

2017

# Irritating Byssus – Etymological Problems, Material facts, and the Impact of Mass Media

Felicitas Maeder

*Natural History Museum Basel, Switzerland*

Follow this and additional works at: <http://digitalcommons.unl.edu/texterm>



Part of the [Ancient History, Greek and Roman through Late Antiquity Commons](#), [Art and Materials Conservation Commons](#), [Classical Archaeology and Art History Commons](#), [Classical Literature and Philology Commons](#), [Fiber, Textile, and Weaving Arts Commons](#), [Indo-European Linguistics and Philology Commons](#), [Jewish Studies Commons](#), [Museum Studies Commons](#), [Near Eastern Languages and Societies Commons](#), and the [Other History of Art, Architecture, and Archaeology Commons](#)

---

Maeder, Felicitas, "Irritating Byssus – Etymological Problems, Material facts, and the Impact of Mass Media" (2017). *Textile Terminologies from the Orient to the Mediterranean and Europe, 1000 BC to 1000 AD*. 36.  
<http://digitalcommons.unl.edu/texterm/36>

This Article is brought to you for free and open access by the Centre for Textile Research at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Textile Terminologies from the Orient to the Mediterranean and Europe, 1000 BC to 1000 AD by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

# Irritating Byssus – Etymological Problems, Material facts, and the Impact of Mass Media

**Felicitas Maeder**, Natural History Museum  
Basel, Switzerland

In *Textile Terminologies from the Orient to the Mediterranean and Europe, 1000 BC to 1000 AD*,  
ed. Salvatore Gaspa, Cécile Michel, & Marie-Louise  
Nosch (Lincoln, NE: Zea Books, 2017), pp. 500-519.

doi:10.13014/K2CC0XVN

Copyright © 2017 Salvatore Gaspa, Cécile Michel, &  
Marie-Louise Nosch.

Photographs copyright as noted.





# Irritating Byssus – Etymological Problems, Material Facts, and the Impact of Mass Media<sup>1</sup>

Felicitas Maeder

**B**yssus and sea-silk made of the fibre beard of the *Pinna nobilis* – zoologically called byssus – have both become subjects of scholarly interest in the last decade. The subject is discussed not only in scientific books and journals, but also in mass media around the world. Although scientific research has clarified some old misunderstandings,<sup>2</sup> the double meaning of the term *byssus*<sup>3</sup> has created new doubts and scepticism in the scholarly debate, bearing the danger of new,

additional erroneous interpretations. This article recapitulates the present state of knowledge and calls attention to the consequences of assumed ‘old/new knowledge’ entering the scientific discussion.

The *Oxford English Dictionary*<sup>4</sup> shows the following etymological entry for the term *byssus*:

< Latin *byssus*, < Greek βύσσοϛ ‘a fine yellowish flax, and the linen made from it, but in later writers taken for cotton, also

1. I thank Marie-Louise Nosch and Cécile Michel for the invitation to the key lecture at the CTR congress *Textile Terminologies from the Orient to the Mediterranean and Europe 1000 BC – AD 1000* in Copenhagen (18th-22nd June 2014) and the possibility to intensify the scientific discussion on the topic of byssus and sea-silk. I thank Prof. Susanne Bickel, Ägyptologisches Seminar, Universität Basel, and Agnieszka Wos-Jucker, a specialised textile conservator from the Abegg Stiftung Riggisberg, for introducing me to the fascinating world of Egyptian linen.
2. Notably McKinley 1998, and, from 1998 onward, the Sea-silk Project at the Natural History Museum Basel, Switzerland ([www.muschelseide.ch](http://www.muschelseide.ch) in English, German and Italian), both with extensive bibliography. For the term sea-silk see also Yates 1843; Bezon 1857; de Simone 1867; Karabacek 1882; Laufer 1915; Basso-Arnoux 1916; Mastrocinque 1928; Brühl 1938; Villani 1948; Zanetti 1964; Vial 1983; Sagot-Ortega 1992; Sroka 1995; Carta Mantiglia 1997; Maeder 2002, 2004, 2008, 2009, 2010, 2013, 2015, 2016 a, b, 2017; Maeder, in press; Maeder & Halbeisen 2001, 2002; Maeder et al. 2004; Campi 2004.
3. For the term byssus see: Braun 1680; Chambers 1753; Rosa 1786; Mongez 1818; Scot 1827; Baines 1835, 533-543; Gardner Wilkinson 1842; Yates 1843; Gilroy 1845; Long 1846; Smith 1854; Bock 1866 und 1895; Forbes 1956; Wipszycka 1965; Vial 1983; Sroka 1995; Quenouille 2006, 2012, 60-67; Kersken 2008.
4. OED, [www.oed.com](http://www.oed.com) (12.4.2014). See also: Smith *et al.* 1890. German: *Paulys Real-Encyclopädie der classischen Altertumswissenschaft*, term Byssos (vol. III, 1, Olck 1897); Italian: Treccani, *Enciclopedia Italiana di scienze, lettere ed arti*, term BISSO (vol. 7, L. M. C., G. Cal., G. Mon. 1930); French: *L'Encyclopédie, Texte établi par D'Alembert – Diderot*, term BYSSE ou BYSSUS (Tome 2, de Jaucourt 1751, 471-472).

silk, which was supposed to be a kind of cotton' (Liddell & Scott), < Hebrew būts, applied to 'the finest and most precious stuffs, as worn by kings, priests, and persons of high rank or honour' (Gesenius), translated in Bible of 1611 'fine linen', < root \*būts, Arabic bād to be white, to surpass in whiteness. Originally therefore a fibre or fabric distinguished for its whiteness.<sup>5</sup>

James Yates refers in his book *Textrinum Antiquorum* (1843) to Forster's *Liber singularis de bysso antiquorum* of 1776. In Yates' book vol. II about fibres of vegetal origin, in §70 titled Byssus, is discussed whether byssus is linen or cotton, especially in relation to Egyptian mummy bandages.<sup>6</sup> In the following I will examine the term *byssus* using the example of Egyptian mummy bandages based on antique written sources and material evidence.

### Written evidence of byssos in antiquity

In a German lexicon of hieroglyphs, we find a whole chapter on clothing. In the section about fabrics two pages show different hieroglyphs for linen (*Leinen* in German). Among them are hieroglyphs for *Königsleinen*, *Byssus* (king's linen, byssus).<sup>7</sup> The term is also found on the Rosetta stone from the 2nd century BC, a decree issued on behalf of King Ptolemy the Fifth. Here the Greek term *byssinon* is used in a legislative text treating the tax reduction on

βύσσοις. King's linen respectively Byssus are referred to as the finest quality of linen, fabricated – at least in Pharaonic times<sup>8</sup> – only in temple surroundings and exclusively reserved for the clothing of priests or statues of gods and for burial use.<sup>9</sup> We know that byssus workers even had special tools for the production process.<sup>10</sup> Hall considers the production of "the fine royal or byssos linen as the state monopoly of the king himself ... but a fixed quantity had to be delivered to the king for export."<sup>11</sup> The special status of byssus manufacturing is confirmed by an account for celebration and ritual occasions of the temple of Soknebtynis in Tebtunis of the 1st half of the 2nd century AD, written on papyrus: For the priestly expenses is mentioned the price of byssos for the robes of Sarapis, 316 drachmas, for the βυσσοῦργοι, the manufacturer of king's linen two garments and x artabas<sup>12</sup> wheat, and 24 drachmas.<sup>13</sup> This is only one example of Quenouille's study with an in-depth analysis of the context of 27 references to the Greek term *bissos* (with the adjective *byssina*, *byssinon* and the noun *byssourgoi*) on papyri from different places in Egypt, dated 3rd century BC to 3rd century AD, referring to numerous quotations of ancient authors. Almost all these papyri are temple registers, payment lists and laws.<sup>14</sup>

### Material evidence of byssos in antiquity

Fortunately, many written sources about the mummification process have survived. And even more fortunately, many Egyptian tombs have survived

5. The 'whiteness' of antique byssos not only refers to the fibre, but stands also as a symbol for purity and innocence, especially in religious sense.

6. Yates 1843, 267-279. For an analysis and discussion of the term see Maeder 2015; 2016 a; 2017; in press.

7. Hannig & Vomberg 2012, 478-479. Vigo 2010, 291-292 shows that the term was already used in Akkadian, and often found in the correspondence between the Egyptian and Hittite courts.

8. Quenouille 2005, 231.

9. Cooke & El-Gamal 1990, 69.

10. Quenouille 2005, 232. She cites many antique sources for the term byssos and discusses the possible material: linen, cotton, a mixed textile, or byssos as a statement of quality.

11. Hall 1986, 9.

12. An antique measure of capacity.

13. Quenouille 2012, 60-62: "Und für die priesterliche Kasse wenden wir die vorliegenden Beträge auf. ... als Preis für Byssos für die Gewänder des Sarapis 316 Drachmen, ...für die Byssurgen für 2 Gewänder und für den Unterhalt für sie x Artaben Weizen, als Lohn für sie 24 Drachmen, ...".

14. Quenouille 2005.

– some of them intact – and have been found in the last 200 years. Today, the analysis of the found mummy bandages or other textile fragments is standard procedure. This allows us to compare the written sources of textile designations with the material evidence.

For the procedure of mummification, enormous quantities of linen were necessary. To eliminate all moisture from the body, the textile had to be changed several times. So it may not surprise that 12 or more layers of linen bandages have been found on Egyptian mummies.<sup>15</sup> Yet, linen was not only used for wrapping the body, linen cloth also belonged to the principal offerings for the deceased. The higher the status, the larger in amount and finer in quality were the linen gifts. A good example of the importance of linen textiles is the mummy of Wah found in the 1930s in a four-thousand-year-old untouched tomb at Thebes. Today it belongs to the collection of the Metropolitan Museum of Art, New York. Wah was not a royal person, but an estate manager to the early Middle Kingdom vizier Meketra (around 2100 BC). The total of cloth found in his tomb has been estimated to 845 square metres.<sup>16</sup> 375 square metres of linen were used for the body only.<sup>17</sup>

Not only the masses of linen used for the dead are amazing, the quality is also quite stupendous. Cooke & El-Gamal told us about the “ability of ancient cultures to produce textiles woven from exceptionally fine staple yarns ... manufactured from linen... known as byssus or royal linen”.<sup>18</sup> Ancient hand spinners were capable of spinning linen yarns finer than 50 micrometres.<sup>19</sup> Byssus or King’s linen, the finest quality, was made of green flax, the early stage of the

plant’s maturity, when the fibres are still soft. “All the technical procedure [of flax processing] was developed in Egypt, where the finest quality of linen tabby, the *byssos*, constituted the luxury clothing – even of the Pharaoh himself.”<sup>20</sup> The tomb of Tutankhamun of the 18th dynasty (around 1300 BC) contained at least 400 items of cloth.<sup>21</sup> Some were made from a fine, almost silk like linen (112 warps and 32 wefts per square cm).<sup>22</sup> In classical literature we find for such gauze-like linen the Latin terms *linea nebula*, misty linen, or *ventus textilis*, woven wind, or woven air<sup>23</sup> – an expression often found in reference to byssus (we will later see the confusion this creates in reference to sea-silk). From another tomb of 18th dynasty Thebes, we know about a linen sheet of 515 cm x 161 cm, which weighs only 140 grams (46 warp x 30 weft per square cm).<sup>24</sup>

