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SILK

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SILK

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Edited by

BERIT HILDEBRANDT with CAROLE GILLIS

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Front cover: Wool fabric with Hermes, the Greek god of trade, excavated by Sir Marc Aurel Stein (inv.no. L.C.iii.010a). Courtesy of the National Museum, New Delhi.

Back cover: Reconstruction drawing based on a silk samite from Antinoë (drawing: Thelma K. Thomas, based on Louvre inv. E 29367; after Martiniani-Reber 1997, cat. 35, p. 20 © Musée du Louvre (M. Chuzeville – cat. n° 75 - and Ch. Larrieu – cat. N° 35 -) (here: Fig. 5.20); used by permission)

To the memory of Irene Lee Good (1958–2013)

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Textiles and trade in South Asia during the Proto-Historic and Early Historic Period

J. Mark Kenoyer

This paper will present a critical overview of trade connections between South Asia and the West between 2600 BC and 300 AD. Special focus will be placed on the production of fine textiles including cotton, wool and silk that may have been produced for use by local elites as well as for external trade. The earliest trade connections between the Indus Valley and West Asia began with overland and marine trade during the period of the Indus Civilization, c. 2600–1900 BC. The subsequent periods of intensive exchange include the periods of the Mauryan and Kushana Empires, dating between 300 BC to around 300 AD. Special attention will be paid to textual evidence for the production and trade of fibers and textiles during this time period and the evidence for linkages with the Mediterranean and later Roman world.

The vast subcontinent of South Asia stretches from the borders of Burma and Southwestern China in the East to the Iranian Plateau in the west, from the Himalayan Mountains in the north to the southern tip of Sri Lanka in the south (Schwartzberg 1992). It is a region that has a wide range of resources that have contributed to the development of textile production and technology since early Prehistory, from the spinning and weaving of different types of fibers to dyes and other decorative components of textiles. The earliest production of textiles in South Asia was primarily for internal use but over time, local textile production came to play an important role in trade to adjacent regions and for long-distance trade. This paper will present the earliest archaeological evidence for the use of plant and animal fibers and woven textiles during the Proto-Historic Period of the Indus Tradition (Kenover 2004). It will also present the current information that is available on the production, use and trade of textiles during the Early Historic Period, particularly during the Mauryan and Kushana Empires

(c. 300 BC–300 AD) when we have limited archaeological evidence and various categories of textual evidence for textile production and trade (Singh, K. 1994; Gopal 1961).

The Indus Tradition refers to the long-term cultural trajectories that begin to take shape with hunting and foraging communities who were living in various parts of the Indus River Valley more than 10,000 years ago. By 7000 BC, settled agro-pastoral communities were established and between 5500–2800 BC we see the development of regional cultures that constituted the foundation for later urban society. The earliest incipient urban centers can be dated to between 2800–2600 BC, followed by full urbanism that is often called the Indus Civilization. From around 2600–1900 BC, large walled cities and surrounding smaller settlements represent the earliest phase of urban development in the northwestern subcontinent, in what is now Pakistan and western India (Fig. 2.1, Table 2.1) (Kenoyer 1998; Kenoyer 2011a).

The core regions of the Indus Tradition are situated in the northwestern subcontinent along the Indus River and its tributaries, as well as the parallel but now dry river system referred to as the Saraswati-Ghaggar-Hakra-Nara River. The use of fibers made from animal wool, cotton, and other plant fibers such as hemp and possibly nettle can be traced to prehistoric communities of early farmers and herders who lived and traded from the highlands of Balochistan and Afghanistan, to the Indus and Ghaggar-Hakra Rivers and their tributaries more than 9000 years ago (Fig. 2.1). Over several thousand years small villages and eventually larger settlements and towns were established in Balochistan and throughout the vast alluvial plains. During these initial phases, evidence for fibers and textiles is based on very fragmentary evidence of baskets, beaded ornaments such as necklaces and anklets, fabric impressions left in clay, and



Fig. 2.1: Map of the Indus Tradition and other major sites (drawing: the author).

Foraging Era	Mesolithic and Microlithic	10,000–2000 BCE			
Early Food- Producing Era	Mehrgarh Phase	7000–5500 BCE			
Regionalization Era	Early Harappan Phases	5500–2600 BCE			
Integration Era	Harappan Phase	2600-1900 BCE			
Localization Era	Late Harappan Phases	1900–1300 BCE			

Table 2.1: Indus Tradition

(compiled by the author)

in rare cases, fibers preserved by metallic salts (Moulherat *et al.* 2002). Eventually, with the rise of early urban centers at around 2800 BC (Kot Diji Period), evidence for textiles is seen in the clothing depicted on terracotta human figurines, some of which have painted designs that indicate decorative patterns that were woven or applied to fabrics.

Increased physical evidence for textiles is found in the subsequent Harappan Period (2600-1900 BC) where rare traces of fibers and textiles have been preserved through various preservation processes (Kenoyer 1998). Fibers and tassels were used in copper/bronze ornaments, and some bronze objects were wrapped in textiles prior to storage in the home or inadvertent burial. In the process of metal corrosion, copper salts replace the organic components of the fibers and in some cases the fibers themselves appear to be preserved as if they were "pickled". In other cases, fibers have been charred or sealed under a thin clay slip on pottery. Fabric impressions on pottery or faience vessels are an additional source of evidence for different types of weaving and spinning. In addition, indirect evidence for textiles is seen in graphic depictions on seals and painted pottery, as well as many different styles of terracotta figurines. Animals such as the unicorn that is depicted on seals are often shown with what may be a coverlet draped over the forelegs (Kenoyer 2013). Male and female human

figurines and sculptures reveal the use of shawls, skirts, trousers, turbans, and head dresses for both men and women. Toy beds were decorated with fabric impressions and designs to suggest the use of bed sheets and various decorated fabrics.

The most common fiber used during the Harappan period appears to have been cotton, but various types of wool as well as jute or hemp fibers were also used. The discovery of silk thread inside copper beads and a copper bangle from the site of Harappa indicates that wild silk was also known and used by the ancient inhabitants of the region. Silk fibers have also been recovered from the site of Chanhudaro preserved inside steatite beads that were stored on a copper dish (Good *et al.* 2009; 2011). Until recently it was thought that Indus silk was used only as a thread for ornaments, but as will be discussed in more detail below, the analysis of a piece of woven fabric preserved on a copper razor from Harappa indicates that silk was also used to weave fabrics.

