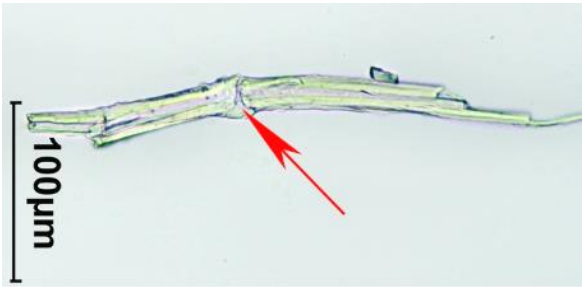

Fig. 58: The arrow marks nodes of bast fibre, micrograph 200x; transmitted polarized light, parallel polars.

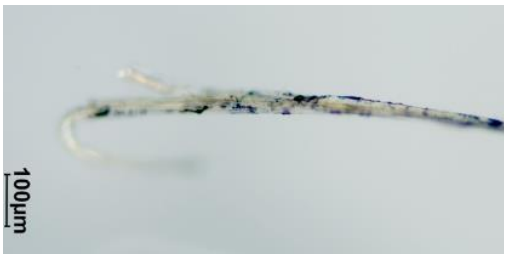

Fig. 59: The dark blue spots indicate the presence of starch.

2.2.2 Cotton

The fibre investigation with optical microscopy in transmitted light indicates that cotton fibres are used in the lining fabric at the lower back pattern and batting lining material [54]. The lining at the back consists of thirty-six warp threads and forty weft threads in one square centimeter. Both of the warp thread and the weft thread are z-twisted (Fig. 60-63).

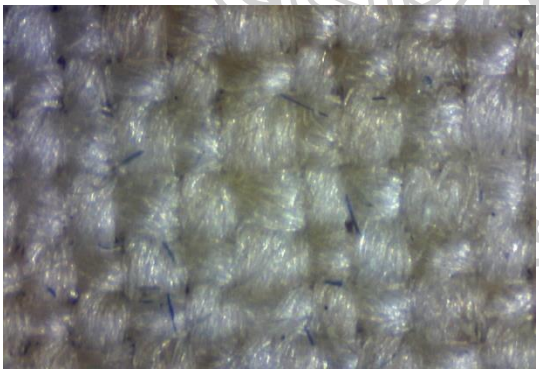

Fig. 60: Detail of cotton lining.

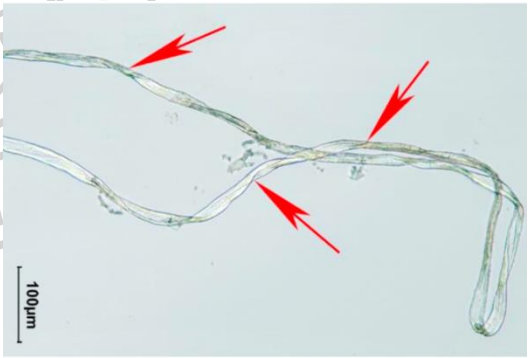

Fig. 61: The arrows mark the characteristic of convolution of cotton fibre, 200x; transmitted polarized light, parallel polars.

[54] The fibre analysis was performed by Dr. Tatjana Bayerova at the Institute of Conservation (headed by o. Univ.-Prof. Mag. Dr. Gabriela Krist), University of Applied Arts Vienna. Appendix – Scientific Investigations.

Fig. 62: Cotton fibre of batting lining, micrograph 50x.

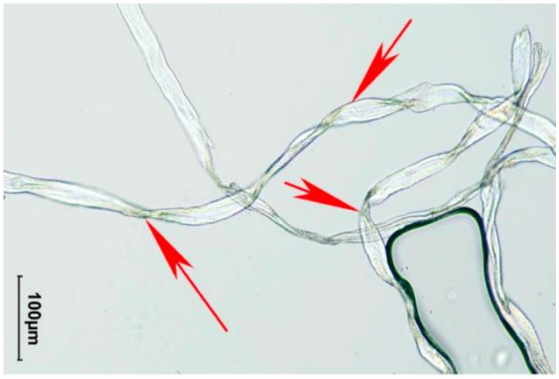

Fig. 63: The arrows mark convolutions of cotton fibre, micrograph 200x; transmitted polarized light, parallel polars.

2.2.3 Silk twill

The investigation with optical microscopy in transmitted light indicates that silk material was used for lining including the sleeves [55]. The yellow silk fabric is a twill weave. The twill weave structure shows a diagonal line that is systematically repeated (Fig. 64-65).

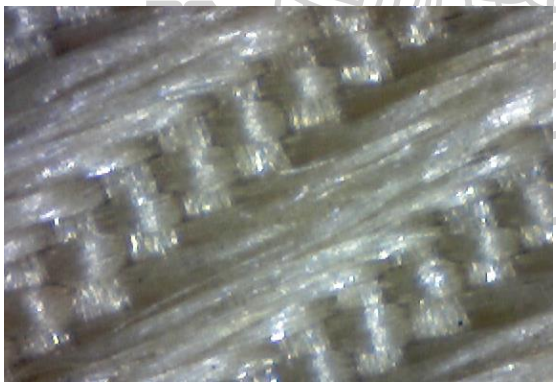

Fig. 644: Detail of silk twill that used for a lining.

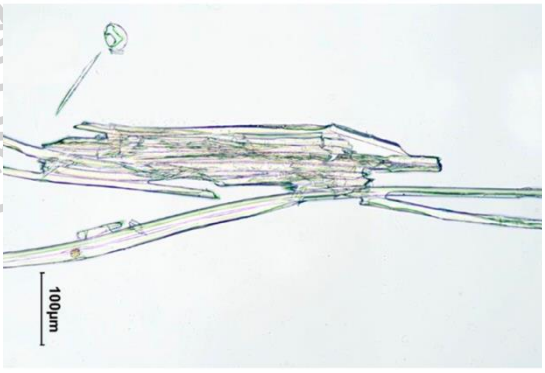

Fig. 65: Silk fibre, micrograph 200x, transmitted polarized light, parallel polars.

[55] The fibre analysis was performed by Dr. Tatjana Bayerova at the Institute of Conservation (headed by o. Univ.-Prof. Mag. Dr. Gabriela Krist), University of Applied Arts Vienna. Appendix – Scientific Investigations.

2.3 Metal embroidery

At the collar, the button seam line, waistline and the cuffs are outlined and ornamented with metal embroidery. The metal strip and the fibre core are not identified (Fig. 66-67). The metal thread is twisted in Z form. The metal threads are attached to the jacket using brown threads with tacking stitch.

Fig. 66: Detail of metal embroidery.

Fig. 67: A core thread of purl embroidery.

2.4 Tailoring and cut

The jacket has long sleeves and is fitted at the torso. It has a standing band-shaped collar with four metal hooks. The single-breasted jacket has seven covered buttons. The round buttons are covered with a jacket-like brocade fabric. The buttonhole is trimmed with brown thread using a buttonhole stitch. At the back waist of the jacket, there are two metal belt hooks and two brocade-covered buttons. The back of the jacket is decorated with two covered buttons at the waistline as well as two metal belt holders. The jacket is embellished with metal threads at the collar, front plackets, and cuffs. The metal threads are sewn onto the fabric with a tacking stitch (Fig. 68). The pattern of the exterior jacket consists of four main parts: the collar, the sleeve, the front part and the back part (Fig. 69). Each part was sewn together using a machine.

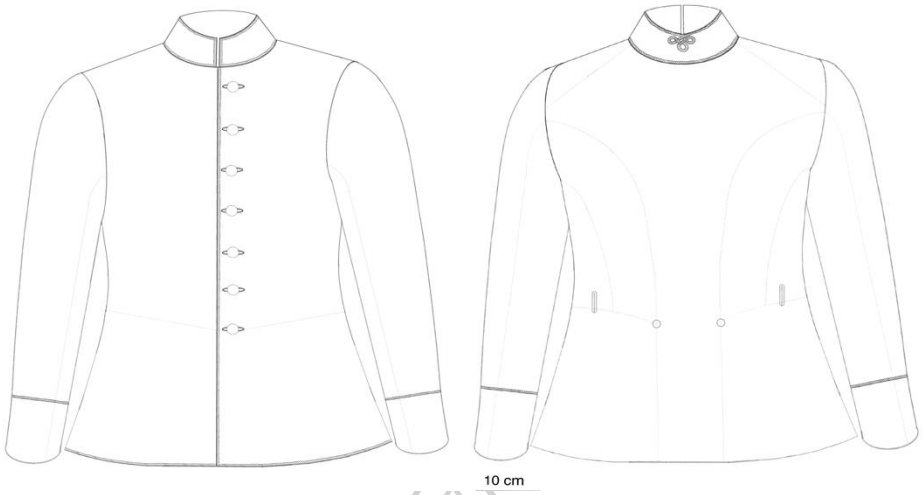

Fig. 68: Illustration of the front and back of the jacket.