Another, more recent example: In 2012, Susanne Bickel and her team from the University of Basel’s King’s Valley Project<sup>25</sup> found an unknown tomb in the Valley of the Kings. It received the number KV 64. The coffin belongs to a young temple singer of God Amun, daughter of a priest of Karnak; her name, Nehemes-Bastet, is known from the coffin lid and a wooden stela found aside. The typology of the coffin and the stela as well as the lady’s name and title indicate a 22nd dynasty date (around 900 BC).<sup>26</sup> Underneath the thick layer of debris on which the burial was placed were found remains of another burial, dated 18th dynasty, like the tomb of Tutankhamun. There are hints that the original owner of this tomb was a princess of the reign of Amenhotep III. In the debris of this first, original burial many textile fragments were found. The examination revealed ten different

15. Veiga 2012, 3.

16. Vogelsang-Eastwood 2001, 295.

17. Winlock 1940, 256; Vogelsang-Eastwood 2001, 295.

18. Cooke & El-Gamal 1990, 69.

19. Cooke & El-Gamal 1990, 71.

20. Geijer 1971, 687.

21. Vogelsang-Eastwood 2001, 295.

22. Vogelsang-Eastwood 2001, 286.

23. Bock 1884, 515; 1895, 4, 8, 10; Heiden 1904, 105.

24. <http://www.metmuseum.org/collection/the-collection-online/search/545138>

25. <https://aegyptologie.unibas.ch/forschung/projekte/university-of-basel-kings-valley-project/report-2012/> (6.1.2015).

26. Bickel & Paulin-Grothe 2012, 36-40.



qualities of linen fabric, from coarse sackcloth to the finest quality.<sup>27</sup>

All mummy bandages analysed until today are made of linen of different qualities. Already the body of a prehistoric burial found in the cemeteries at Mostagedda (Upper Egypt) was wrapped in linen,<sup>28</sup> and even an animal mummy; but here “the fibre consisted of coarse material, which proves the low quality of the linen”.<sup>29</sup> A single mummy textile was once analysed as cotton – which proved to be wrong: The mummy in question (Philadelphia University Museum: PUM II) had been shipped to America in raw cotton – and the cotton fibres found on the mummy were remains of the travel packaging. The mummy bandages were instead all of linen.<sup>30</sup>

### The term *byssus* in the Bible

The Bible, especially the Old Testament, is another well-known source where the term *byssus* is found more than 40 times – depending on the language and the version. The most translated book of the world is also the best source to demonstrate the difficulties in reference to the term *byssus*. The Hebrew Bible knows six different terms for linen: *Būš*, *Šeš*, *Bād*, *Pištim*, *Eṭin* and *Kūtoneth*. Two of them – *Būš* and *Šeš* – were in the Latin vulgate<sup>31</sup> translated as *byssus*. In two other papers I analysed the translation of this Latin term into English, French, Italian and German in Bible versions of the 16th to the 21st century.<sup>32</sup> Table 1 shows the conclusion: a great variety of terms, which makes it difficult to find any congruence. Most common is linen or fine linen, but also cotton and silk occur – and *byssus*, without translation; only once, in German, *byssus* is annotated finest white cotton. The

greatest diversity of translations is found in German Bible editions. *Bād* has very seldom been translated as *byssus* in Latin; the Hebrew linen term *Pištim* – although never translated as *byssus* in Latin – is in some German Bible versions, paradoxically, translated as *Byssus*.

To sum up: In the Old Testament, different Hebrew linen terms were translated with the single term *byssus* in the Latin vulgate. *Byssus* was again translated differently – in different languages and at different times: beside linen and fine linen, (white) cotton, (white) silk occurs, and *byssus*, mostly without specification, and this in English, French and German. In Italian it is *bisso*. This may lead to the conclusion that many Bible translators had most probably no real notion about the material of *byssus*.<sup>33</sup>

Not much different was the notion of *byssus* outside religious discourse. In the lexicon of *Krünitz*, with 242 volumes the most substantial lexicon of the German language, published between 1773 and 1858, the term *byssus* appears 40 times.<sup>34</sup> We find 15 entries in textile contexts (beside the zoological term for the filaments of bivalves). Once *byssus* is another term for batiste, explained as finest linen:

*Batist, Battist, F. Battiste, L. Byssus, ist eine sehr feine, ganz dichte, und sehr weiße Leinwand, die von weißem, sehr schönen Flachse fabriciret wird; wie denn der Batist das allerfeinste Gewebe von Leinen ist....*

Then, as main entry that emphasizes the above mentioned ignorance:

*Byssus, Fr. Bysse, nannten die Alten eine gewisse kostbare Materie, woraus*

27. This confirms Baines, speaking of Egyptian mummies: “... cloth of every degree of fineness, from the coarsest sacking to the finest and most transparent muslin, ...” (Baines 1835, 533-543). Franz Bock analysed in the 1880s several German textile relics and identified different qualities of linen; the finest one he called Alexandrian linen, less fine was the Syrian one, from Antiochia (Bock 1895).

28. Jones *et al.* 2014, <https://doi.org/10.1371/journal.pone.0103608>

29. Abdel-Maksoud & Abdel-Rahman 2013, 56.

30. Vogelsang-Eastwood 2001, 268.

31. The source of the Old Testament of Christian Bibles in most modern languages is generally the Septuagint, a pre-Christian Greek translation, and the Vulgate, a Latin translation going back to the 4th century AD, with several revisions up to the Late Middle Ages.

32. Maeder 2015 (German), Maeder 216 a (English), and Maeder in press (French), with lists of translations of all Hebrew linen terms in Bible versions from the 16th to the 21st century.

33. I did not refer to the annotations of the respective Bible versions – I only took the word itself.

34. <http://kruenitz1.uni-trier.de/> (15.1.2015). *Byssus* was in addition a name for different kinds of algae, sponges, and lichen.

**Table 1.** Hebrew linen terms translated in Latin, English, Italian, French and German in Bible versions from 16th to 21th century

Hebrew	<i>Būš</i>	<i>Šeš</i>	<i>Bād</i>	<i>Pištim</i>
Vulgate Latin	<i>byssus (serico)</i>	<i>Byssus</i>	<i>linea (byssus)</i>	<i>linea</i>
English	linen <b>byssus</b> silk	fine linen <b>byssus</b> silk	linen	linen
Italian	<b>bisso</b> lino fino lino bianco	<b>bisso</b> lino fino lino finissimo	lino <b>bisso</b>	lino
French	<b>byssus</b> lin fin	<b>byssus</b> fin lin fin coton	lin	lin
German	Leinen <b>Byssus</b> Leinwand Baumwolle	weisse Seide <b>Byssus</b> (= feinste weisse Baumwolle) köstliche Leinwand gele (gelbe) Seide	(weisse) Seide Leinwand <b>Byssus</b> weisse Baumwolle	Leinwand <b>Byssus</b> Baumwolle

*Zeuge zu allerley Kleidungsstücken für die Vornehmen und Reichen, insonderheit auch für die Damen und Priester, gewebt wurden. Imgl. die aus dem Byssus gewirkten Zeuge selbst.*

*Worinn aber die Materie des Byssus eigentlich bestanden habe, das scheint man seit vielen Jahrhunderten nicht mehr zu wissen. Einige nennen sie eine wahre Seide; Andre, eine Seide von der Pinne marine, oder von der Perlinauster; Andre, den schönsten ägyptischen Flachs; Andre, eine sehr feine Baum=Wolle; noch Andre leiten sie aus dem Mineralreich her.*

Silk? Linen? Cotton? No wonder there was anything but agreement about the term *byssus*. At the end of this entry, we seem to hear the doubts about all this:

*Die wahrscheinlichste Meinung ist vielleicht die, welche der Chevalier de Jaucourt in der Encyclopédie äussert, daß Byssus ein generischer Name gewesen,*

*womit die Alten allerlei Arten kostbarer Materien zu feinen Kleidungsstücken, bezeichnet hätten.*

Which means: The most probable opinion is perhaps the one of Chevalier de Jaucourt expressed in the *Encyclopédie* that Byssus was a generic name, given by the ancients to all kinds of precious cloth made into fine garments. More than 200 years later, Nadine Quenouille comes to the same conclusion in a study of the term *byssus* in Roman Egypt: “...therefore I would like to propose to keep the Greek term ‘byssus’ without translating it.”<sup>35</sup>

#### 16th century: A second meaning of the term *byssus*

In the above mentioned lexicon entry we find for the first time an additional meaning for the term *byssus*: silk from the fan shell (*Pinna nobilis* L.).<sup>36</sup> In fact: consulting the *Merriam-Webster online*, we find a second – zoological – meaning of the term *byssus*:<sup>37</sup> “a tuft of long tough filaments by which some bivalve molluscs (as mussels) adhere to a surface”.

35. Quenouille 2005, 242.

36. The also mentioned pearl oyster (*Pinctada margaritifera*) is in fact mentioned several times in connection with byssus in older literature – the reason for this has not been studied yet.

37. <http://www.merriam-webster.com/dictionary/byssus> (22.1.2015).

Although in this second case the term *byssus* also derives from the Greek βύσσος, it changed the meaning from a vegetal to an animal fibre.<sup>38</sup> So, not only have we got a second meaning of the term *byssus* for the filaments of the *Pinna*, but these filaments are the raw material for textile use, as explained in an illustrative statement of Beck's *Draper's Dictionary*:<sup>39</sup>

“These filaments have been spun, and made into small articles of apparel. Their colour is brilliant, and ranges from a beautiful golden yellow to a rich brown; they also are very durable. The fabric is so thin that a pair of stockings may be put in an ordinary-sized snuff-box.”

A beautiful, golden-brown, brilliant textile! And very thin – symptomatic for the stories around byssus fibres and its product, sea-silk, as it contains the standard assertion about the fineness and transparency of byssus (sea-silk) fabric. The topos of the sea-silk stockings in a snuffbox<sup>40</sup> – or a walnut shell, alternately – is wide spread. The same is said of “Limerick gloves so delicate that they fit into a walnut shell”.<sup>41</sup> Looking at the entire article to the term *byssus* in *Draper's Dictionary*, we find the second – crucial – mistake: “This manufacture [meaning sea-silk] was well known to the ancients, and is mentioned by Pliny and Aristotle.” However: neither Pliny<sup>42</sup> nor Aristotle<sup>43</sup> ever used the term byssus in connection with the fan shell.

In English dictionaries we find this inconsistency already earlier. While in dictionaries of 1756<sup>44</sup> and

1768<sup>45</sup> the term *byssus* or a derivation of it does not even occur, we find in an edition of 1828<sup>46</sup> at least the term *byssine*, with the only explication: made of silk. In lexica of antiquity we find mostly the long discussion, if byssus would be linen or cotton.<sup>47</sup> Other lexica – mostly specialised – make a clear distinction between byssus/linen and byssus/sea-silk.<sup>48</sup> Or the term sea-silk is explained without reference to the antique byssus.<sup>49</sup>

### The supposed role of Aristotle

Aristotle was by some called the father of sea-silk manufacture: “*Abbiamo anche la testimonianza di Aristotile il quale chiamò la conchiglia porta-seta, agguingendo che il suo bisso ... poteva essere filato e tessuto.*”<sup>50</sup> None of this is true.