During the Harappan Period, settlers and traders from the Indus Valley expanded into the northern parts of Afghanistan and Central Asia (Turkmenistan) and there is also evidence for trade contact between the Indus, the Persian/Arabian Gulf region, Iran and Mesopotamia (Ratnagar 1981; Kenoyer 2008). It is not unlikely that textiles produced in the Indus region were traded to Central Asia and Iran as well as to regions further to the west in Mesopotamia. These textiles would have included cotton and silk, which were produced exclusively in the Indus at this time period, as well as specific types of wool and bast fibers such as hemp and jute. These early Indus contacts set the stage for later trade networks that were developed during the Early Historic Period (c. 800 BC–300 AD).

During the Early Historical Period of South Asia (c. 600 BC-300 AD), most of the evidence for the use of textiles comes from references in classical texts and inscriptions, or from the depictions of textiles in sculptures or paintings (Singh, K. 1994). The textual references from South Asia include the Vedas, the Mahabharata, Ramayana, and Puranas, as well as the later Buddhist and Jain texts. In addition there are references to textiles from South Asia in Chinese texts, such as the accounts of Sima Qian during the Han Dynasty, and later travel texts of Buddhist pilgrims during the fourth and fifth centuries AD (Gopal 1961). The Western textual sources include references to the textiles of South Asia in Biblical, Greek, and Roman texts (Barber 1991; Parker 2008). Up until now, scholars have generally disregarded the South Asian texts, but have taken the Western texts as true representations of the types of textiles produced and traded in antiquity. However, as will be discussed in more detail below, the archaeological evidence from the Indus civilization and adjacent regions suggests that these texts need to be reviewed more critically. This is particularly important when looking at the terms for silk and the association of silk textile production with

the core regions of China. While there is no question that South Asia was a major producer of cotton textiles of both coarse and fine quality, there is clear textual evidence that this region also produced various qualities of silk fabric using both local wild silk moths and Chinese-derived silk moths (Gopal 1961). A detailed discussion of the nature of the evidence during each major period and new directions for research will be presented below.

Earliest evidence for textiles in South Asia

The earliest evidence for the preparation of fine fibers in South Asia is indirect, and comes from the discovery of tiny ostrich eggshell beads dating to the Upper Palaeolithic, more than 10,000–20,000 years ago (Francis 1997; Sali 1989). These beads would have been strung on finely twisted fiber that could have been made from a variety of plant or animal fibers. The importance of these beads is that people were making fine fibers that were strong enough to hold tiny beads in composite ornaments, and that people in this region probably continued to produce a variety of fibers for thousands of years prior to the eventual indigenous development of more complex forms of spinning and weaving.

The role of fibers in ornaments is better documented from the excavations in the pre-ceramic Neolithic levels at the site of Mehrgarh, Pakistan (Fig. 2.1) (Jarrige and Lechevallier 1979). This site is located in the Kachi Plain along the Bolan River at the western edge of the Indus Valley. The site has evidence of small houses made of mud-brick, and numerous burials that date from between 7000–5500 BC. From the very beginning of the habitation there is evidence that the inhabitants practiced wheat and barley farming as well as sheep and goat and cattle herding. Their subsistence was supplemented by hunting, fishing and gathering wild fruits. The site was also probably a major crossroads for communities migrating between the highlands and the plains.

Although the early settlers at Mehrgarh did not produce fired clay pottery vessels, they made unfired clay figurines (Jarrige, C. 2008) and also produced baskets from reeds or processed plant fibers that were coated with bitumen (Samzun and Sellier 1985). In addition, they traded for exotic beads of marine shell and various types of stones, such as lapis lazuli, turquoise and steatite. The tiny beads found woven into wide headbands must have been threaded with strong fibers derived from either plants or animals (Kenoyer 2004).

The only fiber that can be confirmed for the Neolithic period is cotton. Mineralized cotton fibers have been preserved in rare examples of hammered native copper beads recovered from two different burials (Moulherat *et al.* 2002). The beads were strung with a loosely twisted thread but the nature of the twist was not determined. The copper oxides

from the corroded metal preserved the fibers so that it was possible for the researchers to determine that they were from the cotton plant and not some other vegetal material. Earlier studies of charred seeds had already identified the presence of cotton *Gossypium* sp. at the site at around 5000 BC (Costantini 1984), but it was unclear whether the seeds were collected for their oil or whether the cotton fiber was also being processed. The presence of cotton seeds in an area that also had evidence for possible hide production led the excavators to suggest that it might have been an indication of cotton cloth production (Jarrige *et al.* 1995, 67) though at the time of publication they had not yet discovered the fibers in the copper beads.

Although it is not possible to differentiate the two types of Old World cotton morphologically from charred remains or fibers, the most likely candidate for the cotton at Mehrgarh is Gossypium arboreum L. or Tree Cotton (Moulherat et al. 2002; Fuller 2008). The use of cotton during the Neolithic at Mehrgarh needs further study, as it is not clear whether it was collected wild or was being cultivated. A wild form of G. arboreum is reported from Southern Sindh and also from the dry hills of the Central Deccan, but "... the modern distribution may not represent primary habitat as feral varieties may have spread together with the early cultivar" (Fuller 2008, 3). Wild examples of the other Old World species, G. herbaceum, are known only from South Africa and although there are reports of prehistoric cotton from sites in Arabia and Nubia, "There is no evidence that these early finds in Arabia or Nubia relate to early cultivation, and evidence for cultivation in Africa only begins from the Early Historic horizon (broadly speaking, the Roman period)" (Fuller 2008, 4). In addition to cotton, the ancient inhabitants of Mehrgarh also had domestic sheep and goats (Meadow 1998), so we can assume that wool was commonly used in the preparation of cordage, yarn and various types of textiles.

Evidence for the spinning and weaving of textiles at Mehrgarh is represented by spindle whorls made from stone (Jarrige et al. 1995, 188), and polished rib bones and needles may have been used in weaving and sewing (Jarrige et al. 1995, 188, 369, 514). A study of the bone tools from the various periods has shown that polished rib bones are found first in the pre-ceramic Neolithic and increase during the subsequent Chalcolithic period when pottery making becomes widely practised (Russell 1995). Some of the bone tools have been linked to pottery making due to their discovery in a pottery workshop but others may have been used for weaving. Ongoing experimental studies of bone tools at the site of Harappa by the author have shown that the nature of the polish on the bone tools used in pottery making is distinct from those used in the production of fabrics, and that the highly polished bone tools at Harappa and also at Mehrgarh may have been associated with weaving rather than pottery making.