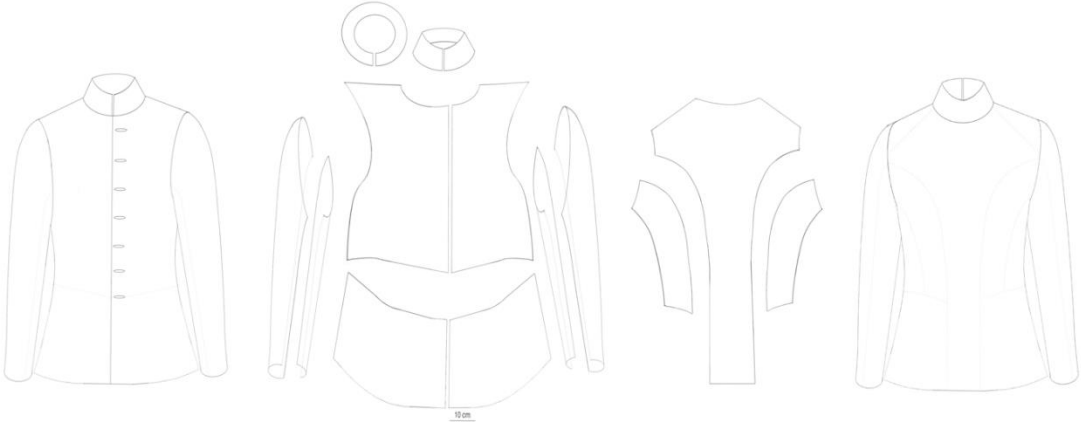

Fig. 69: Illustration of the pattern of the front and back.

The jacket's interior might be compared with the western style jacket which was typically used in that period (Fig. 70). The collar might have been covered with a detachable collar, usually made of cotton fabric, to protect the wearer.

Fig. 70: The lining of a military-style jacket custom-made by Ramsay & Co Bangkok (1884).

The interior is lined with various fabrics (Fig. 71). The collar is lined with bast fibre fabric (Illustration as brown colour in Fig. 71). The front of the upper portion is lined with cellulose-based fabric. The fabric was cut with a pattern resembling the front bodice pattern (Illustration as orange colour in Fig. 71). The lower portion of the back pattern is attached with cotton fabric on both sides (Illustration as dark yellow colour in Fig. 71).

Fig. 71: Illustration of the lining of the collar (brown colour), front part (orange colour) and lower back (dark yellow colour).

The upper part of the jacket and the front placket have a quilted lining. It is made of cotton batting. The cotton batting was cut into four pieces. Then each piece was sewn together with a machine (Fig. 72). The interior including both sleeves might be fully lined with yellow twill silk fabric (Illustration as light yellow colour). The area where the quilt work is sewn in a zigzag design with machine stitching (Illustration as purple colour). A blue strip is located over the yellow twill silk lining at the waistline (Illustration as blue colour). It might be attached to join the internal belt.

Fig. 72: Illustration of the cotton felt lining (purple colour).

Fig. 73: The construction of the lining of the jacket which consists of cellulose base lining, batting, yellow twill silk and belt holder.

3. Condition survey

The condition of the jacket before it came to the museum was poor. The jacket had a brown lining which might have been inserted by the former owner. It was mounted on a fabric board and covered with a plastic wrap sheet. The picture of the front of the jacket in 2009 shows that there are several losses at both sleeves and front part. The structure was deformed at the loss area, especially the upper right sleeve and the lower part of the left jacket. Strong creases are appearing at the collar and both sleeves.

3.1 Condition survey and conservation in 2012

The condition assessment which was examined in 2012 by the Conservation and Registration Department, QSMT reveals the poor condition of the jacket. The jacket was mounted on a fabric-covered board using pins at the collar, sleeves, and bodice. It was covered with a plastic wrap sheet. The board might have off-gassed volatile compounds which created a vinegar-like odour. Brown pieces of fabric which were inserted into the sleeves and body of the jacket might have been added to support the structure. Transparent adhesive tape was used to secure some torn areas as well. The used tape appeared yellow and sticky.

Fig. 74: Condition of the jacket in 2012, the jacket is wrapped with a plastic sheet.

Fig. 75: Condition of the jacket in 2012.

The conservation assessment reveals severe damage to the blue silk satin, which appeared in horizontal tears all over the jacket, especially the lower left corner of the

front side, the upper part of both sleeves and the back of the jacket. The yellow silk lining also showed extensive damage. Both fibres were dry, brittle, and shattered. The cotton batting was also lost in a large area at the back of the jacket. Brown encrustation covered the cotton batting and the nearby brocade.

Previous conservation was carried out by Conservation and Registration Department, QSMT, in 2012. It covered surface cleaning, reconstruction of the structure, and stabilisation. The cleaning method was done by removing the object from the old mount board. Then the insect encrustations and old adhesives were removed mechanically. The dry surface was cleaned only in selected areas using a vacuum cleaner and a soft brush over a protective screen

The reconstruction of the deformed structure was done by humidification. As the fibres relaxed, acid-free papers were inserted to support and minimize the creases. Then padded support using polyester batting covered with fine fabric was made to support the structure permanently. The last step was stabilisation. Brown polyester organza fabric was cut in the same pattern as the inner jacket. A polyester thread with a comparable tone was used. At the centre line, polyester organza was attached using running stitches, while an overcast stitch or whip stitch was used to stitch the edges

Fig. 76: Conservation of the jacket in 2012, dry cleaning.

Fig. 77: onservation of the jacket in 2012, humidification.

3.2 Main fabric

Fig. 78: Condition of the jacket in 2023, torn and deformed at the upper of the proper right side.

Fig. 79: Condition of the jacket in 2023, tears and ravelling threads at the lower corner of the front part.

The brocade fabric is in a fragile condition. The jacket shows significant losses all over it, particularly on the front and back of the jacket and on both sleeves. The pattern appears incomplete as a result. The horizontal tears reveal the absence of blue silk satin fabric. The blue silk fabric is brittle and shattered. The cause of the deterioration might derive from the presence of copper in the fabric which was added for weighting the textile during the production process. The copper was identified by SEM-EDX analysis [56].

Weighting or loading of silk is a finishing process [57] taken to increase the weight of silk fabric after the degumming process. The materials used for the weighting process are sugar, gum arabic, tanning material and mineral salt. During the 19th century, mineral salt such as copper salt was generally used. The fibre structure is weakened by the weighting materials causing brittle and shattering [58]. In addition, the acidity of metal compounds promotes light damage and the chemical reaction such as photo-oxidation

[56] The fibre analysis was performed by Dr. Tatjana Bayerova at the Institute of Conservation (headed by o. Univ.-Prof. Mag. Dr. Gabriela Krist), University of Applied Arts Vienna. Appendix – Scientific Investigations.
[57] The finishing process is the final step in the textile production. It improves the appearance and texture of the fabric as well as its properties such as flexibility, durability, weight,etc. (Timar-Balazsy and Eastop, *Chemical Principles of Textile Conservation*, 44.).
[58] Timar-Balazsy and Eastop, *Chemical Principles of Textile Conservation*, 45.

[59]. These deteriorations are commonly found in imported silk artifacts in Thailand during the 19th – 20th century [60].

In the area where blue silk is lost, the metal threads are ravelling and are disorganized. Deterioration of blue silk fabric weakens the structure, which leads to deformation. The jacket was tightly sealed, pressed with a plastic sheet, and lacked internal structural support. This might have caused the fold lines and creases all over the jacket e.g., the sleeves, the bottom left side, the body seam, and the back

At the upper part of the interior, there are brown encrustations. It covers on both cotton batting lining and brocade fabric. The encrustations might be termite mud tubes which is the pathway that connects the termite nest to the floor and cellar of the house [61]. The solid tubes contain secretion [62], soil and wood. Termite infestation is commonly found in Thailand, especially in paper and wooden artifacts, which are their primary source of nutrients [63] .Carpet beetle shed skin are also found at silk lining and cotton batting. Protein-based materials such as silk lining and silk brocade fabric are the primary source of nutrients for the larvae, whereas the adult feed on flower pollen [64]. Thus, the jacket might have been kept in poor storage condition before.

[59] Timar-Balazsy and Eastop, *Chemical Principles of Textile Conservation*, 105.
[60] Jiraporn Arunyanak,*การจัดเก็บวัตถุพิพิธภัณฑ์* (Bangkok: Museum Siam, 2012), 14.
[61] The jacket might have been kept in a place that is near to a termite's nest (Insectex, "Termite Infestation 101: Recognizing Mud Tubes and More," accessed Aug 7, 2023, https://www.insectekpest.com/blog/termite-infestation-101-recognizing-mud-tubes-and-more/.).
[62] Termite excretion consists of a cellulase protein, which can break down cellulose (Reuben Sanga, "What can termites teach us about better building materials?," accessed Aug 7, 2023, https://www.sciencejournalforkids.org/wp-content/uploads/2022/12/biomimicry_article.pdf.).
[63] Arunyanak,*การจัดเก็บวัตถุพิพิธภัณฑ์*, 24.
[64] Michael Potter, "Carpet Beetles," accessed Aug 7, 2023, https://entomology.ca.uky.edu/ef601.