In the 4th century BC, the Greek philosopher Aristotle wrote a *Historia animalium*. He described the fan shell *Pinna*: “Αἱ δὲ πίνναι ὀρθαὶ φύονται ἐκ τοῦ βύσσοῦ ἐν τοῖς ἀμμώδεσι καὶ βορβορώδεσιν” (*HA* 547b15-16, ed. Balme 2002). In the 13th century, Willem van Moerbeke (approx. 1215-1286), a Flemish Dominican priest, wrote a Latin version of the book and translated the phrase: “*Pinnae rectae nascuntur ex fundo in arenosis...*” (“The *Pinna*-mussels grow upright out of the depth in sandy places...”). This is correct, as ‘ὁ βύσσος’ is masculine, with accent on the last syllable – it means depth. Aristotle was a good observer, he remarked the fibres anchoring the *Pinna* on the ground, and wrote in the same chapter, some

38. ... if we leave aside the very rarely found connection of ancient byssus with real silk.

39. Beck 1882, 39-40.

40. One only has to look at the pair of stockings in the sea-silk inventory to know that this is impossible: <http://www.muschelseide.ch/en/inventar/Objekte/Str-mpfe-Braunschw-.html> (13.1.2015).

41. Williams 2010, 122. Limerick gloves were made from the skins of unborn calves, and therefore very thin.

42. Plinius, *Naturalis Historia* IX 142: “*Concharum generis et pina est. Nascitur in limosis, subrecta semper nec umquam sine comite, quem pinoterem vocant, alii pinophylacem. Is est squilla parva, aliubi cancer dapis adsector.*”

43. See the following chapter.

44. Bailey's *Universal Etymological English Dictionary* of 1756.

45. The third edition of *Johnson's Dictionary of the English language* of 1768.

46. *Johnson's Dictionary of the English language* of 1828.

47. E.g., *A Dictionary of Greek and Roman Antiquities*, 1890.

48. E.g., Harmuth 1915.

49. E.g., Yates 1843, 152-159: Fibres of the *Pinna*.

50. Basso-Arnoux 1916, 4; Carta Mantiglia 1997, 90.



phrases later about sedentary molluscs: “Of those that keep to one spot the pinnae are rooted to the ground”. So it is clear that he did not use the term *byssus* for the filaments of the Pinna.

200 years later, in the second half of the 15th century, Theodorus Gaza (approx. 1400-1475), a Byzantine humanist living in Italy, made another translation of Aristotle’s History of animals. He translated the same phrase: “*Pinnae erectae locis arenosis coenosisque ex bysso ...*”.<sup>51</sup> Theodorus Gaza misunderstood the term ‘ἐκ τοῦ βύσσοῦ’ and mistranslated ‘*ex bysso*’: “the Pinna-mussels grow upright from the bysso...” – ‘ἡ βύσσος’, feminine, with accent on the first syllable, meaning fine linen – as we know it now.<sup>52</sup>

In this way the term *byssus* for the filaments of the Pinna was born: a translation mistake with far-reaching consequences. From that moment on there are two kinds of byssus: “*Byssus terrenus est et marina*” – one of the land, of linen, and one of the sea, of the filaments of the fan shell *Pinna nobilis*, as stated by the French naturalist Guillaume Rondelet (1507-1566). From that moment on the filaments of all bivalves were given the zoological term *byssus*.

I cite only one of many authors to show the consequences of this misunderstanding:

*Il più antico scrittore che non solo conosce la pinna, le sue proprietà zoologiche e le sue abitudini di vita ... ma anche il preziosissimo filo, è tra i greci, Aristotele, il quale è anche l'unico (che si sappia), ad usare la denominazione di βύσσος, mentre negli altri antichi quell fibra è chiamata con altro nome.*<sup>53</sup>

The result of this is seen in the double entry in the *Oxford English Dictionary* for the term *byssus*:

- 1) An exceedingly fine and valuable textile fibre and fabric known to the ancients; apparently the word was used, or misused, of various substances, linen, cotton, and silk, but it denoted properly (as shown by recent microscopic examination of mummy-cloths, which according to Herodotus were made of βύσσος) a kind of flax, and hence is appropriately translated in the English Bible ‘fine linen’.
- 2) Zool. The tuft of fine silky filaments by which molluscs of the genus *Pinna* and various mussels attach themselves to the surface of rocks; it is secreted by the byssus-gland in the foot.

The conclusion is: In antiquity byssus was a fine textile of linen (or cotton, rarely silk). In the 16th century the filaments of bivalves like *Pinna*, blue mussel and others were given the name byssus, in analogy to the ancient byssus.

The fatal consequences for textile history are: From that moment on, textiles called byssus in antique texts were no longer associated only with linen (or cotton, rarely silk). Byssus became, in popular wisdom, for journalists and for some authors, sea-silk. With the simple logic: byssus is the name of the filaments of the *Pinna nobilis* of which was made sea-silk, byssus is found in the Bible and in profane antique literature, so byssus is, almost always and everywhere and at any time: sea-silk.

51. van der Feen 1949, 66-71; the faulty translation was contradicted very soon (see Beullens & Gotthelf 2007, 503), but unfortunately not in English: with the translation from D’Arcy Wentworth Thompson in 1910, the incorrect text persisted until the beginning of the 20th century: “The pinna grows straight up from its tuft of anchoring fibres in sandy and slimy places”. It is still online: [http://classics.mit.edu/Aristotle/history\\_anim.5.v.html](http://classics.mit.edu/Aristotle/history_anim.5.v.html) (25.1.2015) and has been repeated on and on. It even found its way in an actual book about marine biological materials: “Aristotle (transl. 1910) noted that the holdfast in the fan mussel (*Pinna*) consisted of a robust bundle of fibres with sticky tips. The term byssus (Greek “byso” for flax linen) was accidentally coined by him for the holdfast (van der Feen 1949) and has since gained universal acceptance.” The author interpreted van der Feen in a completely reverse sense (Ehrlich 2010, 301).

52. A more extensive discussion about this is found in Maeder 2015, 2016 a, 2017, in press. For additional linguistic and translation problems see van der Feen 1949.

53. Zanetti 1964, 246. To find these other names for sea-silk in different languages and different times is one of the – future – aims of the Sea-Silk Project.

To be quite clear: “Nowhere in classic literature the Latin word ‘byssus’ or one of the two Greek words ‘βυσσός’ (masculine) or ‘βύσσος’ (feminine) is used in connection with any molluscs”<sup>54</sup> – nor with the sea, or with a sea-creature. Laufer confirms this, speaking of the byssus of a mollusc: “In this sense ... the word was not used in the language of the ancients.”<sup>55</sup> In the last centuries, several Italian writers discussed the problem of the nature of byssus textiles in antiquity, and all reject the idea that it could have meant sea-silk.<sup>56</sup> Byssus, before the 16th century, had nothing to do with the filaments of a shell, and therefore nothing to do with sea-silk. Only from the 16th century onward a textile mistakenly called byssus may – perhaps – be sea-silk.<sup>57</sup>

### Sea-silk already existed in antiquity

However: sea-silk is a fact, it existed not only in modern times, but already in antiquity. The fibre is with 10–50 microns in diameter comparable with other natural fibres,<sup>58</sup> and it was spun and woven – later knitted – like any other high quality natural fibre. To what extent we do not know. Probably it was at any time only a very small production, but surely highly valued.<sup>59</sup> However: in antiquity, it was never called byssus! Alciphron called it first in Greek ἡ ἐκ τῆς θαλάσσης ἔρτα, wool of the sea (Lettres 1.2.3). It was also paraphrased, as we know from different written statements, e.g., of the church father Tertullian in the 2nd century AD in his text ‘On the Mantle’: “*Nec fuit satis*

*tunicam pangere et serere, ni etiam piscari vestitum contigisset: nam et de mari vellera, quo mucosae lanusitatis plautiores conchae comant.*”<sup>60</sup> Yet, Tertullian knew about linen byssus! In his text ‘On the Apparel of Women’, he says: “*Vestite nos serico probitatis, byssino sanctitatis, purpura pudicitiae.*”<sup>61</sup> The bishop Basil the Great in the 4th century and the Byzantine historian Procopius in the 6th century were other witnesses for sea-silk.<sup>62</sup> The material evidence of the existence and use of sea-silk is a textile fragment dated 4th century AD, found in 1912 in a women’s grave in the Roman town Aquincum, today Budapest.<sup>63</sup> Unfortunately, the fragment and all documents about the excavation got lost in the 2nd world war.

The problem of the additional ambiguity of the term *byssus* started at the moment the filaments of the fan-shell were given the term byssus. The result can be seen in books from the 15th to the 20th century, where I found terms for sea-silk, in English, Italian, French, and German as reported in Table 2.

In all four languages, we find the term *byssus*, sometimes alone (bisso, bysse, Byssus), sometimes with an adjective (e.g., marine byssus). They are marked in bold face. And in all four languages we find fibre terms – wool or silk – associated with the origin of the sea or from a sea-creature, fish or shellfish. Interestingly, it is never associated with linen or cotton, the two materials associated with the byssus in antiquity.

That this variety of terms invites misinterpretations is obvious. Even scientific institutions cannot resolve the problem. In the 1970s, the *Centre International d’Etudes des Textiles Anciens* C.I.E.T.A. in

54. van der Feen 1949, 66. This is confirmed by my own research in classic literature.

55. Laufer 1915, 105.

56. Fabbroni 1782, Rosa 1786, Viviani 1836.

57. For sea-silk as a product of the Mediterranean fan shell *Pinna nobilis*, the manufacturing process and the textiles made of it see the catalogue of the first exhibition in 2004 in Basel: Maeder *et al.* 2004, and the homepage of the Sea-silk Project in English, German and Italian: [www.muschelseide.ch](http://www.muschelseide.ch).

58. ... such as mulberry silk or Egyptian linen 11–15 micron, Merino wool 18–25 micron, cotton 12–35 micron, mohair/alpaca 20–40 microns.

59. Maeder 2016 b.

60. “Nor was it enough to plant and sow your tunic, unless it had likewise fallen to your lot to fish for raiment. For the sea withal yields fleeces, inasmuch as the more brilliant shells of a mossy wooliness furnish a hairy stuff.” Tertullian, *De Pallio* III, 6, translation by Thelwall 1870, <http://www.tertullian.org/anf/anf04/anf04-03.htm> (11.1.2015).

61. “Clothe yourselves with the silk of uprightness, the fine linen of holiness, the purple of modesty.” Tertullian, *Cult. Fem.* II, 13: [http://www.tertullian.org/latin/de\\_cultu\\_feminarum\\_2.htm](http://www.tertullian.org/latin/de_cultu_feminarum_2.htm) (12.1.2015).