A residual impression of what appears to be a fragment of black- and red-colored woven textile was found in one of the Neolithic burials at Mehrgarh (Jarrige *et al.* 1995, 211, 223 fig. 4.5c). This discovery may indicate that some of the textiles were either dyed or painted with pigments. Black color could be the result of a carbonized vegetable dye such as indigo blue or red madder, or a blackened iron oxide pigment. There is considerable evidence for the use of red ochre in the burials at Mehrgarh and in various domestic areas of the site (Jarrige *et al.* 1995), so the red color may have been derived from ochre, which is also a form of iron oxide.

Although the evidence of textiles from the earliest period at Mehrgarh is quite fragmentary, there is concrete evidence for the early use of cotton fibers for stringing ornaments, and for the early indications of woven textiles, even though the type of textile is still not confirmed.

Indus Tradition textiles

During the Regionalization Era (5500-2600 BC) of the Indus Tradition, there is increasing evidence for the production of textiles and dyeing based on impressions found in clay ornaments, spindle whorls, bone weaving tools, and representations of patterned fabrics painted onto fired terracotta figurines. At the site of Harappa during the Ravi Phase occupation (3900-2800 BC), spindle whorls have been discovered that fall roughly into two different weight categories (Kenoyer 2010b). The sample size for complete spindle whorls is small (n=6), and the two sizes average 16.6 g and 28.4 g. During the subsequent Kot Diji Phase (2800-2600 BC), there are four categories of weights with the two larger categories being roughly the same as those seen during the Ravi phase, at 23.13 g and 30.46 g (n=7). Two smaller categories of spindle whorls could indicate the production of finer threads but the sample size for complete whorls is not very large (n=4) (Kenover 2010b). Overall, the spindle whorls indicate that both fineand coarse-weight threads were being spun, but it is not known what fibers were being spun. The region around ancient Harappa was suitable for growing cotton, hemp and other plants that could produce bast fibers, and also had excellent grazing for sheep and goats, so the fibers being used could have come from a wide range of vegetable or animal sources.

Two small terracotta beads with impressions of loosely woven, simple weave fabrics with what appear to be S-twist threads have been discovered from the Ravi levels at Harappa (Fig. 2.2). Although the impressions are somewhat faint, it is possible to note that the fabric was loosely woven with approximately 11 threads per centimeter and that the threads were less than 0.2 mm thick. Weaving could have been done on a back strap loom or a more complex form but so far no loom weights have been found in the Ravi



Fig. 2.2: Terracotta bead with textile impression, Ravi Phase, Harappa (photo: the author, courtesy of the Harappa Archaeological Research Project and the Department of Archaeology and Museums, Government of Pakistan).



Fig. 2.3: Terracotta figurines, Nausharo (courtesy of J.-F. Jarrige and the Department of Archaeology and Museums, Government of Pakistan).

Phase deposits. There are however numerous bone tools, generally made from bovine ribs that have a high polish that may be linked to weaving. A small piece of bone with multiple holes drilled into it could possibly have been used as a card-weaving tool for making narrow belts (Kenoyer 2011b). Future replicative studies will be undertaken to determine the type of design that might have been produced by such a tool.

At the sites of Mehrgarh an Nausharo, numerous terracotta figurines have been recovered from this same



Fig. 2.4: Terracotta figurine, Harappa, 2800–2600 BC (photo: the author, courtesy of the Harappa Archaeological Research Project and the Department of Archaeology and Museums, Government of Pakistan).

general time period that show the use of a variety of textiles (Jarrige, C. 2008; Kenoyer 2004; 2006a). Many of the female figurines are depicted with elaborate headdresses and necklaces, while the male figurines have turbans or caps, and necklaces. In addition, many of the figurines have what appear to be leg coverings that would have been sewn (Fig. 2.3). At Harappa, a terracotta female figurine dating to the Kot Diji Period (2800–2600 BC) is depicted in what appears to be a full-length skirt made of a fabric woven with two alternating colors in the warp and the weft (Fig. 2.4). This pattern is common in the region today where indigo-dyed blue yarn alternates with natural brown cotton or bleached cotton (Kenoyer 2004). Many of the textiles were probably decorated with beadwork



Fig. 2.5: Terracotta female figurine, Mohenjo-Daro, National Museum, Karachi (photo: the author, courtesy of the Department of Archaeology and Museums, Government of Pakistan).

and sequins as well as various types of buttons. During this time period gold sequins have been discovered for the first time, as well as geometric button seals of fired steatite and bone with holes that could have been used for stringing or to attach them to fabrics. In addition to the depictions of textiles on human figurines, some of the terracotta bull figurines from Harappa and other sites are painted with geometric designs that might indicate the use of some form of textile blankets. Today in Pakistan and India, cattle are often decorated with quilted textiles, which serve as ornamentation as well as protection from cold weather (Kenoyer 2004).

During the Indus Integration Era (2600–1900 BC), major cities were established throughout the Indus River Valley and adjacent regions (Fig. 2.1) (Kenoyer 1998; Possehl 2002). These cities were highly organized with well laid-out neighborhoods, north-south and east-west streets, wells, bathing areas and latrines, as well as some large public structures and craft production areas. The Indus people used



Fig. 2.6: "Priest-King" sculpture, Mohenjo-Daro, National Museum, Karachi (photo: the author, courtesy of the Department of Archaeology and Museums, Government of Pakistan).

a form of writing that is found on seals and inscribed on pottery as well as other items (Kenoyer and Meadow 2010). However, the Indus script has not yet been deciphered and we can use archaeological data only to interpret the nature of their society and the types of crafts and trade that they engaged in. All major settlements were surrounded by massive perimeter walls with brick or stone-built gateways. A wide range of crafts including copper working, stone bead making, shell working, etc., was practiced inside the areas enclosed by the city walls. The presence of some spindle whorls and lots of copper rods/spindles suggest that fibers were being spun inside the city using both drop spindles and hand-turned spinning wheels (Kenoyer 2004). Further studies are needed to confirm the presence of hand-turned spinning wheels (also called spindle wheels by some authors (Baines 1977)), but the significant decline of clay spindle whorls during the Harappan Phase suggests that some other process was being used to spin thread. Grooved stones and fired clay objects have been identified as possible loom



Fig. 2.7: Fabric impressions inside faience vessels, Harappa (a: H99/8939-1, b: H98-3551/8159-15) (photo: the author, courtesy of the Harappa Archaeological Research Project and Department of Archaeology and Museums, Government of Pakistan).

weights, so it is thought that some textiles may have been produced within the walled cities. It is also possible that textiles were woven in rural settlements and brought to the cities, but this is something that needs further research. Regardless of where the textiles were produced, it is not unlikely that textile production and trade were used to support the urban economy as has been documented through textual evidence from contemporaneous cities in Mesopotamia (Wright 2008; Moorey 1985) and Egypt (Lucas 1962; Nicholson and Shaw 2000). Evidence for the use of different types of textiles is found indirectly from the depictions of clothing and turbans on figurines and sculptures, as well as from rare examples of preserved fibers and fabrics (Kenoyer 1998).

