

2017 **Peña, J.T.** “Recycling in the Roman world: definitions, materials, and organization.” Invited lecture for international conference “Oxford Roman Economy Project: Recycling and the Ancient Economy.” University of Oxford, Oxford, United Kingdom, 9/26/17.

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I would like to begin by thanking the conference organizers for first conceiving of and then staging this event, which examines what I think we would all agree is an important and substantially understudied aspect of the Roman economy, and to thank them also for their generous invitation to participate in this conference.

In this talk I present some general observations regarding recycling in the Roman world with a view setting the stage for the presentations and discussion that follow. Towards this end I undertake to do three things:

1. define a set of basic concepts and terms that relate to recycling;
2. identify the various materials that would have been available for recycling in the Roman world; and
3. consider the organization of recycling operations in the Roman world.

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Turning, then, to the first of these tasks, I would begin by noting that the various waste products generated by human activity can be divided into two categories on the basis of how they are treated, namely those that are recovered and those that are discarded. The recovery of wastes generally entails their removal from what is termed a waste stream, meaning the regularly structured path that is employed to transfer waste from its point of generation to its point of definitive discard. Newly generated waste is frequently subject to provisional discard in one location, before then being shifted to some other location for further provisional discard or to its locus of definitive discard.

In some cases waste in the form of artifacts, parts of artifacts, or the by-product of some activity, such as cooking ash, are recovered from the waste stream with a view to being introduced into a productive process as a raw material. This is the practice to which the term recycling is properly applied.

In other cases artifacts or parts of artifacts that enter a waste stream are recovered with a view to being reintroduced into use for the function for which they were originally manufactured or for some other function. These practices represent expressions of what we can term reuse.

Recycling and reuse are closely related, in that both involve the recovery of waste for some application that depends upon its materiality. Further, the distinction between the two is in some cases difficult to define in a way that is clear and consistent. In light of these circumstances it is often helpful to consider recycling and reuse together, and, to judge from the titles of some of the presentations on the program, this will be the approach adopted at this conference.

Some organic wastes - including a portion of food wastes and human and animal feces - are recovered for the nutrients that they contain, either for consumption as food by humans or domesticated animals or to be employed as fertilizer rather than as a raw material in a productive process. Again, some organic wastes are recovered for use as fuel, thus for the energy that they contain. Practices of these kinds might or might not be regarded as instances of recycling.

Materials that are susceptible to recycling can be referred to as recyclables, and those in the process of being recycled as recyclate.

It is often necessary to convert recyclate to some other form before it can be used. This may involve heating with a view either to conversion from a solid to a liquid state – as is commonly done with glass and many metals - or to promoting disaggregation – as done with limestone destined for conversion to quick lime - crushing or grinding - as with ceramic - or shredding or pulping – as commonly done with textiles.

Specific recycling applications can be characterized as involving upcycling - the transformation of the recyclate into a material or product regarded as being in some way of higher quality, or downcycling – its transformation into a material or product of lower quality.

In the field of waste management waste is often divided into three general categories: construction waste, household waste, and industrial/commercial waste. In both the contemporary developed and developing worlds the first of these is generally quantitatively dominant, as in the graphic now on the screen, which displays the data for France for 2012. Some Roman archaeologists have adopted an analogous scheme, dividing the materials recovered in archaeological refuse deposits into architectural, household, and manufacturing/commercial refuse, with the first of these generally quantitatively dominant.

**[SLIDE]**

Moving now to the second task, the various kinds of recyclables available in the Roman world would have been the following:

In the category of construction waste:

Masonry blocks or fragments thereof; concrete facing elements, revetment plaques; sculpted stone architectonic and decorative elements and fixtures; paving stones; mosaic tesserae; ceramic elements; metal elements; fragments of plaster, *cocciopesto* and similar; wooden elements; bone door pivots; and textile and glass fittings.

**[SLIDE]**

In the category of household waste:

Finished craft goods in various kinds of stone, glass, ceramic, faience, plaster, various metals and metal alloys, hard animal parts; soft animal parts; wood; textile, felt; and plant fiber.

Also craft goods manufactured in combinations of two or more of these materials, such as cutlery, furniture, vehicles, and some clothing and items of personal adornment.

And food wastes, including biodegradable remains, along with more durable animal remains.

And finally, substantial quantities of cooking ash, human and animal feces and urine, and the carcasses of domestic animals.

**[SLIDE]**

Lastly, in the category of manufacturing/commercial waste – henceforth referred to as manufacturing waste:

Unused raw materials, tools for manufacturing and exchange operations; waste products left over from the processing of raw materials, such as slag; ash produced by the combustion of fuel as required by several manufacturing processes; waste products generated by reductive manufacturing processes; completed or uncompleted craft goods marred by manufacturing defects that rendered them unusable; finished craft goods that were never transferred to an end consumer; the remains of manufacturing facilities and fixtures.