62. See Maeder 2015, 2017.

63. Hollendonner 1917; Nagy 1935; Maeder 2008.

**Table 2.** Synonyms and translations of sea-silk in English, Italian, French and German from the 15th to the 20th century

English	Italian	French	German
Sea-silk	<b>Bisso marino</b>	Soie marine	Muschelseide
<b>marine byssus</b>  <b>byssus silk</b> pinna silk marine silk  pinna wool marine wool sea wool fish wool  silkworm of the sea	<b>bisso</b>  seta di mare seta marina  lana marina lanapinna lana pena lanapesce lana di nacchera lana dorata  pelo d'astura pelo di nacchera  gnacara	soie de mer soie de pinne <b>soie de byssus</b>  laine de mer laine marine laine de pinne  <b>bysse</b> <b>byssus de pinne marine</b>  poil de nacre	<b>Byssus</b>  <b>Byssusseide</b> Seeseide Fischseide Steckmuschelseide Meeresseide Pinnamarina-Seide  Seewolle Fischwolle Meerwolle
C.I.E.T.A.: Pinna, sea-silk, sea-wool	C.I.E.T.A.: seta della conchiglia	C.I.E.T.A.: soie de coquillage	

Lyon published a textile vocabulary in different languages. The chosen terms *soie de coquillage* or *seta della conchiglia* are probably mere literal translations of the German term *Muschelseide*, known already in the 18th century.<sup>64</sup>

### Byssus and sea-silk in the Italian language – and in Italy

I have addressed the ambiguity of the term *byssus* in antiquity, and – with the additional meaning of sea-silk – even greater ambiguity in modern times. Sea-silk is an ancient Mediterranean phenomenon, interesting from the cultural and textile history point of view. However, it is in Italy where we are confronted with additional linguistic problems. The correct and

coherent term *bisso marino* appears already in 1681, in the first illustrated guide for sea-shells with the beautiful title *Ricreatione dell'occhio e della mente nell'osservatione delle chioccioline*.<sup>66</sup> The author, Filippo Buonanni (1638-1725), presents the fan shell with its filaments: “... *bisso marino a distintione del terrestre, fatto di lino, ò bambagia*”. *Bisso marino*, the byssus of the sea, which he clearly opposes to the so-called *Bisso terrestre*, the ‘rural’ byssus, which consisted of linen, or cotton. He uses the same words as did Rondelet 1555: *Byssus terrenus est et marina*.

100 years later, in 1798, an Italian-French dictionary mentions *bisso* only as a precious textile in the Bible, of unknown material.<sup>67</sup> Only 20 years later, in 1819,<sup>68</sup> *bisso* becomes the common name for sea-silk, as again in the merchant’s polyglot manual of 1860:

64. The term *Muschelseide* is first mentioned in Rudolph 1766.

65. [deleted]

66. Buonanni 1681: Recreation for the eye and mind in the study of shells. Three years later, in 1684, the book is released in Latin.

67. Bettinelli 1798, term *bisso*.

68. Bonavilla 1819-1821.

*Bisso* followed by another term, *Lanapesce* – fish-wool.<sup>69</sup> In a vocabulary of the written and spoken Italian language of 1895,<sup>70</sup> a clear distinction is made between the antique byssus and sea-silk:

*Bisso. s.m. V. G. Tela finissima, molle, delicata, che usavano gli antichi.*

*II Bisso marino chiamano i naturalisti quello che volgarmente dicesi Pelo di nacchera....*

And again ten years later, in 1905,<sup>71</sup> *bisso* is correctly presented as the filaments of bivalves, although open for misinterpretation regarding antique byssus:

*Bisso. È un prodotto di secrezione di una ghiandola che si trova nel piede di molti molluschi bivalvi, come la pinna, il mitilo ecc., e che fu detta appunto ghiandola del bisso. Questa secrezione appena emessa, si solidifica in fili assai resistenti, che servono a fissare il mollusco agli scogli. Talora il bisso di certi molluschi, come quello della Pinna nobilis, è bello ed elegante, di riflessi bronzati e simile a seta. Ora non è più in uso, ma anticamente era assai pregiato e serviva a fare tessuti preziosi. E. G.-T.*

As a second meaning, in the same dictionary, follows *bisso* as a ‘technical’ term: finest, most precious textile used by the ancients, possibly linen:

*Bisso. (tecn.) Tela o panno finissimo, preziosissimo, molle, delicato, che usavano gli antichi. Si crede che fosse un tessuto*

*di lino sottilissimo delle Indie e dell’Egitto, di cui erano fatte le vesti più nobili e più stimate. Siccome poi tali vesti erano spesso colorite di porpora, il colore fra tutti il più pregiato, quindi è che da taluni fu detto bisso lo stesso color di porpora. F. MZZL.*

In the Bible, the two terms *bisso* e *porpora* (byssus and purple) are often found together. It is discussed whether in this sense byssus meant a linen textile dyed with purple, or the colour purple itself.<sup>72</sup> In 1928, Beniamino Mastrocinque uses these two terms as title for his publication: *Bisso e Porpora – per la rinascita delle due grandi industrie. Bisso* (sea-silk), and *porpora*, the colour – according to him – with which sea-silk was dyed. He writes about the two manufactures of his hometown Taranto, capital of *Magna Grecia*,<sup>73</sup> hoping for a revival of both.<sup>74</sup>

Some years earlier, the same efforts had been made in Sardinia. In 1916, Giuseppe Basso-Arnoux published the study *Sulla pesca ed utilizzazione della ‘Pinna Nobilis’ e del relativo bisso*. We find the same mixture of terms concerning byssus: “*Questo fiocco viene chiamate Butz dagli ebrei, Bussos dai greci, Bissus dai francesi ed inglesi; Arbi dagli Arabi; da noi italiani lana-pinna, lana dorata, gnacara; venne anche chiamato ‘seta di mare’.*”<sup>75</sup> It is interesting how Basso-Arnoux explains the differences in the meaning of the term *byssus*: “*Non si deve confondere il bisso della Pinna nobilis, colle filamenta vegetali, pur desse sottilissime, che servivano per tessere delle tele di lino più fine della battista e che solo per analogia di esilità si denominavano bissus...*”<sup>76</sup> – first there was

69. The merchant’s polyglot manual 1860. 100 years later, in 1958, D’Alessio would speak in an article “Il bisso tarantino: leggende e inesattezze” of *lanapesce*, fish-wool, o *lanapenna*, Pinna wool.

70. Fanfani 1895, 129.

71. Lessona 1905, 483.

72. Or is it just an expression of extreme luxury: royal linen (=byssus) and royal purple, together the most famous materials for dressing in antiquity? For the term byssus as colour, see Brunello 1968, 58.

73. Whether sea-silk was already manufactured in antiquity in Taranto is contested. Purple manufacture in antiquity is proved by shell finds.

74. Mastrocinque shows examples made by him of linen dyed with purple; he also mentions wool dyed with purple (tav. VII) and p. 54). There is no material reference of purple dyed sea-silk. Recent experiments show that sea-silk cannot be dyed with purple; see Maeder (2017).

75. Basso-Arnoux 1916, 2.

76. Basso-Arnoux 1916, 4.



the term byssus for the filaments of the molluscs, and in analogy to them the term was given to the fine linen of antiquity – just the opposite of how it really was! While Basso-Arnoux designates the processed byssus always as *bisso marino*, Mastrocinque never uses this term; he speaks of *bisso*, *lanapinna* or *lanapesce*.

The *Enciclopedia italiana di science, lettere ed arti di Treccani* belongs to the greatest encyclopaedias.<sup>77</sup> In the *Treccani* of 1930<sup>78</sup> we find a complete, extensive and comprehensive statement, including the known discussion of linen or cotton, with corresponding authors:<sup>79</sup>

**BISSO** (*dal gr. βυσσός, e questo dal fenicio būš; fr. bysse, sp. biso; ted. Byssus; ingl. byssus*). - Fu così chiamata dai Greci una tela sottilissima e preziosa fatta col lino, proveniente dall'India e dall'Egitto e diffusa nel mondo mediterraneo dai Fenici. In Egitto le manifatture appartenevano ai templi che sotto i Tolomei avevano il monopolio delle tele per le mummie (G. Lombroso, *Recherches sur l'econ. polit. de l'Égypte sous les Lagides*, Torino 1870, p. 108 segg.). Per il suo pregio era adoperata da principi e sacerdoti, anche della religione ebraica. Da alcuni si ritiene che si ricavesse dal *linum asbestinum*, altri poi dicono non essere altro che il moderno cotone. Dall'uso ebraico volle la Chiesa che gli abiti dei sacerdoti fossero di lino.

Nell'ambiente romano, il byssus si trova per la prima volta ricordato in Plinio. A Roma, oltre che dall'Egitto, il bisso era fornito dalla città di Scythopolis presso Damasco, dalla Siria, e da Tarso in Cilicia, come sappiamo dall'editto di Diocleziano in cui ci sono date le qualità migliori. L'Italia ne produceva poco.

L'uso di tela fine sia per indumenti, sia per fazzoletti, tovaglioli, asciugamani, si diffuse negli ultimi tempi della repubblica:

*la donna fu la prima ad abbandonare la veste di lana per quella di tela; e il più antico costume di lino fu il supparum. Alessandro Severo fu un grande amatore delle tele di lino e gl'imperatori in genere facevano tessere il lino per proprio conto.*<sup>80</sup>

Also the statement about the zoological term *byssus* is correct, explaining that it was given to the filaments of bivalves in analogy to the byssus of the ancients.

**Zoologia.** - Nel piede di molti Molluschi Lamellibranchi si trova una ghiandola, che secerne una sostanza semifluida, la quale, a contatto con l'acqua, si solidifica, formando una sorta di peduncolo, o, più spesso, un fascio di filamenti, che servono a fissare l'animale a un sostegno. Per lo più questo fascio di filamenti a cui, per analogia col nome del tessuto sopra ricordato, fu dato il nome di bisso, è di natura cornea, alquanto elastico, e in alcuni casi (*Anomia*) è impregnato di sali calcarei. La ghiandola del bisso non sbocca direttamente all'esterno, ma immette in una cavità del piede, che comunica con l'esterno per mezzo di una piccola apertura. Non tutti i Lamellibranchi sono provvisti del bisso; lo posseggono ad es. i generi *Pecten*, *Tridacna*, *Avicula*, *Mytilus*, *Meleagrina*, *Pinna*; nei generi *Cyclas*, *Unio*, *Anodonta* ed altri esiste in un periodo della vita, ma scompare allo stato adulto.

The entry ends with the use of these filaments as textile fibre, but there is no special term given to this textile:

*Il bisso della Pinna è così abbondante e fine, che può essere tessuto in una stoffa morbidissima, sericea, d'un colore bruno dorato, con riflessi verdastri. Un tempo gli abitanti delle coste siciliane, calabresi,*

77. ... together with the Encyclopaedia Britannica and the Spanish [Enciclopedia universal ilustrada europeo-americana](#).