Terracotta figurines from the sites of Mohenjo-Daro (Marshall 1931, 338, pl. xciv, 14) (Fig. 2.5) and Harappa as well as other major Indus sites provide evidence for the use of many different types of clothing made from woven textiles (Kenoyer 1991). Unlike the long skirts of the Kot Diji-Period figurines, the Harappa-phase female figurines are usually depicted with short skirts and no upper garment. Some females and some figures depicted in a procession on a carved steatite seal are shown with long skirts that reach to the middle of the calf. While many male figurines are depicted nude, some wear long skirts, while others have only narrow loincloths. The elaborate headdresses of many female figurines may have been made using textiles as they have many different shapes that cannot be made using human hair only. Headdresses for male figures include pointed conical headdresses, turbans, and horned hats that may have been made with fabric or basketry (Kenoyer 1991; Clark 2007; 2008).

Most of these figurines might have been painted, but the pigments have been lost. However, one stone sculpture from Mohenjo-Daro was found with pigment still adhering to the carved designs on a cloak (Marshall 1931, 356–357, pl. xcviii). This figure is often referred to as the "Priest-King", and had a cloak decorated with carved circles, double circles and trefoil motifs thrown over his left shoulder (Fig. 2.6). When first discovered, the carved designs were filled with red pigment in the circular areas and a background filled with some dark pigment that may have been green or blue originally. The white color of the original stone was visible in the outlines of the circular motifs, presenting a colorful pattern of red, white and blue/ green. In later periods of South Asian textile production



Fig. 2.8: Terracotta toy bed model with fabric impression, Harappa (photo: the author, courtesy of the Harappa Archaeological Research Project and Department of Archaeology and Museums, Government of Pakistan).

and even today, indigo blue, red madder, and bleached white textiles are combined to produce outstanding patterns using block printing as well as other forms of coloring. The design on the cloak of the ancient sculpture may represent a form of embroidery, appliqué, or tie dyeing, but most likely not block printing since the pattern is not repetitive (Kenoyer 2004).

Textile impressions and preserved fibers

In addition to indirect evidence, there are numerous impressions of woven textiles that provide concrete evidence for the use of simple weaves and both fine and coarse fibers. The most common form of textile impression is found on the interior of hollow faience vessels and though Vats (1940, 466) suggests that the fabric is cotton, ongoing studies of similar vessels found in more recent excavations at Harappa suggest that many different types of fabrics might have been used. These vessels were made by forming the plastic faience paste around a small ball made of cloth that was then removed after the faience was dry, or burned out during the firing of the faience. Some of the fabrics were made with fine threads and tight weave (Fig. 2.7a), while others had fine threads and an open weave like gauze. A few examples show large, unevenly spun threads and irregular weave (Fig. 2.7b). While the former textiles could represent fine cotton or even wool, the latter might represent a form of hemp or jute fabric. The variation in textiles in these examples suggest that the faience workers had access to many different qualities of



Fig. 2.9: Cotton fiber from Harappa (H2000/2114-73), SEM image (photo: the author, courtesy of the Harappa Archaeological Research Project and Department of Archaeology and Museums, Government of Pakistan).

textile and used whatever scraps were available to them (Kenoyer 2004). Several examples of toy beds made of terracotta with fabric impressions on the upper surface have been found at Harappa. A study of the impressions shows that the simple-weave fabrics were made with threads of uniform thickness that demonstrate the high level of skill of Harappan spinners and weavers (Fig. 2.8).

These various examples in faience and terracotta indicate that the spinning was done carefully to avoid producing threads that had variable thickness. There is a dramatic decline in spindle whorls during the Harappa Phase, suggesting a different technology for spinning. While relatively uniform spinning is possible using drop spindles, it is easier to produce fine threads using a spinning wheel. The initial preparation of the fibers by carding or bowing does not leave a trace in the archaeological record, but there are numerous pointed copper rods that could have been used as spindles on a spinning wheel. Traditional spinning wheels in Pakistan and India today are made almost entirely of wood and string, except for the metal spindle that is used to help spin and collect the thread. Some textile historians seem to think that the spinning wheel was introduced quite late into South Asia, even as late as the fourteenth century (Riello and Parthasarathi 2009), but the evidence from Harappa suggests that it was already in use during the urban Harappa Phase, c. 2600–1900 BC.

In addition to fabric impressions, there are rare examples of preserved fibers found in association with copper or silver objects, or rarely, inside steatite or terracotta beads. The following section will provide more detailed discussion of these fibers and the identification of specific fibers.

Cotton (Gossypium sp.)

The most commonly cited discovery of Harappan fiber was discovered in the early excavations at the site of Mohenjo-Daro where fabric used to wrap a silver jar was preserved through metal corrosion (Marshall 1931:1, 20,



Fig. 2.10: Cotton fiber from Harappa (H1999/2811), SEM image (photo: the author, courtesy of the Harappa Archaeological Research Project and the Department of Archaeology and Museums, Government of Pakistan).



Fig. 2.11: Woven textile on pottery sherd, possibly jute, Harappa (H1988/398) (photo: the author, courtesy of the Harappa Archaeological Research Project and the Department of Archaeology and Museums, Government of Pakistan).

218–219). The fabric was made using cotton threads with a warp count of 20 threads per inch (2.54 cm) and a weft count of 60 threads per inch (2.54 cm) (Gulati and Turner 1928). Another different fabric sample had a warp and weft count of 44×43 threads per square inch (2.54 cm), and the calculated weight of the fabric was around 4 ounces (113.4 g) per square yard (1 yard = 91.44 cm) (Marshall 1931:2, 585–586). Additional examples of cotton fiber have been discovered in the recent excavations at Harappa, also in the context of corroded copper or bronze objects that were wrapped in textiles (Kenoyer and Meadow 2001; Kenoyer 2004). Some of the fibers of cotton are part of woven fabrics (H2000/2114-73) with a loose Z-twist and plain weave (Fig. 2.9) and some are from threads made with a loose S-twist (H 1999/2811) used to string terracotta beads (Fig. 2.10). This later example shows the use of ripe fibers with hollow centers as is documented in some of the fibers from Neolithic Mehrgarh (Moulherat et al. 2002).

