

## Fulling

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The practice of fulling woollen garments was never part of an integrated textile production chain in the Greco-Roman world, though in several contexts, there were developments towards large-scale investment and rationalization in fulling workshops. Fullers, particularly in the Roman period, developed a strong, and positive, occupational identity, and were well-integrated members of their respective urban communities.

Fulling was a procedure that aimed to refine or recover woollen garments (see wool), particularly tunics and mantles. It could include, but was not limited to, cleaning: its core aim was to improve the quality of the surface of the textile (see textile production) by raising and curating the “nap”—a soft layer of interlaced fibres that gives woollen textiles a soft, ideally even shiny surface, and makes them warmer and more comfortable to wear. Because it involves a chemical treatment and brushing, fulling has a slightly abrasive effect on textiles: garments can be subjected to the procedure repeatedly, but not endlessly. In practice, fullers worked with new as well as with used garments, and the available sources do not distinguish clearly between fulling newly woven textiles and recovering used ones—both categories of textiles seem to have been subjected to an identical procedure, though previously unfulled textiles may have required a more thorough and lengthy treatment. While the procedure was common, not all woollen textiles were fulled, and the frequency with which textiles were refilled could vary.

### Evidence

Fulling is attested to in the Greek as well as in the Roman world. Greek texts refer to fulling with words derived from the root *knaphe-*, which is related to what appears to have been the Greek word for “thistle” (*knaphos*) and puts emphasis on the actions performed by fullers while raising the nap, which could be done by brushing the textile with thistles. All Latin terminology is derived from the word *fullo*, which may stem from the proto-Indo-European root *\*b<sup>h</sup>el-*, and thus is related to words like *fulmen* and *fulgeo* (“shine brightly”); the Latin terminology may be thought to have emphasized the actual effect brought about by the treatment, and the brilliant appearance of a newly fulled garment.

Evidence for fulling in the Greek world is scarce and fragmented. Two brief late-6th-century bce funerary inscriptions from the Athenian acropolis referring to a *knapheus* are the earliest secure attestations of professional fulling (IG I3 554, 616). From then on, inscriptions appear in limited numbers throughout the Classical and Hellenistic period. These include funerary inscriptions, but also, at Delphi, several apprenticeship contracts (e.g., SGDI II, 1904). From the late 5th century onwards, Classical Greek authors casually refer to fullers as common figures in (Athenian) urban life, but without offering a lot of detailed information about their profession and its socioeconomic role (Arist. *Vesp.* 1122, *Eccl.* 389; *Her.* 4.14; *Lys. Sim* 3.16; *Plat. Gorg* 491a). There are no iconographic representations of the craft, and with the exception of some small, late Hellenistic fulleries at Delos, there is no archaeological material.<sup>1</sup> From early on in the Hellenistic period, however, *knapheis* are found in Egyptian papyri, and the craft is mentioned several times in the mid-3rd-century bce Zenon archive (P.Cair.Zen. 2.59176, 2.59206, 4.59539, and 4.59744).

Most evidence for fulling comes from the first three centuries ce. From this period, there is a large quantity of literary references; a variety of legal texts; a large number of inscriptions; a significant amount of documentary evidence, including papyri, wax tablets, and lead tags; archaeological evidence of the highest quality; and several iconographic depictions of fullers at work. As far as it is location specific, the evidence is also well-spread geographically: while the largest quantities of evidence come from the more densely urbanized regions of the Roman Mediterranean, there is (epigraphic) evidence from Gaul, the Germanies, Spain, and Southeastern Europe. Nevertheless, there are three clear clusters of evidence. Besides papyrological evidence in Egypt, these include inscriptions from the cities of Western Anatolia and an exceptionally large body of high-quality evidence from Roman Italy.<sup>2</sup> The Italian material in particular looms large over any discussion about fulling in the Greco-Roman world: it includes over twenty fully excavated fulling workshops (at Pompeii, Ostia, Rome, Herculaneum, and Florence).<sup>3</sup> Due to the nature and permanence of the installations used in these workshops, their remains give a relatively detailed insight into the organization of the production process and its embedding in an urban context, particularly in combination with the iconographic depictions of the fulling process and the fragmentary references to it in literary texts.