78. Treccani 1930.

79. Byssus with the meaning asbestos is mentioned also in Rondelet 1558, 38-39; see also Maeder (2016 b).

80. Today the Italian term *bisso* means first a fine linen or cotton used for embroideries.



*tarantine e di Malta, ne facevano guanti, cravatte e altri oggetti di abbigliamento. Tale industria fioriva ancora nel sec. XVIII, ma la materia prima era troppo scarsa perché essa potesse acquistare notevole importanza (v. lamellibranchi). L. M. C., G. Cal., G. Mon.*<sup>81</sup>

Today's *Treccani* Internet entry is a summary of the above-mentioned – still with no special term for sea-silk.<sup>82</sup>

In 1780, Giuseppe Capecelatro (1744-1836), Archbishop of Taranto, dedicated his study "*Spiegazione delle conchiglie che si trovano nel piccolo mare di Taranto*" to the Russian Empress Catherine II and sent it with several sea-silk gloves to the court of St. Petersburg. Luigi Sada has the great merit to have reprinted the text in 1983. Capecelatro uncovers some continually repeated legends of sea-silk in antique Taras (Taranto): "*Le vesti di lanapenna non sono trasparenti... Le Tarantinidie così dette dall'uso, che facevasene in Taranto, dovevano essere di sottilissimo bisso* [in lino, not in sea-silk], *perchè così si accorda, e che erano diafane, e che convenivano all'uso, ed al poco pudore insieme delle antiche Ballerine.*"<sup>83</sup> However, in an appendix, Sada contradicts Capecelatro's statement: "*Inventori e maestri dell'arte dell'apparecchiatura e tessitura del bisso* [filaments of *Pinna nobilis*, ergo byssus] ... *nella città bimare* [Taranto] *si confezionavano le celebri vesti tarantinidie, diafane, morbide, leggere, di colore aureo, ricercate e indossate da matrone, famose etère, danzatrici e baccanti*".<sup>84</sup> Once more, the famous fineness and transparency of antique

linen byssus is transferred to sea-silk byssus. Capecelatro, a great promoter of sea-silk manufacturing and knowing very well the whole manufacturing process, never spoke of *bisso* – meaning sea-silk – but of *lanapenna*, Pinna wool.<sup>85</sup>

In 1994, the Italian textile journal *Jacquard* published an article titled "*Il Bisso*". Byssus of the *Pinna nobilis* would be the byssus of antiquity, known in Egypt, Greece and Rome, and in the Bible. The contradiction with the term would be old, "*poiché la stessa denominazione era impropriamente attribuita a tessuti di cotone o di lino, mentre solo il filato derivato dalla Pinna nobilis può definirsi 'bisso'*"<sup>86</sup> – because the term *bisso* was misleadingly attributed to textiles of cotton or linen while the only true *bisso* comes from the *pinna nobilis*, as the article concludes, this corroborating the age-old misunderstanding.

How persistently some opinions survive is also seen in the estimable book *La seta del mare - il bisso. Storia, cultura, prospettive* – the first illustrated monograph about the sea-silk production in Taranto: "*L'uso millenario della parola bisso per indicare la seta marina ricavata dal mollusco bivalve denominato pinna nobilis, ha lasciato esili tracce anche in alcuni testi della Bibbia.*"<sup>87</sup> Thousands of years the term *bisso* would have meant sea-silk, having left also traces in the Bible...

In scientific texts published in Sardinia, more importance is attached to clearness in the matter. While Paolo Piquereddu, former director of the *Museo etnografico Sardo*, speaks of *lana marina*,<sup>88</sup> Gerolama Carta Mantiglia, folklorist at the University of Sassari,

81. Authors: Leone Mattei Cerasoli, Guido Calza, and Giuseppe Montalenti.

82. <http://www.treccani.it/enciclopedia/ricerca/bisso/> (20.1.2015).

83. Capecelatro, in Sada 1983, 29-62 and 42. However, Capecelatro adds in a footnote that we do not know yet what was meant with the byssus of the ancients: some have had the opinion that it was sea-silk ("*che il bisso sia codesta lana Pinna*"). The Online Liddell-Scott-Jones Greek-English Lexicon confirms this. Yet, we still do not know for sure of what material the *tarantinidie* were, the diaphane light dresses for dancers in antique Taras: of the finest Apulian wool, or of the also famous finest cotton? See also D'Ippolito 2004, 73-113.

84. Sada 1983, 66.

85. For the eminent role of Capecelatro in the history of sea-silk see <http://www.muschelseide.ch/en/geschichte/neuzeit/giuseppe-capecelatro.html>

86. Bardini Barbafera 1994, 10.

87. Campi 2004, 201-205. Unfortunately the nicely illustrated book contains also many traditional myths and legends concerning the term *bisso*.

88. Piquereddu 2009, 22.

makes often a distinction between the raw material *bisso* and the textile *bisso marino*.<sup>89</sup>

Why did I present the ambiguity of the term *bys-sus* so extensively in the Italian language? Italy is of particular importance for sea-silk in two respects. Not only is it still the only country with a documented sea-silk production, at least since medieval times.<sup>90</sup> Sant'Antioco, a small island southwest of Sardinia, is – together with Taranto in Apulia – the only place where the manufacturing of sea-silk was known until the 1950s. We have an interesting statement by Vittorio Alinari, a famous Florentine photographer who was travelling – and photographing – in Sardinia at the beginning of the 20th century and made the following remarks about the textile production in Sant'Antioco:

*Ma la lavorazione più curiosa è quella che si fa della Pinna Nobilis, che viene pescata in grande abbondanza nel golfo e la cui appendice terminale (bisso), formata da filamenti setacei, viene, in prima, ripulita dalle concrezioni calcaree che vi stanno aderenti, quindi filata e tessuta. Ne deriva una stoffa di un bel colore metallico, che si avvicina al rame, con la quale si confezionano delle sottovesti che, guarnite di bottoni in filigrana d'oro, pure lavorati nel paese e nel cagliaritano, producono bellissimo effetto. Per ogni sottoveste occorrono almeno novecento code la cui filatura costa, all'incirca, una lira al cento. Questo non può ritenersi un prezzo esagerato perché non può filarsene che un centinaio al giorno essendo il filo delicatissimo e facile a strapparsi.*<sup>91</sup>

Sant'Antioco is also the only place where the sea-silk processing still is alive, if only on a small scale and just for demonstration purposes.<sup>92</sup> Women of Sant'Antioco who had learned sea-silk processing in the weaving studio of Italo Diana in the 1930s passed on their knowledge to many locals of the younger generation. The last sea-silk weaver that once learnt from Italo Diana – Efisia Murroni – died in 2013 at the age of one hundred years. So it is not surprising that several sea-silk weavers still live in Sant'Antioco. The Sardinian journalist Claudio Moica has recently reanimated the local history of sea-silk production in the 20th century in several articles in the local *Gazzetta del Sulcis*. They are available online.<sup>93</sup> And the English marine biologist Helen Scales takes also a critical look at the present situation in Sant'Antioco in chapter VI of her book *Spirals in Time - The Secret Life and Curious Afterlife of Seashells*. This book has been recently translated in Italian: *Spirali nel tempo. Le conchiglie e noi* (Beit 2017).

### Invented tradition and the role of mass media

Beside this well-founded local history, Sardinia seems to have a rich history of mystification around sea-silk and its processing: “... è strano che si parli di segreto e di conservazione ereditaria del metodo del quale si servano gli antichi per fissarne la doratura” – this is a statement of Giuseppe Basso-Arnoux in 1916.<sup>94</sup> Apparently this tendency has survived and keeps evolving since the 1990s, especially in Sant'Antioco. Against better knowledge, the term *bisso* is used by some without any distinction in the sense of sea-silk, which leads to assertions like: the Bible is full of sea-silk, all mummies are wrapped in sea-silk, and

89. Carta Mantiglia 1997; 2006. Unfortunately some of the stories about Aristotle and transparency persist.

90. Other possible but not yet confirmed countries are Croatia, Spain, and, may be, Malta and Tunisia.

91. Alinari 1915, 114. This shows clearly that sea-silk products were made for the market – at least at that time – and sold.

92. The fan shell *Pinna nobilis* is protected since 1992: European Council [Habitats Directive](#) 92/43/EEC, on conservation of natural habitats and the wild fauna and flora. Annex IV, Animal and Plant Species of Community Interest in Need of Strict Protection. No part of the shell may be harmed.

93. <http://www.gazzettadelsulcis.it/archivi.asp>: no 682, 10.7.2014, p. 6: *Si scoprono nuovi maestri della tessitura: il bisso a Sant'Antioco*; no 685, 31.7.2014, p. 7: *La difficile ricostruzione della vita di Italo Diana, il misterioso maestro del bisso di Sant'Antioco*; no 688, 4.9.2014, p. 6: *Felicitas Maeder e la ricerca della verità intorno alla storia del bisso*; no 690, 18.9.2014, p. 7: *Gli insegnamenti del maestro Italo Diana ad Efisia Murroni, l'ultima allieva del bisso*; no 692, 9.10.2014, p. 9: *Italo Diana ricordato dai figli di Jolanda Sitzia: L'allieva e la rievocazione del maestro*; no 694, 23.10.2014, p. 9: *Le sorelle Pes maestre di tessitura e di bisso: La passione di Assuntina e Giuseppina*.

94. Basso-Arnoux 1916, 3.

more and more textile relics around the world are – of course – from sea-silk. Even perfectly researched textile techniques like *l'or de Chypre* is brought in connection with sea-silk.<sup>95</sup> So-called ‘secret oral traditions’ around sea-silk manufacturing flourish and encounter numerous fascinated admirers, if not local, then outside of the island, and around the world. Mass and social media play an important, albeit questionable, role in the spread of this so-called ‘cultural heritage’. Countless interviews, radio broadcasts, documentary films and self-promoting books diffuse a made-up story of sea-silk, which has – except the real process of washing, combing, spinning and weaving – very little to do with the historical record.

One endlessly re-echoed assertion has a particularly dangerous effect: the assumed transparency of sea-silk. In Manoppello, a little town in the Abruzzi (Italy), exists a very fine, translucent veil in the Capuchin church, the so-called *Volto Santo*, venerated as the face of Christ. In 2004 it was ‘identified’ as *bisso* – only at sight.<sup>96</sup> This *bisso* has been – without any questions or doubts – translated by journalists and authors as sea-silk, and thus found its way in several books, papers, videos, and films.<sup>97</sup> Manoppello is today a growing pilgrimage destination and has an enormous repercussion in the Catholic world.<sup>98</sup> This fact determines more and more how sea-silk ‘looks’ – even if none of the inventoried sea-silk objects have the slightest resemblance with a translucent, veil-like textile. Another veil, shown in Assisi and venerated as the veil of Madonna, has newly been ‘identified’

as sea-silk in the Vatican Magazin.<sup>99</sup> This textile has been examined in 1980<sup>th</sup> and analysed as mulberry silk.<sup>100</sup> In the meantime, also two textile relics in German minsters are marked sea-silk: in Kornelimünster the sudarium of Jesus “*aus feinsten äußerst zarter alexandrinischer Muschelseide (Byssus)*”<sup>101</sup> and in Aachen Mary’s robe, made of linen and “*aus kostbarem orientalischem Byssus, auch Muschelseide genannt.*”<sup>102</sup> Both textile relics have been analysed by Franz Bock in the 1880s and were clearly identified as fine linen.<sup>103</sup>

Eric Hobsbawm and Terence Ranger published in 1983 the widely discussed book “The Invention of Tradition”. The chapter of the invention of Scottish Highland traditions is especially interesting, as it contains an example from the textile world: the kilt as embodiment of a traditional Scottish costume – in fact quite modern, invented in the 18th century.<sup>104</sup> What we presently observe regarding sea-silk is a similar development: the worldwide spread of half-knowledge about a so-called ‘ancient sea-silk tradition’, a mixture of ‘old wisdom’ and sacral vows, which is, in fact, in great parts an invented one.<sup>105</sup> No problem that this forged ancient sea-silk tradition is mentioned in every Sardinian traveller guide. But what we must consider is the fact that the enormous publicity worldwide enters slowly – like a reverted trickle-down effect – into the heads of those who are seriously interested in textiles. At least, several publications of the last decade mentioning byssus and/or sea-silk suggest this, even if the source is not mentioned, or not even perceived.