Bast fibers: flax (*Linum usitatissimum* L.) and jute (*Corchorus* sp.)

The discovery of seeds from oilseed and fiber-producing plants such as flax indicate that these plants were present in the environment around major Harappan sites in Gujarat, Punjab, Balochistan and Rajasthan (Fuller 2008). The discovery of flax seeds at Harappa, Nausharo, and Rojdi (Gujarat) during the Harappa Phase may indicate the use of the seeds for their oil as well as the use of flax fibers in making textiles. At present no conclusive examples of linen textiles have been reported from the Indus itself, but examples of hemp and jute fabrics and netting have been found at the site of Shar-i-Sokhta in the Helmand Valley of Balochistan and Iran (Good 2007; Wright *et al.* 2012).

At the site of Harappa, there is evidence for the use of bast fibers for fabric production: some of these fibers have been tentatively identified as jute *Corchorus capsularis* L. (Wright *et al.* 2012). Several examples of pottery dating to



Fig. 2.12: Copper wire necklace with silk thread, Harappa (H2000/2242-1) (photo: the author, courtesy of the Harappa Archaeological Research Project and Department of Archaeology and Museums, Government of Pakistan).

around 2200-1900 BC have impressions of fabrics that have been preserved by the fine slips that covered the fabric prior to firing. The preservation of fabric impressions after firing of the pottery has been described as follows: "Its presence in this location may be explained by a common pottery practice of draping damp cloth over areas susceptible to fast drying in order to slow the drying rate. A thin application of clay slip appears to have been washed over the surface of the cloth, coating each of the individual fibers of the threads with a thin film of clay. The cloth was still in place when the dish was fired, burning out the fibers but leaving the clay coatings intact" (Wright et al. 2012). The fabric preserved on this piece of pottery represents single-ply, loosely Z-twisted fibers that were woven in a plain or tabby weave with 12-13 threads per square centimeter, balanced in both directions. Wright has suggested the use of spindle whorls in the production of the threads and points out that the quality of the textile demonstrates the experience and skill of the craftspeople who were producing this fabric (Wright et al. 2012). A closer examination of the fibers shows that there are considerable variations in the thickness of the fiber used in this textile, which is consistent with the type of fibers produced using bast fibers like jute and hemp (Fig. 2.11). Further studies are needed to confirm its identification as



Fig. 2.13: SEM image of silk fibers from the copper wire necklace, Harappa (H2000/2242-1) (photo: the author, courtesy of the Harappa Archaeological Research Project and the Department of Archaeology and Museums, Government of Pakistan).



Fig. 2.14: Copper razor wrapped in woven silk fabric, Harappa (H2000/2164-1) (photo: the author, courtesy of the Harappa Archaeological Research Project and the Department of Archaeology and Museums, Government of Pakistan).

jute and eliminate the possibility of other fibers such as flax, hemp, or nettle. These weedy plants would have been quite common in the landscape around ancient Harappa and would have been relatively easy to process.

Wool

Wool is another fiber that has been tentatively identified in optical microscope studies of preserved fibers but has yet to be studied under higher resolution imaging as the samples are kept in the reserve collection at Harappa Museum. The fibers are preserved on corroded copper artifacts from Harappa. Some of the wool fibers studied by the author are relatively coarse and others are extremely fine. The fine wools, called pashmina and shatoosh today, may derive from distinct species of sheep, goat or high mountain antelope from the northern region of Jammu and Kashmir. The discovery of this type of wool would not be surprising since recent provenience studies of rocks and metals such as lead indicate Jammu as a possible resource area (Law 2011). Further studies are needed to confirm the types of wool being used by the Harappans, but the faunal remains confirm that they had both sheep and goat present at most sites (Meadow and Patel 2003).

Silk

Perhaps the most important discovery regarding the textiles of the Indus cities is the identification of wild silk fibers (Kenoyer 2004; Good *et al.* 2009; 2011) and a fragment of woven silk textile. At present at least three samples from Harappa have been identified as silk, and one sample from the site of Chanhudaro, which is located in the southern Indus Valley (Fig. 2.1). This means that silk was being used in both the northern and southern parts of the Indus River Valley and we can expect to find more examples in the course of future fieldwork. At Harappa, two samples were found quite near to each other in the excavations carried out in 2000 on the northwestern part of Mound E and date to Harappa Period 3B (2450–2200 BC). A third sample was found in 1999 on the eastern part of Mound E in excavations of the latest Harappan occupation, Harappa Period 3C (2200–1900 BC). The sample from Chanhudaro comes from levels that can be roughly dated to this same time period.

One sample from Harappa (H99/8863-2) of fibers (S-plied Z-twist) was found inside a copper alloy bangle, and may have been used as a tassel. This fiber was tentatively identified by the late Irene Good as belonging to the wild silk species Antheraea assamensis, which is commonly known as Maga, Muga, or Munga today (Good et al. 2009). The second sample (H2000/2242-1) of fiber (single-ply Z-twist) was found inside a copper wire necklace and tentatively identified as A. mylitta, which is generally referred to as Tussar or Tussah silk (Good et al. 2009) (Figs 2.12 and 2.13). A third sample (H2000/2164-1) was discovered next to the copper wire necklace in 2000, but was studied only recently. This object is a broken copper razor, similar to ones found wrapped in cloth or fibers in other parts of the site (Figs 2.14 and 2.15). The two broken pieces were wrapped with a piece of fabric that eventually became corroded and was preserved with the metal. Some traces of single strands of fibers were also found wrapped around the handle portion of the object, possibly as a decorative tassel or for protecting the handle. Both the woven fabric and the wrapped fibers appear to be silk, and probably A. mylitta. This identification can be based on the surface morphology of the silk fibers, which appear to be almost identical to those found in the copper wire necklace. The woven fabric is a plain weave with finely twisted fibers (single-ply Z-twist) (Fig. 2.14). The widths of the twisted threads are between 0.25-0.5 mm. There are approximately 18 threads per cm in the warp and 14 in the weft, with the weft strands being slightly heavier (around 0.5 mm each). The discovery of woven silk in the Indus at this early date is extremely significant as it represents the only evidence for early weaving of silk outside of China. The implications of this discovery will be addressed in more detail below and in the section on Early Historic textiles.