Fig. 80: Condition of the jacket in 2023, brown encrustation at the cotton batting.

Fig. 81: Condition of the jacket in 2023, brown encrustation at the brocade fabric.

The blue silk fabric is slightly discoloured at the shoulder and sleeves. The cause of discolouration could be both the environment of the former storage and the blue silk brocade which is very sensitive to light due to the weighting agents.

Furthermore, the metal threads at the collar, sleeves, shoulders and lower part of the back have oxidized and are darkened. The SEM-EDX analysis indicates the copper corrosion product. It turned the surface to a darker green colour [65]. Copper corrodes more easily than silver and gold since it is less stable. The corrosion forms in the presence of moisture and air pollutants [66].

[65] The fibre analysis was performed by Dr. Tatjana Bayerova at the Institute of Conservation (headed by o. Univ.-Prof. Mag. Dr. Gabriela Krist), University of Applied Arts Vienna. Appendix – Scientific Investigations.
[66] Timar-Balazsy and Eastop, *Chemical Principles of Textile Conservation*, 136-137.

Fig. 82: Condition of the jacket in 2023, darkened area at the back caused by oxidation of the metal.

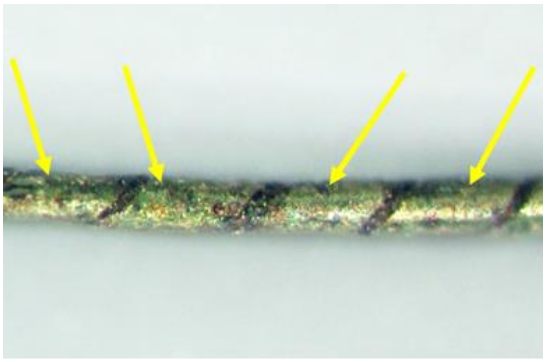

Fig. 83: Green corrosion product of copper at the outer surface of the metal thread.

3.3 Lining

3.3.1 Bast fibre

The bast fibre lining fabric of the collar is in good condition. The structure is strong (Fig. 84). The colour is slightly darkened. The oxidation of cellulose could be the reason for the darkening of the colour [67]. The structure of the right side of the linen collar lining shows deformations.

Fig. 84: Condition of the jacket in 2023, darkened area at the bast fibre lining.

[67] Timar-Balazsy and Eastop, *Chemical Principles of Textile Conservation*, 26.

3.3.2 Cotton

The cotton batting used for the quilted lining is severely damaged from insect infestation (Fig. 85).

However, the structural condition is still strong. Brown encrustation caused by termite infestation appears at the left side of the back pattern. As a result, the colour of the cotton batting facing the cellulose-based lining and brocade fabric changed into a yellow-brown colour.

Fig. 85: Condition of the jacket in 2023, lost at the upper back.

3.3.3 Silk twill

The jacket might have been entirely lined with yellow twill silk fabric. Most of the yellow silk lining is lost. It is brittle and shattered. The deterioration of the yellow silk is similar to the weighted blue silk satin.

Fig. 86: Condition of the jacket in 2023, the yellow silk twill that used to line the entire jacket is lost.

Fig. 87: Condition of the jacket in 2023, lost and shattering.

3.4 Metal embroidery

The purl materials that decorate the collar, placket, and cuffs are in good condition. They have oxidized and slightly darkened (Fig. 88). The purl at the lower portion of the jacket is torn, exposing the core thread. They are detached due to broken lines at the corner of the lower left of the jacket. The two belt holders are also darkened (Fig. 89). The metals become darkened as a result of corrosion product.

Fig. 88: Condition of the jacket in 2023, darkened area at the back of the collar.

Fig. 89: Condition of the jacket in 2023, the belt holders at the back of the jacket is darkened.

4. Aim of the conservation

Conservation aims to develop a concept to stabilize the object for long-term storage which can be used for further study. The conservation will be tested on a selected area. Then the technique will be applied to treat the entire jacket. It is agreed that the original lining which consists of cotton batting and yellow silk fabric will not be altered. The materials utilized for conservation should not modify the appearance and structural integrity. The conservation will focus on three areas; removing previous restoration, surface cleaning and stabilizing. Firstly, the old restoration which covers insect encrustation will be removed since it has the potential to damage further covers. After that, the cleaning process will proceed. Finally, stabilisation will be done using a stitching technique.

5. Concept of the conservation

5.1 Cleaning

The jacket had already been cleaned in 2012. After that, it has been kept in good condition

storage at the museum. The object is stored in a cabinet. It is covered with a Tyvek® sheet in an acid-free box. It still shows a good state of condition. Thus, it might not be necessary to clean the entire jacket.

Fig. 90: The test area for dry cleaning.

The testing area for cleaning will be focused on the upper part of the interior which has the insect shed and encrustation (Fig. 90). The encrustation is covered on both cotton batting lining and brocade fabric. A testing cleaning will be focused on the dry cleaning method since the wet cleaning might be effected to brocade fabric which contains metal material.

Cleaning is the process of removing foreign matter from the original object. Cleaning is an irreversible measure. Weighing the possible advantages and disadvantages of cleaning is a crucial task. Each measure should be selected depending on the condition of the object. The effect of cleaning should be determined prior to any cleaning treatment.

Dirt is a mixture of substances such as textile fibres, human skin, insect shed, mold spores, grease, etc. It promotes further deterioration. Most of the dirt is hygroscopic. It encourages the growth of micro-organisms [68]. Additionally, it deteriorates fibres through enzymatic activity causing discolouration and increased acidity [69].

Dirt adheres to the surface of the fibres through adhesion, which is the secondary bond between the dirt and fibre molecules. Dirt that contains oils, waxes, proteins, and dyes

[68] Museum & Galleries Commission, *Science for Conservators Volume 2: Cleaning* (London: Routledge, 2005), 13-14.
[69] Timar-Balazsy and Eastop, *Chemical Principles of Textile Conservation*, 158-159.

is composed of polar and non-polar parts. Van der Waals forces hold the non-polar part to the fibre, whereas the polar part bonds to the polar region of the material through dipole and hydrogen bonds [70].

5.1.1 Dry cleaning

In order to clean the dirt from the surface, the adhesion must be broken. Mechanical or chemical action can be used to accomplish this. Mechanical action such as dry surface cleaning can be performed first due to the low potential for further deterioration e.g., bleeding, corrosion, and deformation [71]. Mechanical surface cleaning is a manual procedure in which tools are used to remove dirt from the fabric surface. This process typically uses tools such as brushes, tweezers, scalpels, sponges, and adjustable-suction vacuum cleaners. The method is only suitable for removing loosely bounded dirt on the surface [72].

Firstly, the tested area will be dry cleaned with the lowest speed power of a suction vacuum cleaner to remove the loose particles [73]. The surface will be covered with a protective net to protect the silk lining which is attached to the batting. A nozzle should not contact the object's surface directly because the object will be pulled out.

After that, the encrustation will be removed with a scalpel, a soft brush and a low suction vacuum. The batting should be cleaned first before the brocade fabric. A piece of Mylar® sheet or an acid-free paper can be placed between the felt lining and brocade fabric to create a barrier during the cleaning process.

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[70] Timar-Balazsy and Eastop, *Chemical Principles of Textile Conservation*, 161-162.
[71] Museum & Galleries Commission, *Science for Conservators Volume 2: Cleaning*, 27-28.
[72] Canadian Conservation Institute, "Mechanical Surface Cleaning of Textiles," accessed Jun 15, 2023, https://www.canada.ca/en/conservation-institute/services/conservation-preservation-publications/canadian-conservation-institute-notes/mechanical-surface-cleaning-textiles.htm.
[73] Western Australian Museum, "Treatments Cleaning," accessed Aug 30, 2023, https://manual.museum.wa.gov.au/conservation-and-care-collections-2017/textiles/treatments/.

5.2 Stabilisation

The testing area for stabilisation is at the lower corner of the proper right of the front portion of

the jacket. It measures 20 cm x 10 cm. It has horizontal tears along the corner and creases at the side (Fig. 91). This area used to be lined with silk fabric, which could be the same fabric that covers the batting. The area will be stabilized using transparent material which allows to see the structure of the jacket.

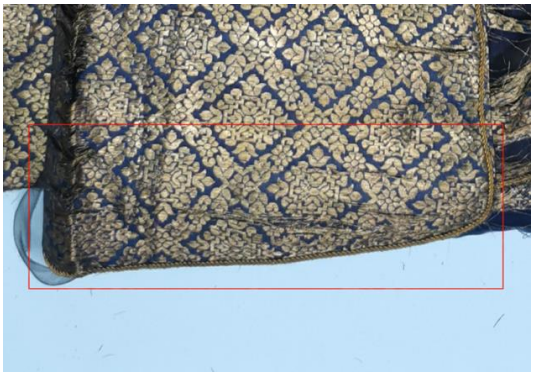

Fig. 91: The test area for stabilisation.