### **Operational Sequence**

The basic operational sequence of fulling consisted of three steps: soaping, rinsing, and finishing.<sup>4</sup> The first step, soaping, entailed a thorough treatment of the textile with alkaline chemicals, including “fuller’s earth” (calcium montmorillonite) and aged urine (i.e., ammonia). This treatment served to dissolve animal fats and remove stains and other pollution. It required the active bodily effort of a worker, who was supposed to trample the textile under foot, and then to rub it, scrub it, and wring it out. The use of human urine has been overstated by 20th-century scholars, who believed that Roman fullers put urinals in front of the entrances to their workshops. This is actually not attested, and seems unlikely. While urine use is mentioned in literary sources (Plin. NH 28.26), fuller’s earth appears to have been the more common chemical agent.<sup>5</sup> The second step was rinsing. This phase is only apparent in some larger Roman fulling workshops that preserve the remains of purpose-built rinsing basins, but it cannot be left out, as the chemicals used in the first step of the process need to be washed out. The treatment required some physical effort by workers: merely soaking the textiles was not enough. After drying, the final step—finishing—was at once the most important and the most complex. It involved a thorough brushing to raise the nap, and a careful shearing and polishing to make sure its surface felt even and looked smooth. Finds from Pompeian workshops suggest that Roman fullers had brushes of varying roughness at their disposal, as well as shears, and that they could have an installation that helped spanning the cloth during the treatment.<sup>6</sup> Textual sources suggest thistles could also be used (Plin. NH 25.108).

Besides the core operational sequence, a number of optional treatments could be added to the finishing phase. These included sulphuring, chalking, and pressing. Sulphuring could add an additional lustre to white garments and enhanced the softness of their surface. It was done by spreading the garment out over a wooden frame and burning sulphur underneath it; Pliny, the only source on this, explicitly states that not all clothes underwent this treatment, as it could be detrimental to some dyestuffs (Plin. NH 35.196–198). Chalking was done with high-quality natural clays—Theophrastus (De Lap. 61–67) refers to several varieties, from several Greek regions and islands; Pliny specifically refers to chalk won on the small island of Kimolos (Plin. NH 35.198)—and it served to give white textiles an additional lustre. This optional procedure could, for instance, be performed on the togas of electioneering candidates so that they stood out against those of their fellow citizens (Pers. Sat. 5.177). Finally, clothes could be put under a cloth press. This procedure probably served to stabilize the nap by pressing the fibres of the nap against the textile. Remains and depictions of cloth presses have been found in Pompeii.<sup>7</sup> These were large, fixed installations operated by two screws; garments were folded and put between two horizontal

plates, after which the screws were tightened. It remains unclear when the procedure first emerged and how commonly it was used.

## **Economic History**

Contrary to the practice in medieval Europe, fulling in the Greco-Roman world was never part of a cohesive textile production chain. This also was unnecessary, as garments in the Greco-Roman world were simple and generally woven to shape: they were ready to wear as soon as they left the loom, and could be sold to end users immediately afterwards, who subsequently could decide to have the garment fulled—or not. Hence, there is no evidence for direct economic ties between fullers and other craftsmen involved in the textile economy, nor were there many larger economic units including crafts like weaving, dyeing, or tailoring alongside fulling—with the exception of some elite households in Rome (e.g., the Statilii Tauri, CIL VI, 6287–6290), and some estates in Egypt (P.Cair.Zen. 2.59176, 2.59206, 4.59539, and 4.59744), but there is no reason to see these as large-scale textile entrepreneurs: to a significant extent, this textile work appears to have been directed towards the internal needs of these households and estates.