95. “*Qu’est donc cet or de Chypre, qui n’a visiblement rien de métallique? C’est un produit des fonds marins, le byssus de la grande nacre (Pinna nobilis), c’est la Soie de Mer. Le Maestro di Bisso Chiara Vigo le confirme, et précise que le terme ‘or de Chypre’ désigne une façon particulière du travail de la Soie de Mer, donnant un fil grège (non teinté) réservé à la décoration des vêtements sacerdotaux.*” <http://www.sardolog.com/bisso/france/loanec.htm> (28.1.2015). About gold threads in textile see: Bock 1884, 4-5; de Reyner et al. 1997; Gleba 2008; Karatzani 2012; Jacoby 2014; and [http://www.annatextiles.ch/vo\\_sti/dictiona/metmat.htm](http://www.annatextiles.ch/vo_sti/dictiona/metmat.htm) (7.8.2015).

96. <http://manoppello.eu/eng/>

97. E.g., Badde 2005, 2010a & b, 2011, 2014; Schrader 2007; Gaeta 2010; van den Hövel 2013.

98. <http://manoppello.eu/eng/index.php?go=bisior> (3.2.2015).

99. Badde 2010c.

100. Flury-Lemberg 1988, 318 and 492. More detail in Maeder 2016, 829.

101. <http://katholisch-informiert.ch/2014/06/aachener-reliquien-historisch-authentisch/> (3.2.2015).

102. Domkapitel Aachen: Pilgern in Aachen 2014. In the English edition of this leaflet only ‘byssus’ is mentioned – a good example of the translation problems.

103. Bock 1895, 8-14.

104. Trevor-Roper 1983: The invention of tradition: the Highland tradition of Scotland. In Hobsbawm and Ranger 1983, 15-42.

105. The old homepage [www.chiaravigo.com](http://www.chiaravigo.com) is not online anymore. The new one is [www.chiaravigo.it](http://www.chiaravigo.it). Chiara Vigo – not the sea-silk manufacturing! – would be presented for Italian candidate as UNESCO Intangible Cultural Heritage (<http://notizie.sassarinews.it/n?id=120796>).

**2007: Example one**

In the *Collection de l'École Française de Rome*, an impressive volume of 752 pages: *La culture matérielle médiévale – l'Italie méridionale byzantine et normande*. In chapter IV, *Métiers et activités et la draperie*, are presented on the same level: animal fibres, vegetal fibres, silk, furs – and byssus.<sup>106</sup> Entering the topic, we read that antique authors took byssus as a linen *de couleur gris-cendre* (of ash-greyish colour<sup>107</sup>). Latin and Greek dictionaries would take *byssus* and *byssos* as a vegetal fibre, cotton or linen. But this is wrong, we read: “*En réalité, le byssus est un tissu diaphane, créé en utilisant une fibre provenant d'un mollusque acéphale à coquille bivalve.*” (In reality, byssus is a sheer fabric using the fibre of a bivalve mollusc.)

**2008: Example two**

In the third edition of a German practical lexicon for textile studies we find for the term *Byssus* the known reprises of transparent cloth for mummies and relics:

*Ein feinfädiger Netzhemdenstoff aus Dreherbindung; ferner feinfädige, zarte, ungemusterte oder mit eingewebten Mustern versehene Gewebe aus Seide, Muschel-seide oder Flachs. Diese Gewebe (Byssos) wurden schon zur Pharaonenzeit zum Einhüllen der Mumien und Reliquien benutzt. ... Seit dem Altertum wurde dieses Sekret 'geerntet' und zu durchsichtigem, naturfarbigem Gewebe verarbeitet (gewirkt).*<sup>108</sup>

**2010: Example three**

Outside textile discussions, we find a scary example of an uncritical copy-paste text in a recent Springer

book about marine biology materials. In chapter 18 titled “Byssus – An Ancient Marine Biological Material”, the same old mythical stories are assembled. We read about the ‘Cloth of gold’ and Jason’s ‘Golden Fleece’ and the tunic found by Herodotus “made of a loose fabric of exceedingly fine thread ... finer than a hair”, and of course, the “fine, diaphanous fabrics ... commonly used in making the apparel of the queen and the princesses and the wives and daughters of rich men and high officials.” Even the legend of ‘the byssus gloves folded and packed inside a walnut shell’ is included. The author ends the chapter with the following words: “Because of the very simple (and today unique) technique of the spinning of the byssus threads, I take the liberty to represent here several images which, in my opinion, will astonish our material research community.” Shown is a whole page with photographs of the sea-silk production with our ‘last and only *maestro di bisso*’.<sup>109</sup>

**2010: Example four**

In a linguistic study of Neo-Assyrian textiles and their colours, we read about the byssus of molluscs for luxury clothes: “*Le byssus, tissu très fin et de grande valeur, réalisé à partir de filaments produits par des mollusques, était réservé à quelques vêtements de luxe*”.<sup>110</sup> This cannot be taken amiss, as the reference to this statement is a paper of 1991 in which, about the Akkadian term *būšu*, ‘Hebrew *būš*, Phoenician *bš*’, is said: “Knowledge of true byssus appears to have fallen out of the focus of modern scholars of history; most recent works on ancient textiles only mention it in passing as a fine linen, although conchologists are still aware of its existence”... Byssus would be “an ultra-fine fabric woven from the tuft of fine silky filaments ... of the genus *Pinna*...”<sup>111</sup> Unfortunately, Dalley here referred to several pieces of misinformation debunked since. Her bold conclusion is: “From Late

106. Ditchfield 2007, 425-427.

107. Did he take this idea by Harmuth 1915, where one concept of *Buz* is a “plain woven gray cotton fabric made in Central Asia”?

108. Wadisch 2008, 18.

109. Ehrlich 2010, 299-318. Although he refers to some papers of Maeder, and Maeder & Halbeisen, all citations are copied from a homepage without any scientific background ([www.designboom.com](http://www.designboom.com)), dated 2002.

110. Villard 2010, 388-399.

111. Dalley 1991, 121.



Bronze Age and Early Iron Age sources it may be possible to show, both from representations and from texts that indicate the direction of trade, that Akkadian *būšu* is indeed the fabric made of mollusc filaments.”<sup>112</sup>

### 2013: Example five

In a discussion about the term *thalassai* in the *Book of Prefect*, a Byzantine commercial manual of the 9th century, a “textile from byssos – the so-called sea silk (also: marine wool or marine silk)” is mentioned.<sup>113</sup> The authors not only refer to the above-mentioned book of Ditchfield, but also to the *Der Kleine Pauly. Lexikon der Antike*:

Byssos (βύσσος) bezeichnet verschiedene pflanzliche und tierische Fasern, βύσσιος, βύσσινον πέπλωμα ... Kaum jünger als die Bezeichnung für Leinfasern dürfte die für die bis heute Byssos genannten Haftfasern festsitzender Meermuscheln, besonders der im Mittelmeer verbreiteten *Pinna nobilis* sein, aus deren 3-8 cm langen Fasern seit dem Altertum Stricke, Strümpfe, Handschuhe u.a. hergestellt werden.<sup>114</sup>

The same term in *Der Neue Pauly*:

Byssos (βύσσος). Pflanzliche und tierische Fasern, die in weitgehend durchsichtigen Gewändern (βύσσιος, βύσσινον πέπλωμα) verarbeitet wurden.<sup>115</sup>

Some facts, some ambiguities, some similarities... it is no wonder that the authors of the article come to the following conclusion: “We therefore believe that *thalassai* is a manufacture fabricated from *byssos* (‘sea silk’, ‘marine wool’) and imported from Syria

as luxurious commodity.” It should be added that *thalassai* really could refer to textiles made of sea-silk, made of the byssus of *Pinna nobilis*! But it was not the *byssos* of the ancients.

### 2013: Example six

The term *byssus* and its derivations are also mentioned and discussed in the book *Etymologies of Isidor of Sevilla and in the Summarium of Heinrici*. The conclusion of the authors is: „Byssum ist kein bestimmtes Material, sondern ein Qualitätsbegriff, hinter dem sich die Rohstoffe Leinen, Baumwolle und Muschelseide verbergen können.“<sup>116</sup> Of course, sea-silk was known in the 7th and 11th century, but as I have demonstrated above, it would not have been called byssus.

### 2013: Example seven

In a recent semiotic thesis about the traditional costume in Sardinia, the whole chapter of byssus and sea-silk consists of unquestioned stories about this so-called ‘oral tradition’ heard from the above mentioned Sardinian weaver who has declared herself the last and only sea-silk weaver of the world, “*Maestro di bisso*” since 20 generations!<sup>117</sup> No questioning, no discussion of terms, no precise references to any literature. The chapter ends with a poem of Giovanni Pascoli, a 19th century Italian poet citing the precious silk «*la preziosa seta*»: “*O mani d’oro, le cui tenui dita menano i tenui fili ad escir fiori dal bianco bisso, e sì, che la fiorita sembra che odori*” – even the ‘white byssus’ is not scrutinised or questioned.<sup>118</sup>

112. Dalley 1991, 121-122.

113. Jaroszinsky & Kotłowska 2013, 39-46.

114. *Der Kleine Pauly. Lexikon der Antike* 1979, 978–979 (H. Gams).

115. Hünemörder 1997, 866.

116. Müller *et al.* 2013, 320.

117. <http://www.donneuropa.it/lifestyle/2014/04/18/chiara-vigo-maestro-bisso-venti-generazioni/> (20.12.2014).

118. Sedilesu 2013, 98-102. ‘White byssus’ is another topos in byssus/sea-silk discussion, probably referring to cotton, or used in a symbolic sense. This is only one of a dozen Italian Universities theses on sea-silk in Sardinia of the last years, all referring to Chiara Vigo. Corresponding events have taken place in different universities like Cagliari, Siena, Venice, Rome and other cultural institutions.



### 2014: Example eight

In a book of 2014 titled “Unwrapping Ancient Egypt” we read:

*The finest linen, known as ‘royal linen’, was almost sheer and is sometimes erroneously translated as byssus, after the Greek word for a thread spun from mollusk secretions, whose miraculous, gossamer quality the finest woven flax may have resembled.*<sup>119</sup>

### Conclusions of the Italian situation

John Peter Wild stated once: “To discover the meaning of a specific textile term, a lexicon is a good place to start, but a bad place to end.”<sup>120</sup> How true! Studying the terms byssus and sea-silk in lexicons and dictionaries is of nearly no help. They only render the researchers uncertain with all their inconsistencies and contradictions. As we have seen, even actual specialised dictionaries raise more questions than answering them.