The damage such as tears, holes, abrasion, frayed edges etc. weaken the fabric structure [74]. Stabilisation is the process of strengthening the structure of an object by supporting or reassembling. The object can be locally or fully stabilized depending on the condition. The example of stabilisation techniques are adhesive stabilisation and stitching techniques [75].

5.2.1 The materials used for stabilisation

The materials used for stabilisation depend on the purpose of conservation such as temporary display, permanent display or storage. It should contain supporting properties, a long lifespan and supple aesthetics to the treated object.

In this study, silk crepeline will be used for the testing area since it provides good support and is transparent. The colour of the silk crepeline should match the colour of the jacket. The treatment thread will be taken from the silk crepeline.

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[74] Harold F. Mailand and Dorothy Stites Alig. *Preserving Textiles: A Guide for the Nonspecialist* (United States: The Indianapolis Museum of Art, 1999), 35.

[75] Textile Specialty Group Conservation Wiki, "TSG Chapter VI. Treatment of Textiles- Section H. Consolidation/Stabilization- Non-adhesive Methods," accessed Aug 31, 2023, https://www.conservation-wiki.com/wiki/TSG_Chapter_VI._Treatment_of_Textiles_-_Section_H._Consolidation/Stabilization_-_Non-adhesive_Methods.

5.2.1.1 Fabric

A fragile object should be supported by a material that has adequate strength and elasticity. Tensions will appear if a stronger material is used to support a delicate object. Later, the object will be deformed.

Different types of fabric can be used for backing support e.g., linen, cotton, wool, and silk. Silk crepeline is usually used because it provides the gentlest support and has good strength [76]. Silk crepeline is loose plain-woven silk. The material is easy to dye. It finely conforms to the structure when draping [77]. However, a silk object can be supported with cotton fabric since it is less shiny after being dyed. This is comparable to historical silk objects which often lose their luster after a period of time.

The treatment fabric should be washed before use since most of them might be treated with a finishing agent e.g., starch, cellulose, Polyvinyl Alcohol, etc [78]. The finishing agent prevents dye absorption. Moreover, it accelerates the deterioration process of the object, especially in high-humidity environments. Removal of finishing agents can be done by boiling treatment fabric in water [79].

5.2.1.2 Thread

The reeled silk thread is very thin. It provides strength and flexibility. Thus, it can be used to treat fragile fabric without damaging the original object. Under high pressure, the silk thread will break before causing harm to the object. Moreover, the thread can be dyed in the desired colour. However, an artificial thread like nylon which provides high-strength properties might not be suitable to use. The threads are stiff and less flexible causing damage to the object [80].

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[76] The coat of the Bernisches Historisches Museum, Switzerland, which was treated with washed and dyed silk crepeline about 1963, is still in good condition (Mechthild Flury-Lemberg, *Textile Conservation and Research: A Documentation of the Textile Department on the Occasion of the Twentieth Anniversary of The Abegg Foundation* (Bern: Schriften Der Abegg Stiftung, 1988), 39.).

[77] Textile Specialty Group Conservation Wiki, "TSG Chapter VI. Treatment of Textiles- Section H. Consolidation/Stabilization- Non-adhesive Methods.".

[78] SEKISUI, "Textile Sizing Chemicals in Industrial Warping: Comparing PVOH vs. Starch," accessed Aug 10, 2023. https://www.sekisui-sc.com/blog/polyvinyl-alcohol-vs-starch-as-warp-sizing-chemical-in-textiles.

[79] Flury-Lemberg, *Textile Conservation and Research: A Documentation of the Textile Department on the Occasion of the Twentieth Anniversary of The Abegg Foundation*, 38-39.

[80] Flury-Lemberg, *Textile Conservation and Research: A Documentation of the Textile Department on the Occasion of the Twentieth Anniversary of The Abegg Foundation*, 38.

5.2.2 The technique used for stabilisation

In this study, the sandwich technique will be applied to the test area since it requires less amount of stitches. The stabilisation test series should be practised before being applied to the object. Firstly, the ravelling metal threads will be organized and secured onto a piece of silk crepeline, which is placed underneath a damaged area, using the laid and couched stitch technique (Fig. 92). The length of a stitch is 1 mm and each couching is 5 mm apart. Then a piece of silk crepeline will cover the damaged area creating a sandwich-like layer. Finally, a running stitch will be applied along the edge of the treatment fabric.

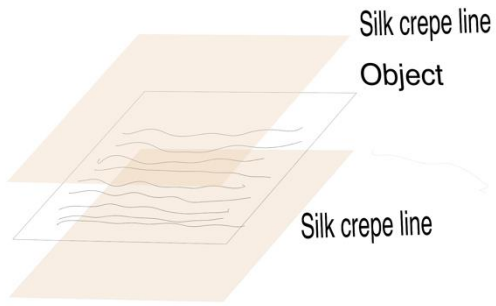

Fig. 92 : Illustration of stabilisation

The stitching technique is generally applied for textile stabilisation since it is reversible. The conserved area will replicate the original object's colour and form. However, the stitching may weaken the fibre structure in some circumstances if the fabric is fragile or brittle [81]. A needle inserted into the treated area may create holes. A stronger treatment thread may damage the thread of the original object [82]. There are

[81] Suzan Meijer, "Bonding Issues?: Adhesive Treatments Past and Present in the Rijksmuseum," accessed Aug 31, 2023, https://www.icom-cc-publications-online.org/1445/50-years-of-synthetic-adhesives-in-the- Rijksmuseum.

[82] Hanna Jedrzejewska, "Problems in the Conservation of Textiles: Needle Versus Adhesive," accessed Aug 31, 2023, https://www.icom-cc-publications-online.org/3649/Problems-in-the-conservation-of-textiles-- needle-versus-adhesive

three methods commonly employed to stabilize a torn area of silk fabric; laid and couched, overlay technique, and sandwich technique.

5.2.2.1 Laid and couched stitch

A laid and couched or laid stitch is a technique for treating a damaged area such as tear [83],

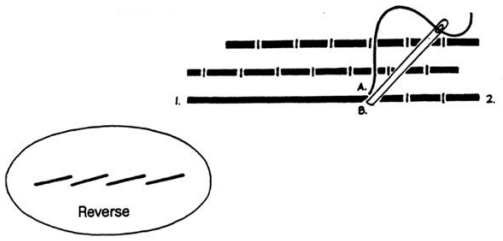

Fig. 93: Laid and couched stitch.

holes [84] and if tears are reinforced or loose threads [85] are secured. The technique developed from the convent stitch [86]. The loose thread can be secured to support fabric which is placed underlying a damaged area. The treatment thread lay crossing the loose thread perpendicularly (Fig. 93) [87]. This technique is primarily employed when treating an object that is in good condition. The structure has to be strong enough to endure extensive stitching. This technique provides good support, although it is time-consuming [88].

[83] Tear is damage where warp or weft threads are broken along the grain of the fabric. This also includes a breakage in irregular line (Museum Textile Service, "Textile Condition Terms," accessed Jun 15, 2023, http://www.museumtextiles.com/uploads/7/8/9/0/7890082/speaking_textile_conservation_nema_2015.pdf.).
[84] Hole is an area of loss in fabric. Warp and weft threads are missing. This also referred to a loss (Museum Textile Service, "Textile Condition Terms." accessed Jun 15, 2023, http://www.museumtextiles.com/uploads/7/8/9/0/7890082/speaking_textile_conservation_nema_2015.pdf.)).
[85] Loose thread refers to a thread that is not fastened and one part is still connected (Museum Textile Service, "Textile Condition Terms." accessed Jun 15, 2023, http://www.museumtextiles.com/uploads/7/8/9/0/7890082/speaking_textile_conservation_nema_2015.pdf.)).
[86] The convent stitch is done to filling the designed pattern. The stitch starts by creating a laid straight thread and secure with the couching technique. Then the stitch is repeated until the pattern is fulfilled (Aleyas Koll, "Convent Stitch," accessed Aug 31, 2023. https://www.embroidery.rocksea.org/stitch/couching-family/convent-stitch/.
[87] The Textile Speciality Group. *The Directory of Hand Stitches Used in Textile Conservation*,26.
[88] Johanna Nilsson, "Evaluation of Stitched Support Methods for the Remedial Conservation of Historical Silk Costumes," accessed Aug 31, 2023, https://www.researchgate.net/publication/283866422_Evaluation_of_Stitched_Support_Methods_for_the_Remedial_Conservation_of_Historical_Silk_Costumes.

5.2.2.2 Overlay technique

The overlay technique, using translucency materials e.g., polyester, nylon net, and silk crepe line is used for protecting the damaged surface [89]. The silk crepeline is commonly used by textile conservators since it provides good strength and flexibility [90]. However, the structure is easy to distort. The overlay technique places a silk crepeline on the damaged surface. Then the silk crepeline is attached with a running stitch. This technique is recommended for fragile silk material objects since it requires fewer stitches.

5.2.2.3 Sandwiched technique

The sandwiched technique can protect fragile silk. The damaged object is placed between a layer of a support fabric and a protection fabric and then attached using a running stitch. A support fabric can vary depending on the conservation purpose, such as a linen or a silk crepeline [91]. The advantage of this technique is that a lesser amount of stitches the same as the for overlay technique is needed [92].