As fulling was a non-essential treatment aimed at improving wearing comfort and appearance, its demand was divided unevenly over society, coming mostly from those social groups that had the means to maintain a high-quality private wardrobe and the need or desire to do so. Practically, this means that demand for fulling was disproportionately large among urban elites, but fullers were widespread enough—in Greece as well as in Rome—to indicate that sub-elite groups also enjoyed access to their services. This is also suggested by the inclusion of fulled clothes in several pawnbrokers records from Roman Egypt (P.Tebt. II, 406, SB 8:9834b). In literary and epigraphic sources, fullers appear to be interacting most frequently directly with these end users (e.g., Plaut. Aul. 508; AE 1958, 273). This picture is confirmed by the archaeological record to the extent that many fulling workshops were very small and had, or were situated in, a shop.<sup>8</sup>

Fulling can be found in a variety of investment contexts, and fulling workshops diverged sharply in scale. Workshops can be securely identified on the basis of the remains of fulling installations, which typically consisted of tubs fixed in a bed of waterproof mortar surrounded by a low wall that could be used by workers to support their arms (fig. 1). As these tubs provided place for one worker, the number of installations is indicative for the production capacity of fulling workshops. Of the securely identified and fully excavated workshops, a large majority had only two or three fulling installations.<sup>9</sup> These small workshops were typically situated in a shop. A small number of medium-sized workshops embedded into Pompeian houses had up to ten fulling installations, while four “fulling factories” in Rome and Ostia had between thirty-five and ninety-seven.<sup>10</sup> These were situated in purpose-built production halls. It is clear that some of these larger fulling workshops also, or predominantly, served a professional market. Yet the location of the largest Roman period fulling workshops directly around Rome suggests that they were on the receiving rather than the sending end of trade flows and prepared textiles destined for the Roman metropolitan market.

In the medium-sized and larger Roman fulling workshops, the production process has been visibly rationalized. Their workrooms appear to have been organized around a complex of three or four large interconnected rinsing basins (fig. 2), in which clothes moved step by step from dirtier to cleaner water; fulling installations were clustered around one side of the rinsing complex, whereas space for finishing procedure sometimes was clustered on the other side.

Essentially, this was a rudimentary production line system, in which clothes, not people, moved through the workshop, and in which there was a relatively rigid division of labor that restricted many workers to doing one simple task. These fulling factories reveal a unique level of economic development that elsewhere is mostly unparalleled before the Industrial Revolution.

## Fullers

Fulling long had a relatively bad reputation among scholars. It was believed to have caused significant olfactory nuisance, and to have been a controversial, disreputable craft, surrounded by all kinds of cultural tensions.<sup>11</sup> These tensions, however, appear to have been overstated. There is no evidence suggesting that fulling caused more nuisance than other urban crafts, and it is clear that the process was not spatially marginalized. Fulling was frequently used by writers of Greek and Roman comedy, but there is no direct tie to any clear cultural tensions. The most controversial aspect of the work of fullers was not the “dirty” nature of the fulling procedure, but the fact that they worked with other people’s private possessions. The legal complexities that could arise from this issue are behind virtually all references to fulling in Roman juridical corpora, and when Fufius Calenus makes a caricature out of Cicero because of his father’s involvement in fulling, it is this specific issue that is at the centre of the invective (Dio Cass. 46, 4–5). Otherwise, their occupation did not compromise fullers’ social position in their urban communities.

Hence, throughout the ancient world, fullers were commemorated with epitaphs explicitly highlighting their daily work, and evidence from the Roman empire also suggests that they were as able as other craftsmen to negotiate their place in the urban community—or perhaps even more so. Because they worked with valued personal possessions of their customers, they were able to develop rather close ties with their clientele. At Pompeii, this is perhaps expressed in the fact that fullers were disproportionately more involved in electoral campaigns compared to other craftsmen. It is, however, important to distinguish those who could publicly acknowledge themselves as “fullers” from the people working in fulleries: sources suggest that, as a rule, the skilled craftsmen in charge of a workshop were seen as true “fullers,” but this was not necessarily also true for their employees or slaves, who could only partially develop an occupational identity, especially if they were only involved in the first phases of the process. To become a true fuller, it was essential to learn the craft, particularly the more difficult third stage.<sup>12</sup>

Most of the small-scale workshops from the Roman period, and the medium-sized workshops at Pompeii, appear to have been closely associated with living accommodation, suggesting that the core work group developed around a household. In many cases, this household is likely to have been dominated by a nuclear family, thus including men, women, and children (cf., e.g., Apul. Met. 9.24–26; CIL VI 9429).<sup>13</sup> In metropolitan Rome and Ostia, the distance between working and living appears to have been more articulate: smaller workshops do not seem to have also included living accommodation, and in the large-scale urban fulling factories in this region, working and living seem to have been entirely separated, both spatially and socially.