The final silk sample of the ancient Indus is from the site of Chanhudaro, which is located in the southern Indus valley (Mackay 1943). This site was an important production center for various types of elite commodities such as long carnelian beads, steatite beads, copper objects, and inscribed seals (Vidal 1989). The sample of silk was found inside a



Fig. 2.15: SEM images of woven silk fabric, Harappa (H2000/2164-1) (photo: the author, courtesy of the Harappa Archaeological Research Project and the Department of Archaeology and Museums, Government of Pakistan).

steatite microbead that was part of a lump of beads preserved on a copper dish. The copper salts may have had some role in preserving the fiber. "The thread consists of a single ply of approximately 40–50 strands, with a slight "S" twist (approximately 12–15 degrees). … [The fibres] appear partially gummed and partially twinned, characteristic of a reeled (but not degummed) silk. … The fibres may be from *A. assamensis* or possibly from a species of *Philosamia* (Eri silk)" (Good *et al.* 2009, 462–463).

The processing of the silk for spinning is also something that can be determined from the examination of the fibers under high resolution stereo electronic microscope (SEM). Some of the fibers from Harappa appear to have traces of sericin and appear to have been only partly degummed before spinning (Figs 2.13 and 2.15). Other fibers, particularly the sample from Chanhudaro, appear to have been partly degummed and reeled, which is a very different process and one that has up until now been linked to China (Good *et al.* 2009). The evidence that both degumming and reeling were practiced by the Indus craftspeople using wild silk suggests that these techniques were common throughout the regions where silk was being processed and not something that was exclusive to China.

The discovery of woven silk fabric in addition to the use of silk fibers for use as tassels and for stringing beads suggests that the Harappan use of silk was quite widespread. The fact that a broken copper tool was wrapped in a piece

of silk cloth prior to taking it for repair or reworking suggests that silk was relatively commonplace and not simply a textile used for high-status attire. The use of silk in the Indus Valley also requires some major reevaluation of our understanding of silk use in the Prehistoric and Early Historic Periods. In the past, all discoveries of silk outside of China were attributed to Chinese silk or possibly the use of local wild silk (Good 1995): however, these discoveries in the Indus Valley now raise the possibility that some of the silk found in Central Asia, West Asia, Egypt (Lubec et al. 1993), and Europe may have come from the Indus Valley. The only way to differentiate these silks is to undertake more detailed comparative studies of the actual specimens. It is also possible that many of the early silk textiles from China were in fact made with wild silk and not from a fully domesticated variety (Peigler 2012).

The various interpretations of silk use during later periods in South Asia are also impacted by these new discoveries. So far there are no samples of silk found from sites of the Indus region during the Late Harappan period (1900–1300 BC). However, at the site of Nevasa, which is located in the northcentral Deccan of peninsular India, silk fibers were discovered in a copper bead necklace dating to around 1500 BC (Gulati 1961). Until the recent discoveries at Harappa, this find was assumed to represent an isolated occurrence and not taken seriously. It now appears that silk continued to be collected and processed in areas of peninsular India,



Fig. 2.16: Map of the Early Historic polities and major trade regions (drawing: the author).

far from the core regions of the Indus and the Ganges where the transition from the Indus cities to the Early Historic Period was taking place.

Early Historic Period textiles

The Early Historic Period in South Asia can be defined in many different ways, but for the purpose of this paper, it can be dated from around 600 BC with the establishment of early

polities in the Ganga-Yamuna River Valley, and continues until around 320 AD with the emergence of the Gupta Dynasty (Table 2.2; Fig. 2.16). This time period corresponds to what can be termed the Indo-Gangetic Tradition, which followed the decline of the Indus Tradition (Kenoyer 1995; Kenoyer 2006b). In contrast with earlier models that see the emergence of cities in the Gangetic region and then a gradual spread to the upper and lower Indus River Valley, new excavations in Pakistan suggest that there is a relatively

	<i>Table 2.2:</i>	Indo-	Gangetic	Tradition
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Regionalization Era					
Vedic and non-Vedic chiefdoms (oral traditions)	1500-800 BCE				
Painted Grey Ware (archaeological culture)	ca. 1200-800 BCE				
Northern Black Polished Ware (archaeological culture)	900/700/500-300 BCE				
Early Chiefdoms and City-States (historical polities)	600–300 BCE				
Nanda Dynasty	362-321 BCE				
Achaemenid Persian occupation in the Northwest	559–326 BCE				
Invasion of Alexander of Macedon	327–326 BCE				
Integration Era					
Mauryan Empire	321–185 BCE				
Localization Era					
Sunga Dynasty: Indo-Gangetic region	185–71 BCE				
Graeco-Bactrian rulers: Northwest, Afghanistan and Indus region	c. 190–150 BCE				
Parthians (<i>Pahlavas</i>): Iran, Afghanistan and Indus region	c. 155 BCE–78 CE				
Kushana Dynasty: Northwest and Gangetic region	c. 78–300 CE				
Saka Kshatrapa: Western Peninsula and Sindh	c. 80 (94)–130–388 CE				
Gupta Dynasty: Indo-Gangetic region	320–540 CE				

(dates compiled by the author from numerous sources including Allchin 1995; Cribb 1996; MacDowall and Taddei 1978; Magee 2004; Singh, U. 2008; Sinha 2001; Thapar 2002)

unbroken tradition of urbanism linking the Late Harappan period in the northern Indus Valley with the first large settlements of the Painted Grey Ware Culture and other traditions in the northwestern subcontinent (Kenoyer 2010a).

The presence of prosperous settlements in the northern Indus region was undoubtedly a major motivation for the Achaemenid Persians to conquer this region around 559 BC and to maintain control of the area until the conquest of Alexander of Macedon in 327/6 BC. Unlike other provinces ruled by the Achaemenids, the only recorded tribute from the Satrapy of Sindhu was gold in the form of gold dust that was presumably collected from the various gold-bearing rivers of the northern Indus River Valley. However, in addition to tribute, this region is known to have provided many other types of trade commodities, including textiles such as cotton, wool and silk (Jain 1974).

While the Indus Tradition could only be studied using the discoveries found in archaeological excavations, the subsequent periods can be approached using a combination of archaeology, oral traditions, and written records from various sources. Due to the limited scope of this paper, the information on the use of textiles during the Vedic period cannot be addressed in detail (Gopal 1961; Balkrishna 1925), but a short summary of the major types of textiles will be presented before discussing the later periods. There are few archaeological sites that can be associated with the earliest periods, but many sites can be associated with later times. Unfortunately, except for the discovery of cotton at a Painted Grey Ware site in the Gangetic plain (Kumar 2010), no direct evidence for textiles has been published from these excavations, so most of the information comes from indirect evidence (spindle whorls, loom weights, etc.) and oral traditions/written texts. Since the main focus of the following discussion will be based on texts, it is important to give a general chronology for the various sources.