[89] Donna Fulkerson Lavallee, "The Abrasiveness of Sheer Overlay Fabric Used in Textile Conservation" (MS thesis., University of Rhode Island, 2005), 3-7.
[90] Johanna Nilsson, "Evaluation of Stitched Support Methods for the Remedial Conservation of Historical Silk Costumes," accessed Aug 31, 2023, https://www.researchgate.net/publication/283866422_Evaluation_of_Stitched_Support_Methods_for_the_Remedial_Conservation_of_Historical_Silk_Costumes?enrichId=rgreq-870e2fa3b0accd0e706ac26a3a0bec52-XXX&enrichSource=Y292ZXJQYWdlOzI4Mzg2NjQyMjtBUzo1NjI1MjQzMDA4NjU1MzZAMTUxMTEyNzY1MjI0Nw%3D%3D&el=1_x_2&_esc=publicationCoverPdf.
[91] Wang Shujuan, "Diversified Treatment for Fragile Ancient Chinese Silk," accessed Aug 31, 2023, https://www.icom-cc-publications-online.org/4342/Diversified-treatment-for-fragile-ancient-Chinese-silks.
[92] Flury-Lemberg, *Textile Conservation and Research: A Documentation of the Textile Department on the Occasion of the Twentieth Anniversary of The Abegg Foundation*, 42.

Summary

The *Yierabab* brocade jacket may have been made in Siam during 1879–1907 by the Western department store ‘Harry A. Badman & Co’. The jacket represented Siamese custom court between the 19th – 20th century, which adapted the Western tradition, especially the garments to the traditional practise. Moreover, an Indian imported brocade fabric, which contains a high percentage of metal material, indicates the wearer's rank *Phraya* of royal officials.

The previous restoration in 2012, which covered cleaning and stabilisation, was not completed. As a result, the conservation project must be continued. The condition of the object was reassessed again.

The jacket is in poor condition, according to the condition assessment. As a result of the previous condition storage and inherent vice material, it was structurally disintegrating at both exterior and interior fabric. There were severe losses all over the jacket. The blue and yellow silk fabrics were shattered. An inorganic material used for weighting the silk might be the cause of this deterioration. Losing the blue silk fabric weakens the structure and causes deformations. Compared to the cellulose-based materials which were not treated with weighting agents, the structure of cellulose-based fabric was in good condition. There are encrustations and insects shed at the lining.

The study aims to develop and propose the conservation concept for long-term storage. A selected area will be used as a model for the future conservation of the complete jacket. The conservation concept covered three areas: removing the previous restoration, dry cleaning, and stabilisation. Firstly, the previous restoration had to be removed since it covered the unclean area. After that, dry cleaning must be conducted locally using dry mechanical cleaning. Finally, stabilisation could be done by using a stitching technique.

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Appendix - Scientific investigations

SAMPLE DATASHEET

SAMPLING	
NAME	DATE
Elias Campidell / Nuchada Pianprasankit	04.04.2023
PROJECT INFO	**SAMPLE NUMBER**
Thesis Nuchada Pianprasankit	BJ1
OBJECT INFO	
INVENTORY Nr.	COLLECTION
2009.2.565	Queen Sirikit Museum of Textiles
TITLE/DESCRIPTION	ARTIST/TAILOR
Brocade Jacket	Harry A Badman & Co
TYPE OF OBJECT	SAMPLE-DESCRIPTION
Brocade Jacket	Blue brocade fabric
SAMPLING LOCATION	
Metal thread from the brocade fabric. The sample was taken from a pulled thread near the upper part of the proper right sleeve.	 
METHOD	CLASSIFICATION
Taken with a tweezer	
QUESTION	
-What is the component of the metal thread e.g., silver, copper? -What is the type of fibre in the inner part of the thread?	

LABORATORY INVESTIGATION[93]

METHODS APPLIED

- Optical microscopy in incident and transmitted light

- Scanning electron microscopy with energy-dispersive X-ray analysis (SEM-EDS)

EXPERIMENTAL

The supplied sample was photographed before starting of investigations.

Fibre preparation: the inner textile part of the thread was separated; part of the fibres was placed on a flat slide, wetted with a drop of deionized water, then dissected into individual fibres with a dissecting needle and covered with a coverslip.

Fibre preparation was examined and photographed in transmitted polarised light of the optical microscope at different magnifications (Nikon Eclipse ME 600 microscope equipped with the digital camera Nikon D300). The fibre material was determined according to characteristic features of fibres' form and surface structure in their longitudinal view, and by subsequent comparison with reference samples.

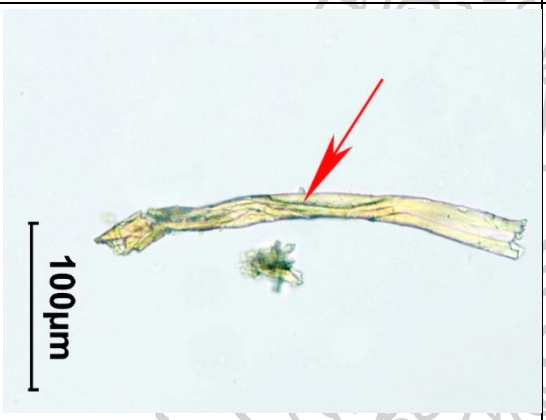
For the study of metal, a cross-section was prepared from a small part of the tread by mounting it into epoxy resin Araldite® 2020 (Huntsman corporation) followed by dry grinding and polishing. Light microscopy of the cross-section was carried out in incident light of the optical microscope (Nikon Eclipse ME 600 microscope, digital camera Nikon D300). The cross-section was further studied by electron microscopy with energy-dispersive X-ray analysis in a high vacuum (scanning electron microscope JEOL JSM-IT200 equipped with the SDD EDX-detector). The elemental composition of the metal thread was analysed in several places.

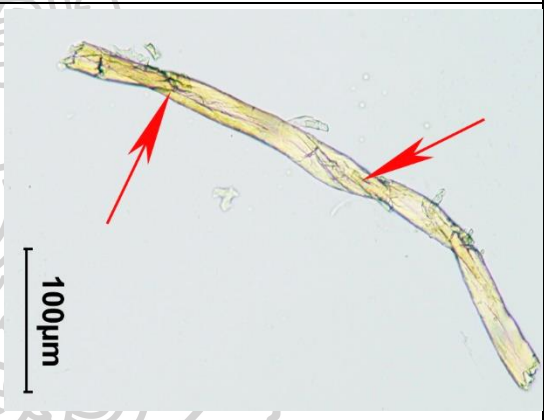
[93] The investigations were carried out by Dr. Tatjana Bayerova at the Institute of Conservation (headed by o. Univ.-Prof. Mag. Dr. Gabriela Krist), University of Applied Arts Vienna.

RESULTS

<table>
<tr>
<td> 

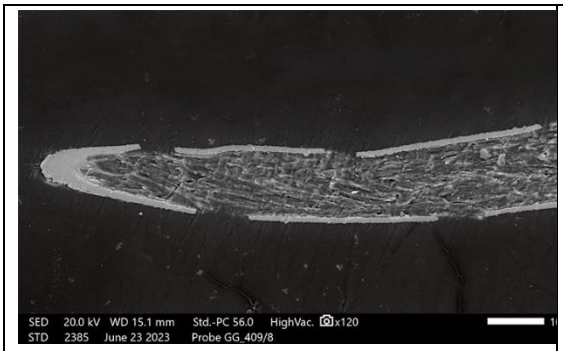
Micrograph, supplied metal thread, magnification 50x</td>
<td> 

Micrograph, supplied metal thread, magnification 100x</td>
</tr>
<tr>
<td> 

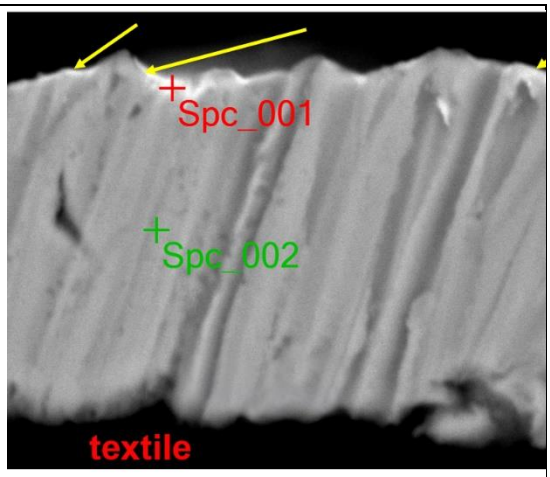
Fibre preparation, micrograph 1 taken at magnification 200x; transmitted polarised light, parallel polars, the arrow marks the twist</td>
<td> 

Fibre preparation, micrograph 2 taken at magnification 200x; transmitted polarised light, parallel polars, the arrows mark the twists</td>
</tr>
<tr>
<td colspan="2">Longitudinal features: The fibres look like a ribbon with twists (convolutions) along the length of the fibre, interior central canal or lumen looks like a striation; the lumen is large, typically more than half the full width of the fibre
The textile fibres of the metal thread are composed of cotton.</td>
</tr>
</table>