There is ample evidence that skilled fullers in larger urban communities regularly formed professional associations or otherwise operated as a group in their urban community. This evidence particularly comes from Roman Italy, Roman Asia Minor, and Roman Egypt, and it highlights both the varied nature of the activities in which these associations were involved, as well as the extent to which they could form a bridge between fullers and local elites, and could help to represent the interests of fullers vis-à-vis the local authorities. Several epitaphs from Asia Minor record how associations of fullers buried their members (e.g., SEG 40.1045 [Julia Gordos]; TAM 5.1, 86 [Saittai]); a range of honorific inscriptions attests how fullers erected statues for their benefactors—such as the well-known statue of Eumachia in Pompeii (CIL X 810). Other inscriptions record how associations of fullers were involved in religious activities: a Late Republican inscription from the sanctuary at Praeneste records how a

collegium of fullers, probably from Rome, offered to Fortuna Primigenia (CIL I 1455, 1456). On a more official level, at Rome, a collegium of fullones was involved in a lengthy litigation about the location of their meeting place on the Esquiline (CIL 6, 266–268).<sup>14</sup> Two papyrus texts from Egypt show how fuller's associations in Oxyrhynchus and Tebtynis played a role in the collection of certain taxes (SB 18:13916; P.Tebt.2:287). It is likely that these organizations (and their patrons) also otherwise played a role in securing the economic interests of their members within the local community, and perhaps beyond.

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## **Notes:**

(1.) Pavlos Karvonis, "Les installations commerciales dans la ville de Délos à l’époque hellénistique," *Bulletin de correspondance hellénique* 132 (2008): 153–219.

(2.) On Egypt, see Kerstin Dross-Krüpe, Wolle, Weber, *Wirtschaft Die Textilproduktion der römischen Kaiserzeit im Spiegel der papyrologischen Überlieferung* (Wiesbaden, Germany: Harrasowitz, 2011), 86–89. On Asia Minor, see Guy Labarre and Marie-Thérèse Le Dinahet, "Les Métiers du textile en Asie Mineure de l’époque hellénistique à l’époque impériale," in *Aspects de l’artisanat du Textile dans le monde méditerranéen* (Paris: Montagnac, 1996), 49–116.

(3.) Miko Flohr, *The World of the Fullo. Work, Economy and Society in Roman Italy* (Oxford: Oxford University Press, 2013), 20–30.

- (4.) Flohr, *World of the Fullo*, 98–121.
- (5.) Miko Flohr and Andrew Wilson, “The Economy of Ordure,” in *Roman Toilets. Their Archaeology and Cultural History*, eds. Ann-Olga Koloski-Ostrow, Gemma Jansen, and Eric Moormann (Leuven, Belgium: Peeters, 2011): 127–136.
- (6.) Flohr, *World of the Fullo*, 144–145.
- (7.) Nicolas Monteix, *Les Lieux de Métier. Boutiques et ateliers d’Herculanum* (Rome: École française de Rome, 2010), 205–216.
- (8.) Flohr, *World of the Fullo*, 73–74.
- (9.) Flohr, *World of the Fullo*, 77.
- (10.) A. Pietrogrande, *Scavi di Ostia VIII. Le Fulloniche* (Rome: Libreria dello Stato, 1976).
- (11.) Esp. Mark Bradley, “It All Comes Out in the Wash. Looking Harder at the Roman Fullonica,” *Journal of Roman Archaeology* 15 (2002): 21–44.
- (12.) Flohr, *World of the Fullo*, 276–277.
- (13.) Flohr, *World of the Fullo*, 265–273.
- (14.) Nicolas Tran, “Le ‘procès des foulons’: l’occupation litigieuse d’un espace vicinal par des artisans romains,” *Mélanges de l’École Française de Rome. Antiquité* 119.2 (2007): 597–611.