The dates for the oral traditions preserved in Vedic texts cannot be accurately determined, but they are thought to date to a period prior to around 1500 BC (Bhattacharya 1999; Thapar 2000). The epic texts of the Mahabharata, Ramayana and numerous Puranas are also difficult to date precisely, but most can be dated prior to the emergence of cities in the northern Indo-Gangetic region around 600 BC. There are also many texts associated with the lives and times of the Jain saint Mahavira and the founder of Buddhism, Siddhartha Gautama (c. 600-400 BC), but the compilation of the texts is much later, and most date to after the 1st century AD. The Astadhyayi is a grammatical treatise that also contains important geographical and political information. This text is attributed to the grammarian Panini and dated to around the 5th century BC. However, it contains elements that may have been contributed by his predecessors and later editors. The Arthashastra is a text on statecraft that is attributed to Kautilya, a minister of Chandragupta Maurya during the 4th century BC. This comprehensive text is one of the most important sources of information on the nature of Early Historic monarchies, republics and politics in general. The Manavadharmashastra or "Code of Manu" is thought to be of great antiquity, but its compilation in the form known today can be dated to between 100-300 AD on the basis of references to historical communities such as the Greeks (Yavanas), Scythians (Sakas) and Persians (Pahlavas) (Allchin 1995; Sinha 2001; Singh, U. 2008; Thapar 2002; Olivelle 2004).

In the earliest Vedic literature (Rg Veda) the major textile referred to is wool, primarily from sheep (Chaturvedi 1999). In later Vedic texts there are references to many other types of fibers that include hemp and possibly jute, as well as linen, and other fibers made from bark, grasses or

leaves (Gopal 1961; Chaturvedi 1999). Terms for weaving and preparing fibers for spinning are well attested in the texts, including terms for stitching, embroidery, dyeing, and painting, using colors that include red and light brown (tawny). Both men and women were associated with textile production but this craft is most commonly associated with women (Chaturvedi 1999). It is noteworthy however that there are no references to cotton in the Vedas (Gopal 1961). When cotton is mentioned in later religious texts (Smriti texts), it is considered to be ritually impure and not appropriate to wear during specific rituals. This situation suggests that Vedic communities learned about cotton from other communities who were living in the Indus Valley and Gangetic regions (Gopal 1961). Another explanation could be that the initial composition of the Vedic hymns dates to a period earlier than the use of cotton at sites such as Mehrgarh (i.e., 7000 BC). Eventually, however, the ritual proscriptions against cotton were abandoned and a cotton thread was worn by Brahman men as an indication of ritual status and purity (Das, S. K. 1930), a practice that continues today. It is also important to note that there is no mention of silk in the Vedic texts, though some scholars have suggested that fine fabrics refer to it (Gopal 1961; Singh, U. 1994).

The later Vedic period reflected in the Mahabharata and the Ramayana texts includes many references to individuals wearing different types of textiles and gifts of textiles that reveal their importance in the economy and trade. Generally speaking the terms for wool, linen, cotton, hemp and even silk that are found in these texts derive from Sanskrit terms or words based on other South Asian languages (Ali 1900 (1974)) such as Dravidian or possibly Mundari. The indigenous roots for the textile terms suggest that the textiles themselves were developed locally. This is particularly important when discussing the terms for silk. The term for the silk worm, as well as silk cloth as defined by the grammarian Panini, is kausheya, and is derived from the term for the silk cocoon, which is kosha (Balakrishna 1925, 49). In addition to kausheya many other indigenous terms have been identified in the various texts, but some terms clearly had multiple meanings and the context is critical for determining whether the word refers to silk or to another material. One important example is the word *patta*, which is used to refer to both silk and to hemp, depending on the context (Gopal 1961, 56). In the Ramayana, Sita is said to put on a silken (kausheya) dress. The Mahabharata mentions silk cloth (kausheya) woven with pearls. The term kitaja refers to silken clothes in general and King Yudhisthira of the Mahabharata is said to have received gifts of silken cloth from Vahlika and Cina (Balkrishna 1925; Gopal 1961). Although the events of the Mahabharata and the Ramayana predate the major contacts between South Asia with the Achaemenid Empire to the West, and China in the East, later additions to the texts do contain some references to

distant regions, such as *Vahlika* (Balkh or Bactria) and *Cina* (China). The precise date for contact between South Asia and China is not known but generally speaking, the use of the term *Cina* for China is thought to date to the period of the Qin dynasty (Gopal 1961), around 221 BC.

The Arthashastra is one of the most important texts providing evidence for the nature of silk production in northern South Asia during the early Mauryan Empire (321–185 BC) (Rangarajan 1992). Textile production was one of the important industries used to support the Mauryan state, and was carefully regulated. All the major fibers discussed above are mentioned in the text, wool, cotton, linen, hemp/jute, and silk. Much of the silk production during the Mauryan period is centered in the eastern regions of Bengal (Gopal 1961) that includes the lower Gangetic River Valley and the farther Brahmaputra River that flows through the modern Indian state of Assam and the country of Bangladesh. During the later Kushana period that corresponds to intensive Roman contact with India by sea, ports along the coasts of South India and the interior sites of the Deccan Plateau were major centers for production of gemstones and other commodities that were in high demand in the Mediterranean, including cotton and silk textiles (Das, D. R. 1969; Cherian et al. 2007; Kelly 2009; Rajan 1994). There are over 30 different terms for various types of native silks from Tamil literary sources in South India that are distinct from silk derived from China (Gopal 1961, 62), so this region may also have been a major production zone for silk in the past, as it still is today. The terms for silk include both Sanskrit-based words mentioned above, as well as new terms that indicate the use of imported silk from Cina (China or Central Asia) or silk derived from a new variety of silk moth that was brought from Cina (China or Central Asia). The terms cinamsuka or cinapatta were used to distinguish between local South Asian silk and silk that was imported from either Central Asia or China. The term patrorna is thought to have been used to refer to silk produced by worms feeding on mulberry leaves, so there is clear indication for the local production of mulberry-based silks as distinct from wild silk moths and worms that live on other types of trees (Balkrishna 1925; Gopal 1961).