	
Metal foil removed from the metal strip, straightened; outer (visible) side (“gold” looking part)	Metal foil removed from the metal strip, straightened; inner side (side attached to the textile fibres – “reddish” looking side)
	
Micrograph, cross-section, showing the metal layer over the inner textile	Micrograph, cross-section, showing the metal layer over the inner textile, detail

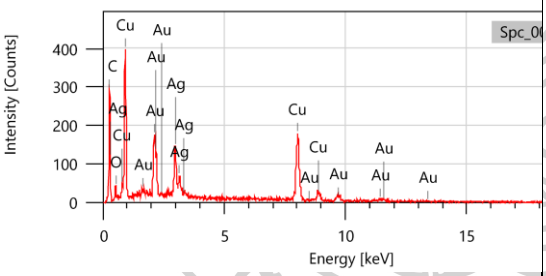


SEM-BSE micrograph 1, cross-section, showing the metal layer over the inner textile

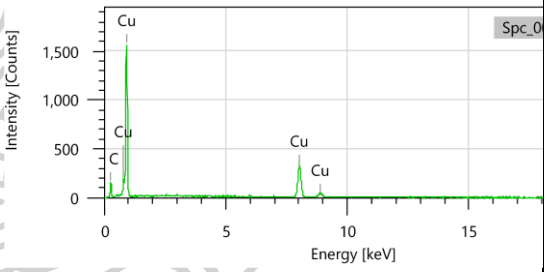


SEM-BSE micrograph 2, cross-section, detail

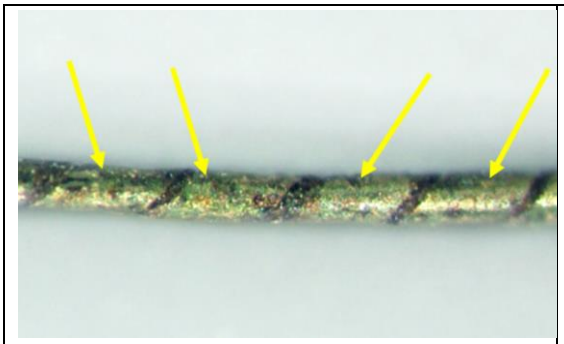
The gold layer is applied only on the outer (visible) part of the metal strip (marked with yellow arrow)



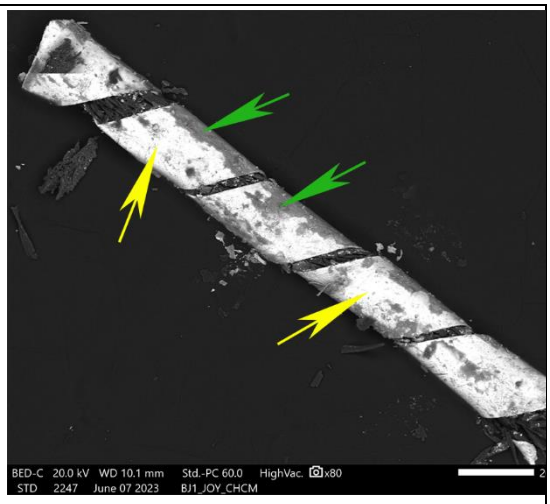
SEM-EDS-spectrum 1 of the gold layer on the top of metal (corresponding to the measuring point Spc_001 from the SEM-BSE micrograph 2)



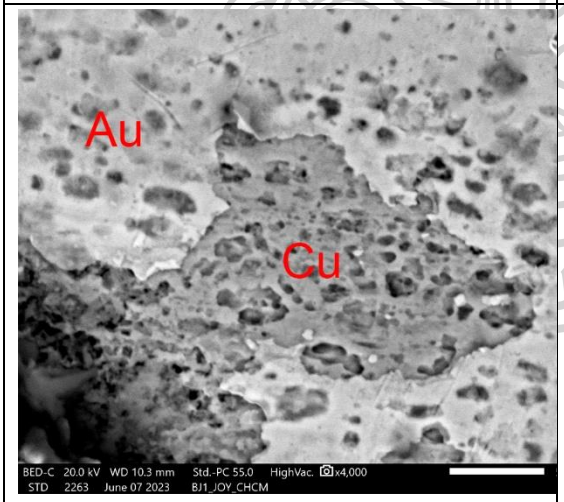
SEM-EDS-spectrum 2 of the inner part of the metal (corresponding to the measuring point Spc_002 from the SEM-BSE micrograph 2)



Micrograph, magnification 100x; the arrows mark green corrosion products of copper

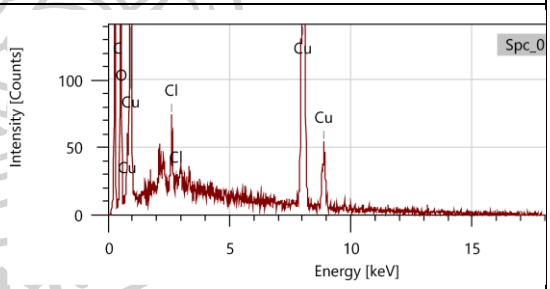


SEM-BSE micrograph 3, the surface of the metal thread. The lighter parts are places with “visible” gold (marked with yellow arrows). The darker parts are places where the gold is covered by the corrosion products of copper (marked with green arrows)



SEM-BSE micrograph 4, the surface of the metal thread, detail.

The lighter part is gold (Au), the darker part is the copper (corrosion Cu) covering the surface of gold



SEM-EDS-spectrum 3 of the green corrosion product on the surface of gold

The metal strip is composed of copper that is on the outer (visible) side gilded with gold (gold alloy with silver, see SEM-BSE micrograph 2 and the respective SEM-EDS spectra 1, 2). On the surface of the metal thread, matt and darker green spots are visible even with the naked eye. The study using SEM-EDS proved that the green spots are corrosion products of copper that cover the surface of gold (see the SEM-BSE micrograph 4 and the SEM-EDS spectrum 3).

SAMPLE DATASHEET

SAMPLING	
NAME	DATE
Elias Campidell / Nuchada Pianprasankit	04.04.2023
PROJECT INFO	**SAMPLE NUMBER**
Thesis Nuchada Pianprasankit	BJ2
OBJECT INFO	
INVENTORY Nr.	COLLECTION
2009.2.565	Queen Sirikit Museum of Textiles
TITLE/DESCRIPTION	ARTIST/TAILOR
Brocade Jacket	Harry A Badman & Co
TYPE OF OBJECT	SAMPLE-DESCRIPTION
Brocade Jacket	Blue brocade fabric
SAMPLING LOCATION	
The blue satin fabric of the brocade. The sample was taken out from torn fabric at the upper part of the proper right sleeve.	 
METHOD	CLASSIFICATION
Taken with a tweezer	
QUESTION	
-What is the type of fabric? -What is the dye component of the fabric?	

LABORATORY INVESTIGATION

METHODS APPLIED

- Optical microscopy in transmitted light[94]

- Scanning electron microscopy with energy-dispersive X-ray analysis (SEM-EDS)[95]

- Raman microspectroscopy[96]

EXPERIMENTAL

The supplied sample was photographed before starting of investigations.

Fibre preparation: part of the fibres was placed on a flat slide, wetted with a drop of deionized water, then dissected into individual fibres with a dissecting needle and covered with a coverslip.

Fibre preparation was examined and photographed in the transmitted polarised light of the optical microscope at different magnifications (Nikon Eclipse ME 600 microscope equipped with the digital camera Nikon D300). The fibre material was determined according to characteristic features of the fibre's form and surface structure in their longitudinal view and by comparison with reference samples.

The fibres were further investigated by SEM-EDS in a high vacuum (scanning electron microscope JEOL JSM-IT200 equipped with the SDD EDX-detector) for the presence of inorganic components. The elemental composition was analysed in several places.

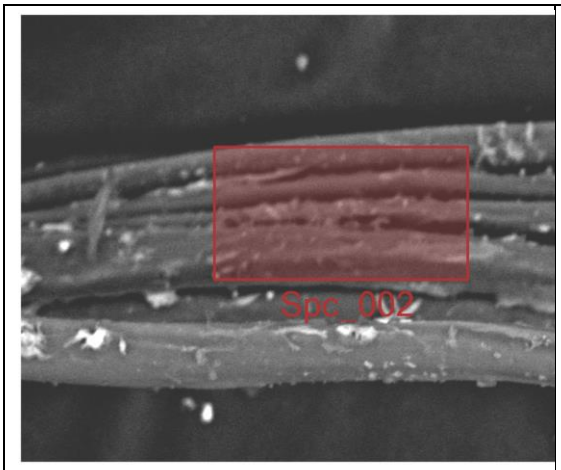
[94] The analysis of fibres was carried out by Dr. Tatjana Bayerova at the Institute of Conservation (headed by o. Univ.-Prof. Mag. Dr. Gabriela Krist), University of Applied Arts Vienna.
[95] The SEM-EDS analyses were performed by Dr. Tatjana Bayerova at the Institute of Conservation (headed by o. Univ.-Prof. Mag. Dr. Gabriela Krist), University of Applied Arts Vienna.
[96] The investigation of indigo was carried out by Dr. Federica Cappa, Institute of Science and Technology in Art (headed by Univ.-Prof. Dipl.-Biol. Dr. Katja Sterflinger), Academy of Fine Arts Vienna.