This background explains why fantastic stories around real sea-silk production – as we hear of Sant’Antioco – encounter such an enormous interest. Sea-silk exists! You can touch it! How could all this not be true?

These few examples – from the thesis of a Roman university to historical and textile studies of antique and medieval times up to a modern specialised lexicon and biological reference book – show the consequences of the impact of mass media in present-day research, at least in the matter of byssus and sea-silk. The ‘power of naming’ – so it seems – lies more and more in fanciful websites, odd blogs, facebook accounts, and magic events around ‘secret and sacred old traditions’. How should textile research handle this?

### Bibliography

Abdel-Maksoud, G. & Abdel-Rahman, E.-A. (2013) The investigation and conservation of a gazelle mummy from the late period in ancient Egypt, *Mediterranean Archaeology and Archaeometry*, 13(1), 45-67.

- Alinari, V. (1915) *In Sardegna. Note di viaggio*. Firenze.
- Badde, P. (2005) *Das Muschelseidentuch. Auf der Suche nach dem wahren Anlitz Jesu*. Berlin.
- Badde, P. (2010a) *L'autre suaire: Enquête sur le secret de Manoppello*. Paris.
- Badde, P. (2010b) *The Face of God - The Rediscovery Of The True Face of Jesus*. San Francisco.
- Badde, P. (2010c) Der Schleier der Jungfrau. Die Franziskaner in Assisi zeigen ein ganz besonderes Muschelseidentuch. *Vatican Magazin* 12, 48-51.
- Badde, P. (2011) *Das göttliche Gesicht im Muschelseidentuch von Manoppello*. Kisslegg.
- Badde, P. (2014) *Die Grabtücher Jesu in Turin und Manoppello: SUDARIUM ET VESTES*. Berlin.
- Bardini Barbafera, L. (1994) Il Bisso, *Jacquard* 21, 5-12.
- Baines, E. (1835). *History of the cotton manufacture in Great Britain*, London.
- Basso-Arnoux, G. (1916) *Sulla pesca ed utilizzazione della “Pinna Nobili” e del relativo bisso*. Roma.
- Battisti, C. & Alessio, G. (1950) *Dizionario Etimologico Italiano*. Firenze.
- Beck, S. W. (1882) *The Draper's Dictionary. A Manual of Textile Fabrics: their history and applications*. London.
- Beekes, R. (2009) *Etymological Dictionary of Greek*. Leiden.
- Bender, C. (2008). *Die Sprache des Textilen. Untersuchungen zu Kleidung und Textilien im Alten Testament*. Stuttgart.
- Beullens, P. & Gotthelf, A. (2007) Theodore Gaza's Translation of Aristotle's *De Animalibus*: Content, Influence, and Date, *Greek, Roman, and Byzantine Studies* 47, 469-513.
- Bezon, J. (1857) *Dictionnaire général des tissus anciens et modernes, ...* Lyon.
- Bickel, S. & Paulin-Grothe, E. (2012) The Valley of the Kings: two burials in KV 64, *Egyptian Archaeology* 41, 36-40.
- Bock, F. (1866) *Geschichte der liturgischen Gewänder des Mittelalters oder Entstehung und Entwicklung der kirchlichen Ornate und Paramente*. Bonn.
- Bock, F. (1884) *Goldstickerein und Webereien in alter und neuer Zeit und das dazu verwandte Goldgespinnst*. Nürnberg.
- Bock, F. (1895) *Die textilen Byssus-Reliquien des christlichen Abendlandes, aufbewahrt in den Kirchen zu Köln, Aachen, Cornelimünster, Mainz und Prag*. Aachen.
- Bonanno, P. (1684) *Recreatio mentis et oculi - In Observatione Animalium Testaceorum*. Roma.
- Braun (Braunius), J. (1680) *Vestitus sacerdotum hebraeorum: sive commentarius amplissimus in Exodi cap. 28*

119. Riggs 2014, 117. The author refers to Dalley 1991 (as did Villard 2010), but also to the homepage of the Sea-silk Project; I take it as an appeal to re-read it carefully and look for misunderstandings.

120. Wild 2007, 5.

- ac 39 et Levit. cap. 16, aliaque loca s. Scripturae quam plurima.* Amsterdam.
- Brühl, L. (1938) Muschelseide. In F. Pax & W. Arndt (eds.), *Die Rohstoffe des Tierreichs*, 963-985. Berlin.
- Brunello, F. B. (1973) *The Art of Dyeing in the History of Mankind*. Vicenza.
- Buonanni, F. (1681) *Ricreatione dell'occhio e della mente – Nell'Osseruatione delle Chioccioline*. Roma.
- Campi, E. (2004) Il bisso nella Bibbia. In E. Campi (ed.), *La seta del mare - il bisso. Storia, cultura, prospettive*. 201-205. Taranto.
- Campi E. (ed.) (2004) *La seta del mare - il bisso. Storia, cultura, prospettive*. Taranto.
- Carta Mantiglia, G. (1997) La produzione del bisso marino. In G. Mondardini Morelli & G. Lilliu (eds.), *Pesca e pescatori in Sardegna. Mestieri del mare e delle acque interne*, 89-99. Cinisello Balsamo-Milano.
- Carta Mantiglia, G. (2006) I materiali della tessitura: lana, lino, cotone, seta, bisso, canapa. In *Tessuti. Tradizione e innovazione della tessitura in Sardegna*, 65-103. Nuoro.
- Chambers, E. & Scott, G. L. (1753) *A supplement to Mr. Chambers's cyclopædia: or, universal dictionary of arts and sciences*. London.
- Cooke, W. D. & El-Gamal, M. (1990) Ancient textile technology - the hand spinning of ultra-fine yarns, *CIETA-Bulletin* 68, 69-74.
- D'Alessio, C. (1958) Il bisso tarantino: leggende e inesattezze, *Voce del Popolo* LXXV, no. 15. Taranto.
- Dalley, S. (1991) Assyrian textiles and the origins of carpet design, *Iran* 29, 117-135.
- de Reyer, D., Pilboud, S., Dennebouy, N. & Monnerot, M. (1997) Autour de la chasuble de saint Yves, analyse des fils d'or utilisés dans les décors de textiles médiévaux. *Comptes rendus des séances de la Société de Biologie et de ses filiales* 191 (4), 511-519.
- de Simone, L. G. (1867) *La madreperla tarentina e il suo bioccolo. Monografia illustrativa di un album di lavori in lanapenna spedito all'esposizione di Parigi*. Taranto.
- Diderot, D. & d'Alembert, J. B. I. R. (eds.) (1751) *Encyclopédie, ou dictionnaire raisonné des sciences, des arts et des métiers*. Paris.
- D'Ippolito, L. (2004) Fra antiche tradizioni e ambizioni industriali: la produzione di bisso marino a Taranto / Zwischen alter Tradition und industriellen Ambitionen: Die Produktion von Muschelseide in Taranto. In Maeder, F., Hänggi, A. & Wunderlin, D. (2004) *Muschelseide – Goldene Fäden vom Meeresgrund / Bisso marino - Fili d'oro dal fondo del mare*, 73-112. Milano.
- Ehrlich, H. (2010) Byssus: From Inspiration to Development of Novel Biomaterials. In *Biological Materials of Marine Origin. Biologically-Inspired Systems I*, 299-318. Berlin.
- Fabbroni, A. (1782) *Del bombice e del bisso degli antichi*. Perugia.
- Fanfani, P. (ed.) (1895) *Novissimo vocabolario della lingua Italiana, scritta e parlata; compilato... e riveduto; aggiuntovi in appendice, un dizionario di geografia moderna, e un compendio di mitologia*. Napoli.
- Flury-Lemberg, M. (1988) *Textilkonservierung im Dienste der Forschung*. Katalog 77. Bern.
- Forbes, R. J. (1956) *Studies in ancient technology*. Leiden.
- Gaeta, S. (2010) *L'enigma del Volto di Gesù*. Milano.
- Gardner Wilkinson, J. (1842) *Manners and Customs of the Ancient Egyptians: Including Their Private Life, Government, Laws, Arts, Manufactures, Religion and Early History*. Vol. 3. London.
- Geijer, A. (1971) Technical viewpoints on textile design. Continuity and evolution especially during the first millennium A.D. In *Artigianato e tecnica nella società dell'alto medioevo occidentale*, 685-712. Spoleto.
- Gilroy, C. G. (1845) *The History of silk, cotton, linen, wool and other fibrous substances; including observations on spinning, dyeing and weaving*. New York.
- Gleba, M. (2008) 'Auratae vestes': Gold textiles in the ancient Mediterranean. In C. Alfaro & L. Karali (eds.), *Vestidos, textiles y tintes. Estudios sobre la producción de bienes de consume en la Antigüedad*. 61-77. Purpureae Vestes II: Textiles and Dyes in Antiquity. Valencia.
- Hall, R. (1986) *Egyptian textiles*. Aylesbury.
- Hannig, R. & Vomberg, P. (2012) *Kulturhandbuch Ägyptens. Wortschatz der Pharaonen in Sachgruppen*. Mainz.
- Harmuth, L. (1915) *Dictionary of Textiles*. New York.
- Heiden, M. (ed.) (1904) *Handwörterbuch der Textilkunde aller Zeiten und Völker*. Stuttgart.
- Hollendonner, F. (1917) Az aquincumi római szövet anyaga, *Botanikai Közlemények* XVI, 35-37.
- Hünemörder, C. (1997) Byssos. In *Der Neue Pauly - Enzyklopädie der Antike*, 866. Stuttgart.
- Jacoby, D. (2014) Cypriot gold thread in late medieval silk weaving and embroidery. In S. B. Edgington & H. J. Nicholson (eds.), *Deeds Done Beyond the Sea. Essays on William of Tyre, Cyprus and the Military Orders presented to Peter Edbury*. London.
- Jaroszynski, A. & Kotlowska, A. (2013) Eparchikon Biblion V, 2. Is Thalassai the Same as Byssos? *Studia Ceranea* 3, 39-46.
- Jones, J., Higham, T. F. G., Oldfield, R., O'Connor, T. P. & Buckley, S. A. (2014) Evidence for Prehistoric Origins of Egyptian Mummification in Late Neolithic Burials. *PLoS ONE* 9(8): e103608. <https://doi.org/10.1371/journal.pone.0103608>
- Karabacek, J. (1882) *Ueber einige Benennungen mittelalterlicher Gewebe*. Wien.