Wild, cultivated and domestic silk

Most scholars assume that the Chinese domestic silk moth or worm (*Bombyx mori*), which has lost its ability to fly, along with the mulberry tree that it feeds on were both introduced to South Asia at some point in the Early Historic Period (Singh, U. 1994). However, it is important to note that the wild ancestor, *Bombyx mandarina* (Moore), is found distributed in both China and South Asia and that people in both regions might have been collecting wild silk for hundreds or thousands of years before the process of domestication was complete. The earliest evidence for the use of silk in China dates to around 2570 BC from the Liangzhou Neolithic site of Qianshanyang (Good et al. 2009, 458, referring to Zhou 1980; Vainker 2004). The discovery of silk in China is generally contemporary with the dating of the first wild silk found in the Indus Valley (i.e., 2450–2200 BC). It is not known whether this early example is made from domestic or wild silk, and it is not clear when the domestic variety actually became dominant in the silk industry. Furthermore, there is evidence that another silk moth species, Antheraea pernyi, which is raised on oak trees and called *tussah*, was also commonly used in ancient China, with textual evidence for large-scale production as early as the Han period (Peigler 2012, 95, referring to Chou Iau (Zhao Yau) 1990; Chou Iau (Zhao Yau) 1988). While B. mori and A. pernyi fed on different types of trees and were probably raised in different regions of China, it is not unlikely that silk as well as yarn produced from these two species were being exported from China. Since both species can be degummed and reeled, it is not clear how distinct the two types of fabrics would have been in the past, even though they are quite easy to differentiate in modern production. This new evidence suggests that not all of the silk being produced and exported from China was from the domestic species B. mori, and makes it even more difficult to differentiate imported Chinese silk from that produced in South Asia, where tussah or "wild silk" was also being produced. When textiles are woven, it is possible to determine styles of weaving and patterns from different regions, but the export of raw silk or yarn would be extremely problematic. The only technique that might work would be to analyze the various isotopic signatures of the silk fiber to determine the geological region in which the silk moth and worms were living (Price 2000). This technique has not been undertaken as it requires destructive analysis of fibers to obtain the isotopic signature.

While it is unlikely that two independent processes of domestication of B. mori took place in Asia, it is possible that if wild B. mandarina was in fact being collected in South Asia, this practice was abandoned with the introduction of B. mori from China. The discovery of wild silk in the Indus period and other recent genetic studies show that the so-called "wild" silk moths of South Asia have been exploited and probably cultivated for more than 5000 years, resulting in major differences between true wild populations and cultivated ones. Long-term human intervention in breeding cycles and the preservation of larger cocoons for breeding has eventually resulted in larger cocoons with longer strands and therefore larger quantities of silk. The modern populations of tussah (A. mylitta and A. pernyi), muga (A. assamensis), and eri (Samia Cynthia) are all distinct from their ancestral wild populations, even though they continue to be cultured outdoors and harvested from trees (Peigler 2012).

Conclusion

The literary references to silk production in India discussed above have long been cited in publications from South Asia, beginning with the critical articles written by Mookerjee (1912) and Balkrishna (1925). These early scholars argued that India – i.e., South Asia – had an indigenous silk industry prior to contact with China. Subsequent authors have echoed their sentiments and added occasional new references (Gopal 1961; 2001; Jain 1974; Singh, U. 1994), but textile historians and general historians have never taken these arguments seriously. South Asia was widely recognized as a major source for cotton, but silk was invariably attributed to China or some other region (Barber 1991; Good 1995).

It is only now with the discoveries of woven silk and silk fibers used in ornaments from Harappa and Chanhudaro and the new research on the different species of silk moths that these early statements of indigenous silk production in South Asia can be justified. With this new information, it is possible to critically evaluate and shed new light on the Persian, Greek and later Roman perceptions of India and their discussions of silk (on Greek and Latin terms related to silk and their possible interpretations, see also Chapters 3 and 4 in this volume). In all of the Greek and Roman texts, the term for silk was associated with a people, the Seres or their country, Serica, "the land of silk" that was located to the east or northeast of Persia (McCrindle 2000 (1927); Parker 2008). The fact that Serica was referred to separately from India has resulted in the assumption that they were in fact perceived as distinct regions, but this assumption needs to be reevaluated. The Achaemenid and early Greek sources do not mention the term Seres but most scholars assume that silks were being used during the Achaemenid period based on later Greek and Roman texts. The term Seres is first attributed to Strabo during later Roman times, though some have argued that it originated earlier (Jones 1924). The main confusion appears to be the translation of Serica to China. Technically speaking the Seres were the people who made silk from the silk worm (ser) and given our current knowledge of early silk in India, they could have lived in either South Asia or Central Asia, which were both located at the eastern edge of the known world for the early Greeks (Parker 2008). When the author of the Periplus lumps all silk under the term "linen of Serica", it has been assumed that the place being referred to is China (Schoff 1912; Parker 2008). This assumption should be rejected, because it is clear that China was not the only place producing silk. The situation becomes even more complex when one takes into account the facts that by the early centuries BC/AD, both China and South Asia were cultivating "wild" and domestic silks and that the major trade between the two regions was through Central Asia, though there is some new research that suggests some trade may have taken place between Yunnan and eastern India (Yang 2008). In later Greek and

Roman texts *metaxa* comes to be used for "raw silk" which is thought to refer to the *Antheraea* species of "wild" silk that is called *tussah* (Arozena 1994; see also Chap. 4 of this volume). If further research can demonstrate that the distinction between *serica* and *metaxa* is valid, then the problem will be to differentiate between "raw silk" from south Asia and the same type of silk coming from China. The same problem will have to be addressed for *B. mori*, which was clearly being cultivated in South Asia as well as other regions outside of China.

The role of South Asia in both the overland and sea trade of the Early Historic Period needs much more research, and in particular the scientific analysis of wool, cotton, and silk that may have been passing in and out of the region. For example, the ongoing excavations at the Roman port of Berenike on the Red Sea have found much evidence for cotton textiles (Sidebotham 1996), but so far there is no report of wool or silk that must have also been part of the trade through this route. There are still many questions that need to be answered, but it should be assumed that much of the silk that was being traded to the west was not exclusively produced in China. It is also important to reject the idea that the silk being traded from South Asia to the west was simply the transshipment of yarn and silk textiles imported from China. The overwhelming textual evidence from South Asia and evidence for silk production in the earlier Indus period suggest that both locally produced and possibly some imported silk were being traded from South Asia. This revisionist approach should not be taken as a rejection of the important role of China in the silk trade or the "Silk Road", but rather the inclusion of other participants and commodities that made this trade richer and more diverse.

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