RESULTS

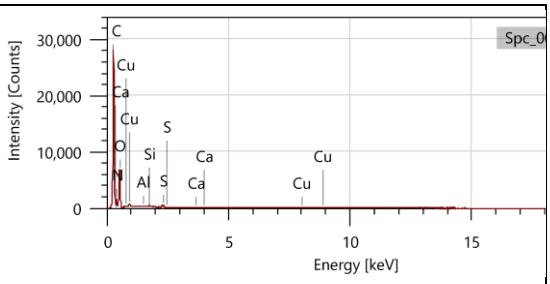
Micrograph, supplied sample, magnification 50x

Fibre preparation, micrograph 1 taken at magnification 200x; transmitted polarised light, parallel polars

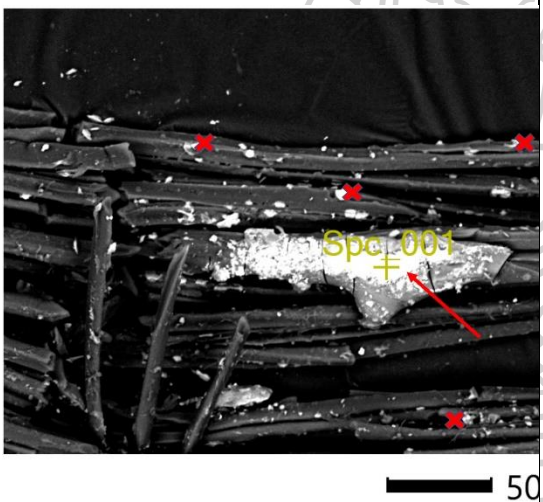
Fibre preparation, micrograph 2 taken at magnification 200x; transmitted polarised light, parallel polars



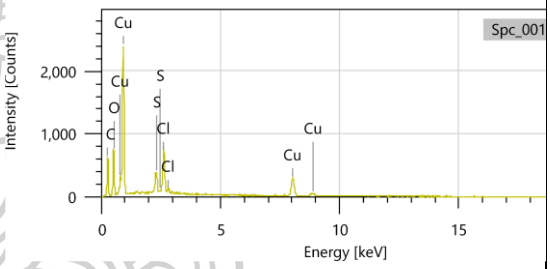
SEM-BSE micrograph 1 with the measured area Spc_ 002



SEM-EDS-spectrum of the measured area Spc_002 showing the presence of copper in fibres



SEM-BSE micrograph 2 with the measured area Spc_ 002 (pointed with arrow). The small “shiny” particles scattered over the fibres are particles of dirt (some of them marked with x)



Display name	Standard data	Quantification method	Result T
Spc_001	Standardless	ZAF	Metal

Element	Line	Mass%	Atom%
C	K	30.03±0.37	54.9
O	K	17.30±0.34	23.7
S	K	3.14±0.10	2.1
Cl	K	7.33±0.16	4.5
Cu	K	42.20±1.10	14.6
Total		100.00	
Spc_001			Fitting ratio

SEM-EDS-spectrum and semiquantitative elemental composition of the measured area Spc_001 showing the particle containing copper and chlorine

Longitudinal features: The surface of fibres is smooth and structureless; fibres are very thin, and the lumen is not visible.
The fibres are made of silk.

Due to the extreme brittleness of fibres, they were further studied by SEM-EDS for the presence of inorganic components, which would indicate the weighting of silk. In all measured spots/areas (altogether around 35 measured places), the presence of copper was confirmed (see the SEM-BSE micrograph 1 and spectrum of the measured area Spc_002). In the SEM-BSE micrograph 2, the particle measured as Spc_001 is marked with an arrow. Its semiquantitative composition on the right shows that the particle contains copper and chlorine.
The SEM-EDS measurements confirmed the presence of copper in fibres confirming the silk was weighted by water-soluble copper salts (possibly with copper chloride). Despite the mostly used weighting substances for silk were salts of tin, salts of copper were used, too[97].

This finding explains also the extreme fragility of the fibres today.

The analysis of dye

The analysis of the blue dye was carried out by Raman-microspectroscopy: LabRAM ARAMIS (HORIBA Jobin Yvon GmbH, Germany) coupled with BXFM microscope (Olympus, Japan). Measuring conditions of measurements: 785 nm (80 mW), and CCD detector (1024x256, Peltier cooled -70 °C) in the backscattered configuration.

The dye was analysed directly on the fibre without any previous treatment.

The analysis proved that the blue dye is indigo.

[97] Hacke, M. 2008. Weighted silk: history, analysis and conservation. *Reviews in Conservation, 9*: page 6.

SAMPLE DATASHEET

SAMPLING	
NAME	DATE
Elias Campidell / Nuchada Pianprasankit	04.04.2023
PROJECT INFO	**SAMPLE NUMBER**
Thesis Nuchada Pianprasankit	BJ3
OBJECT INFO	
INVENTORY Nr.	COLLECTION
2009.2.565	Queen Sirikit Museum of Textiles
TITLE/DESCRIPTION	ARTIST/TAILOR
Brocade Jacket	Harry A Badman & Co
TYPE OF OBJECT	SAMPLE-DESCRIPTION
Brocade Jacket	Light yellow lining at the sleeve.
SAMPLING LOCATION	
Light yellow lining at the sleeve of the jacket. The sample was taken from the torn lining fabric at the upper part of the proper right sleeve.	 
METHOD	CLASSIFICATION
Taken with a tweezer	
QUESTION	
-What is the type of fabric?	

LABORATORY INVESTIGATION[98]

METHOD APPLIED

- Optical microscopy in transmitted light

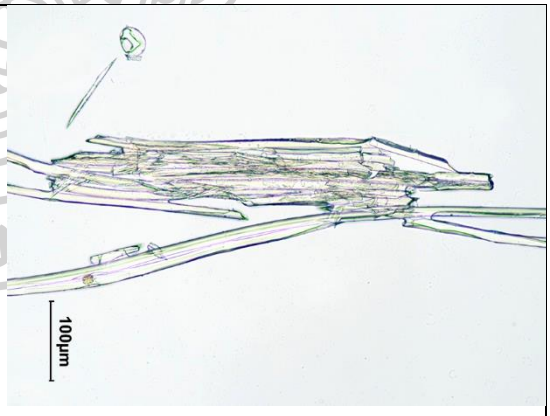
EXPERIMENTAL

The supplied sample was photographed before starting of investigations.

Fibre preparation: part of the fibres was placed on a flat slide, wetted with a drop of deionized water, then dissected into individual fibres with a dissecting needle and covered with a coverslip.

Fibre preparation was examined and photographed in the transmitted polarised light of the optical microscope at different magnifications (Nikon Eclipse ME 600 microscope equipped with the digital camera Nikon D300). The fibre material was determined according to characteristic features of the fibre's form and surface structure in their longitudinal view and by comparison with reference samples.

RESULTS

<table>
<tr>
<td>  </td>
<td> 
</td>
</tr>
<tr>
<td>Micrograph, supplied sample, magnification 50x</td>
<td>Fibre preparation; micrograph taken at magnification 200x; transmitted polarised light, parallel polars</td>
</tr>
<tr>
<td colspan="2">Longitudinal features: The surface of fibres is smooth and structureless; fibres are very thin, the lumen is not visible.
The fibres <u>are made of silk.</u></td>
</tr>
</table>

[98] The investigations were carried out by Dr. Tatjana Bayerova at the Institute of Conservation (headed by o. Univ.-Prof. Mag. Dr. Gabriela Krist), University of Applied Arts Vienna.

SAMPLE DATASHEET

SAMPLING	
NAME	DATE
Elias Campidell / Nuchada Pianprasankit	04.04.2023
PROJECT INFO	**SAMPLE NUMBER**
Thesis Nuchada Pianprasankit	BJ4
OBJECT INFO	
INVENTORY Nr.	COLLECTION
2009.2.565	Queen Sirikit Museum of Textiles
TITLE/DESCRIPTION	ARTIST/TAILOR
Brocade Jacket	Harry A Badman & Co
TYPE OF OBJECT	SAMPLE-DESCRIPTION
Brocade Jacket	Lining fabric of the collar
SAMPLING LOCATION	
Lining fabric of the collar of the jacket. The sample was taken near the right side of a label which located at the centrey line of the collar.	 
METHOD	CLASSIFICATION
Taken with a scissor and tweezer	
QUESTION	
-What is the type of fabric? -What is the component of the fabric e.g., adhesive, starch?	

LABORATORY INVESTIGATION[99]

METHODS APPLIED

- Optical microscopy in transmitted light

- Spot tests

- test for starch using iodine/potassium iodide[100]

- test for proteins using p-Dimethylaminobenzaldehyde[101]

EXPERIMENTAL

The supplied sample was photographed before starting of investigations.