- Karatzani, A. (2012) Metal threads: the historical development. In I. Zimi & E. Tzachili (eds.), *Textiles and Dress in Greece and the Roman East: A Technological and Social Approach*, 55-65. Athens.
- Kersken, S. A. (2008) *Töchter Zions, wie seid ihr gewandet? Untersuchungen zu Kleidung und Schmuck alttestamentlicher Frauen*. Münster.
- Krünitz, J. G. (ed.) (1805) *Ökonomisch-technologische Encyklopädie, oder allgemeines System der Staats-, Stadt-, Haus- und Landwirthschaft, und der Kunst-Geschichte*. Berlin.
- Laufer, B. (1915) The story of the pinna and the Syrian lamb, *The journal of American folklore* 28 (108), 103-128.
- Lessona, M. (ed.) (1905) *Dizionario di Cognizione utile, enciclopedia elementare*. Torino.
- Long, G. (1846) *The Egyptian Antiquities in the British Museum: Monuments, Obelisks, Temples, Sphinxes, Sculpture, Statues, Paintings, Pyramids, Mummies, Papyrus, and the Rosetta Stone*. Vol. 2. London.
- McKinley, D. (1998) Pinna and her silken beard: a foray into historical misappropriations, *Ars Textrina* 29, 9-223.
- Maeder, F. (2002) The Project Sea-silk – Rediscovering an Ancient Textile Material, *Archaeological Textile Newsletter* 35, 8-11.
- Maeder, F. (2004) Muschelseide - wie weiter? *Archaeological Textiles Newsletter* 39, 12-15.
- Maeder, F. (2008) Sea-silk in Aquincum: First production proof in antiquity. In C. Alfaro & L. Karali (eds.), *Vestidos, textiles y tintes. Estudios sobre la producción de bienes de consume en la Antigüedad*. 109-118. Purpureae Vestes II: Textiles and Dyes in Antiquity. Valencia.
- Maeder, F. (2009) Die Edle Steckmuschel und ihr Faserbart: Eine kleine Kulturgeschichte der Muschelseide, *Mitteilungen der Naturforschenden Gesellschaften bei der Basel* 11, 15-26.
- Maeder, F. (2010) La soie marine en France et les objets tricotés du XVe-XXe siècle. In Coppens, M. (ed.), *La maille. Une histoire à écrire. Association française d'Etude du Textile, Journées d'Etude 20/21 novembre 2009*, 77-101. Troyes.
- Maeder, F. (2013) Gesucht und gefunden: Muschelseide in einem alten Wollmusterbuch des 18. Jahrhunderts, *Das Monschauer Land, Jahrbuch 2013*, 10-22.
- Maeder, F. (2015) Byssus und Muschelseide – ein sprachliches Problem und seine Folgen. In H. Harich-Schwarzbauer (ed.), *Weben und Gewebe in der Antike: Materialität – Repräsentation – Episteme – Metapoetik. / Texts and textiles in the ancient world: Materiality – Representation – Episteme – Metapoetic*. Ancient Textile Series 23, 3-20. Oxford.
- Maeder, F. (2016 a) Nicht überall, wo Byssus draufsteht, ist Muschelseide drin. Sprachliche und materielle Aspekte eines Missverständnisses – und die Folgen. In K. Dietz, C. Hannick, C. Lutzka, & E. Maier (eds.), *Das Christusbild. Zu Herkunft und Entwicklung in Ost und West*. Akten der Kongresse in Würzburg (16.-18.10.2014) und Wien (17.-18.3.2015), 790-848. Würzburg.
- Maeder, F. (2016 b) Landscape of Sea-Silk. Traces of traditional production around Mediterranean Sea. *Proceedings of the ICOM Costume Committee Annual Meeting, Milan 2016*. [http://network.icom.museum/fileadmin/user\\_upload/minisites/costume/pdf/Milan\\_2016\\_Proceedings\\_-\\_Maeder.pdf](http://network.icom.museum/fileadmin/user_upload/minisites/costume/pdf/Milan_2016_Proceedings_-_Maeder.pdf)
- Maeder, F. (2017) Byssus and sea-silk: a linguistic problem with consequences. In H. Landenius Enegre & F. Meo (eds.), *Treasures from the sea – Sea-silk and Shell purple dye in antiquity*. Ancient Textiles Series 30, 4-19. Oxford.
- Maeder, F. (in press) La soie marine et son histoire - un produit textile de la Méditerranée. In R. González Villaescusa, K. Schörle, F. Gayet, & F. Rechin (eds.), *L'exploitation des ressources maritimes de l'Antiquité: activités productives et organisation des territoires*. Actes des XXXVIIe rencontres internationales d'archéologie et d'histoire d'Antibes et XIIe colloque AGER. Antibes.
- Maeder, F. & Halbeisen, M. (2001) Muschelseide: auf der Suche nach einem vergessenen Material, *Waffen- und Kostümkunde* 1, 33-41.
- Maeder, F. & Halbeisen, M. (2002) Il Bisso marino: alla ricerca di un materiale perduto, *Jacquard* 50, 4-10.
- Maeder, F., Hänggi, A. & Wunderlin, D. (2004) *Muschelseide – Goldene Fäden vom Meeresgrund / Bisso marino - Fili d'oro dal fondo del mare*. Milano.
- Mastrocinque, B. (1928) *Bisso e porpora - per la rinascita delle due grandi industrie*. Taranto.
- Michelsen, E. H. (1860) *The merchant's polyglot manual, in 9 languages*. Oxford.
- Mongez, A. l'ainé (1818) *Recherches sur l'habillement des anciens: I<sup>ère</sup> Partie. Matières employées par les anciens pour leurs vêtements, et du travail de ces matières*. In *Histoire et Mémoires de l'Institut Royal de France. Classe d'Histoire et de Littérature Ancienne*, 228-229. Paris.
- Müller, M., Babin, M.-L. & Riecke, J. (eds.) (2013) *Das Thema Kleidung in den Etymologien Isidors von Sevilla und im Summarium Heinrici I*. Berlin.
- Nagy, L. (1935) *Aquincumi Mumia-temetkezések. Mumien-gräbnisse aus Aquincum* (Deutscher Auszug). Budapest.
- Olck, F. (1897) Byssos. In G. Wissowa (ed.), *Paulys Real-Encyclopädie der classischen Altertumswissenschaft*, 1108-1114. Stuttgart.



- Piquereddu, P. (2003, ristampa 2009) Note di storia dell'abbigliamento in Sardegna. In M. T. Binaghi Olivari (ed.) *Costumi. Storia, linguaggio e prospettive del vestire in Sardegna*, 15-60. Nuoro.
- Quenouille, N. (2005) Some aspects of the Textile Industry in Roman Egypt. New Archaeological and Papyrological Researches on the Fayyum, *Papyrologica Lupiensia* 14, 229-250.
- Quenouille, N. (2012) Edition und Kommentar neuer Papyri aus den französisch-italienischen Grabungen in Tebtynis (Ägypten) (P.Tebt. Quen.). Inaugural-Dissertation Universität Trier, WS 2007/2008, *Fachbereich III / Papyrologie*. Trier.
- Riggs, C. (2014) *Unwrapping Ancient Egypt*. London-New York.
- Rondelet, G. (1555) *Universae aquatiliū historia*. Lyon.
- Rondelet, G. (1558) *L'histoire entière des poissons*. Lyon.
- Rosa, D. M. (1786) *Delle Porpore e delle materie vestiarie presso gli antichi*. Modena.
- Rudolph, D. G. (1766) *Hand-Buch oder kurze Anweisung wie man Naturalien-Sammlungen mit Nutzen betrachten soll*. Kopenhagen.
- Sada, L. (1983) *Perle dei mari di Puglia*. Taranto.
- Sagot-Ortega, A. (1992) Le byssus ou laine d'or, *Techniques et Culture* 19, 191-196.
- Scales, H. (2015) *Spirals in Time. The Secret Life and Curious Afterlife of Seashells*. London, New York. In Italian: (2017) *Spirali nel Tempo. Le Conchiglie e Noi*. Trieste.
- Schrader, C. (2007) *Vor dem Angesicht: Betrachtungen und Erfahrungen vor dem Muschelseidenbild in Manoppello*. Berlin.
- Scot, D. (1827) On the substance called Fine Linen in the Sacred Writings, *The Edinburgh New Philosophical Journal* 3, 71-81.
- Sedilesu, S. (2013) *Il costume tradizionale sardo - Storia, significato e tradizione*. Roma.
- Smith, W. (1854) *Dictionary of Greek and Roman Geography*. London.
- Smith, W. L., Wayte, W. & Marindin, G. E. (eds.) (1890) *A Dictionary of Greek and Roman Antiquities*. London.
- Sroka, P. (1995) Kostbarer Faserstoff aus der Antike. Handelt es sich beim biblischen Byssus um Muschelseide? *Restaura* 5, 338-342.
- Treccani (ed.) (1930) *Enciclopedia Italiana Treccani*, Milano.
- Trevor-Roper H. (1983) The invention of tradition: the Highland tradition of Scotland. In E. Hobsbawm & T. Ranger (eds.), *The invention of tradition*, 15-42. Cambridge.
- van den Hövel, M. (2013) *Der Manoppello-Code: Veronica Manipuli*. Norderstedt.
- van der Feen, P. J. (1949) Byssus, *Basteria* 13(4), 66-71.
- Veiga, P. (2012) Studying Mummies and Human Remains: Some Current Developments and Issues, *Washington Academy of Sciences WAS*, 1-22.
- Vial, G. (1983) A propos d'une soierie façonnée, dite de "Byssus", *Bulletin du Centre International d'Etude des Textiles Ancien CIETA* 5758, 50-60.
- Vigo, M. (2010) Linen in Hittite Inventory Texts. In C. Michel & M.-L. Nosch (eds.) *Textile Terminologies in the Ancient Near East and Mediterranean from the 3rd to the 1st Millennia BC*, 290-322. Ancient Textiles Series 8. Oxford.
- Villani, G. B. (1947-48) *La pinna nobilis con particolare riferimento alla lavorazione del bisso e sua possibile rinascita industriale*. Bari.
- Villard, P. (2010) Les textiles néo-assyriens et leurs couleurs. In C. Michel & M.-L. Nosch (eds.) *Textile Terminologies in the Ancient Near East and the Mediterranean from the 3rd to the 1st Millennia BC*, 388-399. Ancient Textiles Series 8. Oxford.
- Viviani, D. (1836) Del Bisso degli antichi del professore cav. Domenico Viviani. In *Biblioteca italiana, o sia Giornale di letteratura, scienze ed arti compilato da varj letterati*. Vol. 81, 94-109. Milano.
- Vogelsang-Eastwood, G. (1993) *Pharaonic Egyptian clothing*. Leiden.
- Vogelsang-Eastwood, G. (2001) Textiles. In P. T. Nicholson & J. Shaw (eds.) *Ancient Egyptian Materials and Technology*, 268-298. Cambridge.
- Wadischat, E. (2008) *Expert-Praxislexikon Textilkunde*. Renningen.
- Wild, J. P. (2007) Methodological introduction. In C. Gillis & M.-L. B. Nosch (eds.) *Ancient Textiles. Production, Craft and Society*, 1-6. Ancient Textiles Series 1. Oxford.
- Williams, W. H. A. (2010) *Creating Irish Tourism: The First Century, 1750-1850*. London.
- Winlock, H. E. (1940) The Mummy of Wah Unwrapped, *The Metropolitan Museum of Art Bulletin* 35(12), 253-259.
- Wipszycka, E. (1965) *L'industrie textile dans l'Egypte romaine*. Warschau-Krakau.
- Yates, J. (1843) *Texterium Antiquorum: An Account of the Art of Weaving Among the Ancients ...* Part 1, London.
- Zanetti, G. B. (1964) Un'antica industria sarda: il tessuto d'arte per i paramenti sacri, *Archivio Storico Sardo* 29, 193-273.