Fibre preparation: part of the fibres was placed on a flat slide, wetted with a drop of deionized water, then dissected into individual fibres with a dissecting needle and covered with a coverslip.

Fibre preparation was examined and photographed in the transmitted polarised light of the optical microscope at different magnifications (Nikon Eclipse ME 600 microscope equipped with the digital camera Nikon D300). The fibre material was determined according to characteristic features of the fibre's form and surface structure in their longitudinal view and by comparison with reference samples.

The presence of starch and proteins was tested with the spot tests: test for starch using iodine/potassium iodide, and test for proteins using p-Dimethylaminobenzaldehyde.

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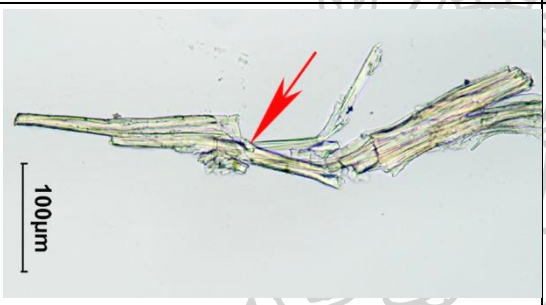
[99] The investigations were carried out by Dr. Tatjana Bayerova at the Institute of Conservation (headed by o. Univ.-Prof. Mag. Dr. Gabriela Krist), University of Applied Arts Vienna.

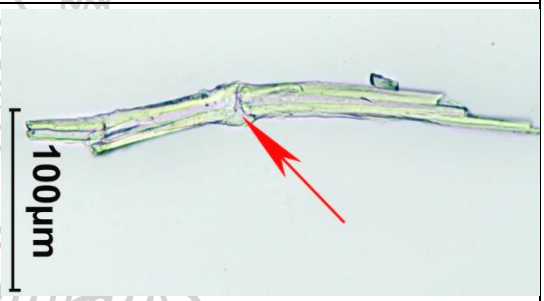
[100] Odegaard, N., Scott, C. & Zimmt, W.S. 2000. Material characterization tests for objects of art and archaeology. London, Archetype.

[101] Schramm, H.P. & Hering, B. 1995. Historische Malmaterialien und ihre Identifizierung. Ed. U. Schießl. Stuttgart, Ferdinand Enke.

RESULTS

<table>
<tr><td> 

Micrograph, supplied sample, magnification 50x</td><td></td></tr>
<tr><td> 

Fibre preparation; micrograph 1 taken at magnification 200x; transmitted polarised light, parallel polars, cross marking node pointed with an arrow</td><td> 

Fibre preparation; micrograph 2 taken at magnification 200x; transmitted polarised light, parallel polars, cross marking nodes pointed with an arrow</td></tr>
<tr><td colspan="2">Longitudinal features: the majority of fibres are present as a bundle of tightly packed fibres in the lengthwise direction; smooth and bamboo-like fibres of irregular width, no lengthwise striations, cross marking nodes typical for bast fibres are present.
The fibres are made bast fibres. The closer specification was not possible due to the short length of fibres.</td></tr>
</table>

 The fibre immersed in the solution of iodine/potassium iodide The formation of strong dark blue colour indicates the presence of starch	

Both spot tests - test for starch and test for proteins – were positive. The fibres are treated with starch and protein.

SAMPLE DATASHEET

SAMPLING	
NAME	DATE
Elias Campidell / Nuchada Pianprasankit	04.04.2023
PROJECT INFO	**SAMPLE NUMBER**
Thesis Nuchada Pianprasankit	BJ5
OBJECT INFO	
INVENTORY Nr.	COLLECTION
2009.2.565	Queen Sirikit Museum of Textiles
TITLE/DESCRIPTION	ARTIST/TAILOR
Brocade Jacket	Harry A Badman & Co
TYPE OF OBJECT	SAMPLE-DESCRIPTION
Brocade Jacket	Felt lining fabric which used as a lining for the upper part of the jacket
SAMPLING LOCATION	
Felt lining fabric located at the upper part of the jacket. The sample was taken from the edge of the felt at the upper front part of the proper right jacket.	 
METHOD	CLASSIFICATION
Taken with a scissor and tweezer	
QUESTION	
-What is type of the fabric?	

LABORATORY INVESTIGATION[102]

METHOD APPLIED

- Optical microscopy in transmitted light

EXPERIMENTAL

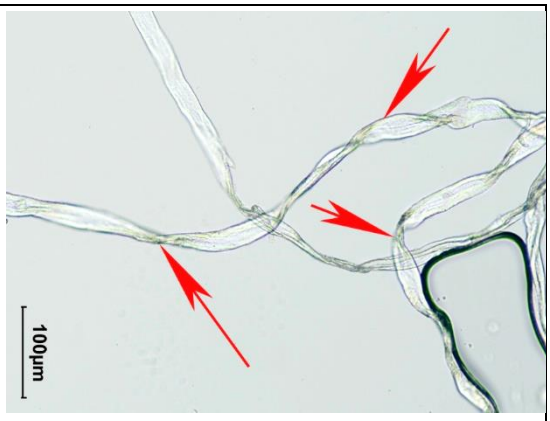
The supplied sample was photographed before starting of investigations.

Fibre preparation: part of the fibres was placed on a flat slide, wetted with a drop of deionized water, then dissected into individual fibres with a dissecting needle and covered with a coverslip.

Fibre preparation was examined and photographed in the transmitted polarised light of the optical microscope at different magnifications (Nikon Eclipse ME 600 microscope equipped with the digital camera Nikon D300). The fibre material was determined according to characteristic features of the fibre's form and surface structure in their longitudinal view and by comparison with reference samples.

[102] The investigations were carried out by Dr. Tatjana Bayerova at the Institute of Conservation (headed by o. Univ.-Prof. Mag. Dr. Gabriela Krist), University of Applied Arts Vienna.

RESULTS

	
Micrograph, supplied sample, magnification 50x	Fibre preparation; micrograph taken at magnification 200x; transmitted polarised light, parallel polars, the arrows mark some of the twists
Longitudinal features: The fibres look like a ribbon with twists (convolutions) along the length of the fibre, the interior central canal or lumen looks like a striation; the lumen is large, typically more than half the full width of the fibre. The fibres are made of cotton.	

SAMPLE DATASHEET

SAMPLING	
NAME	DATE
Elias Campidell / Nuchada Pianprasankit	04.04.2023
PROJECT INFO	**SAMPLE NUMBER**
Thesis Nuchada Pianprasankit	BJ6
OBJECT INFO	
INVENTORY Nr.	COLLECTION
2009.2.565	Queen Sirikit Museum of Textiles
TITLE/DESCRIPTION	ARTIST/TAILOR
Brocade Jacket	Harry A Badman & Co
TYPE OF OBJECT	SAMPLE-DESCRIPTION
Brocade Jacket	Lining fabric at the waistline of the jacket.
SAMPLING LOCATION	
Lining fabric near the waistline of the jacket. The sample was taken from the edge of the fabric at the proper left of the jacket.	 
METHOD	CLASSIFICATION
Taken with a scissor and tweezer	
QUESTION	
-What is the type of fabric?	

LABORATORY INVESTIGATION[103]

METHOD APPLIED

- Optical microscopy in transmitted light

EXPERIMENTAL

The supplied sample was photographed before starting of investigations.

Fibre preparation: part of the fibres was placed on a flat slide, wetted with a drop of deionized water, then dissected into individual fibres with a dissecting needle and covered with a coverslip.

Fibre preparation was examined and photographed in the transmitted polarised light of the optical microscope at different magnifications (Nikon Eclipse ME 600 microscope equipped with the digital camera Nikon D300). The fibre material was determined according to characteristic features of the fibre's form and surface structure in their longitudinal view and by comparison with reference samples.

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RESULTS

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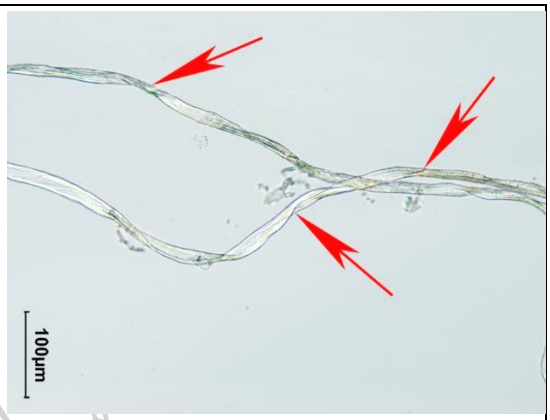
<td> 

Fibre preparation; micrograph taken at magnification 200x; transmitted polarised light, parallel polars, the arrows mark some of the twists</td>
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The fibres are made of cotton.</td>
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VITA

NAME	Nuchada Pianprasankit
INSTITUTIONS ATTENDED	2012 Bachelor of Arts (Art History), Faculty of Archaeology, Silpakorn University 2017 Master of Arts (Career English for International Communication), Language Institute, Thammasat University