**[SLIDE]**

I should also mention the recyclables that would have been generated by agricultural production. Among these were tools and fixtures, as well as organic by-products, such as prunings, the lees from the pressing of olives and grapes, chaff and straw, and manure.

**[SLIDE]**

The set of waste materials that any culture chooses to recycle is, of course, determined by a suite of circumstances, including attitudes towards waste, pollution, and consumption. In the Roman case, as we will hear in the presentations that follow, textiles, papyrus, statuary and architectural elements, and objects in metal and glass were regularly recycled. One category of material regularly recycled that is not represented in the program is ceramic. Both pottery and architectural ceramics were recycled in large amount as a pozzolana in hydraulic plaster and concrete, and, to a lesser extent, as temper in pottery. Another is that of human and animal feces and urine, which were used as fertilizer and as an industrial reagent, respectively. Animal bone was also presumably recycled for the manufacture of items in bone, as well as ash, as an industrial reagent and perhaps as fill in the manufacture of brick and/or mudbrick. This list of items almost certainly represents just one part of the picture, and future research will doubtless expand it and provide a more detailed view of various recycling practices.

For the third of the three tasks that I indicated at the outset I would like to consider the organization of recycling in the Roman world.

**[SLIDE]**

The evidence for recycling consists in the main of archaeological evidence, including the chemical and physical properties of certain categories of artifacts – ranging from glass vessels to copper alloy coins, to mummies, to entire buildings and parts thereof – [SLIDE] deposits of materials apparently assembled as recyclate – including cargoes of used glass and metal objects recovered from shipwrecks, [SLIDE] caches of marble statues and piles of construction debris that have been found in towns, [SLIDE] and refuse deposits created at different points in a waste stream that can be characterized qualitatively and quantitatively for their composition.

The textual evidence, in contrast, is decidedly limited, rendering it difficult to infer the organizational basis for recycling activities. This does include a small set of informative, though isolated data points that bear on some aspects of the question. [SLIDE] For instance, we learn from two passages in Martial that in Rome of the later first century AD there were *ambulatores* - itinerants - who exchanged matches for broken glass; from other texts that there was the occupation of *scrutarius*, a seller of second-hand objects, and that workers known as *stercorarii* emptied cesspits and transferred the excrement that they collected outside the town by wagon, presumably for dumping on a dung heap or provision to farmers as fertilizer; from a painted notice at Pompeii that at some point during the late Republic there were sales of used roof tiles in the town; and from a dedication that in Rome during the reign of Vespasian there was a *collegium* of *subrutores*, apparently persons specialized in the demolition of buildings.

Given this dearth of textual information I turn to comparative evidence to draw some inferences regarding how Roman recycling operations might have been organized. [SLIDE] A useful point of departure for this is Martin Medina's 2009 book *The world's scavengers: salvaging for sustainable consumption and production*, which examines in historical and theoretical perspective the groups of persons who earn their living in the contemporary developing world through the recovery of recyclables as part of the informal economy.

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Medina indicates that this activity, today generally referred to as waste picking, can take any of five distinct forms:

1. the recovery of recyclables in urban areas by unregulated and informal mobile waste pickers;
2. the recovery of recyclables in urban areas by mobile waste pickers operating under a formal municipal arrangement;
3. the recovery of recyclables in sorting plants;
4. the recovery of recyclables by itinerants working in non-urban areas; and
5. the recovery of recyclables at refuse dumps.

I would like to turn my attention to the first of these forms of refuse collection, as I believe that it may be of particular relevance to the Roman case.

**[SLIDE]**

For this I will focus on one specific group of waste pickers, the *chiffonniers*, or “rag-men”, of 19th century Paris, as their activities are well documented and they dealt in a suite of recyclables generally similar to those that would have been present in Roman towns.

Parisian *chiffonnage* of what is regarded as its golden age – roughly the 1820s to the 1880s – emerged from earlier activity of this kind carried out on a less structured, often part-time basis. The classic *chiffonnier* was an adult male who worked on foot, making his rounds after dark to root through the refuse piled along the sides of the streets for collection by a municipal service, extracting material of value. The principal focus of this work was, as the occupation’s name suggests, rags – chiefly in cotton and linen - which were recycled for the production of paper. The *chiffonniers* collected a wide variety of other kinds of refuse, including animal bone, objects in metal, glass, ceramic, and whale bone, paper, cardboard, corks, sponges, snail shells, sardine cans, candle stumps, cigar butts, and stale baguette.

**[SLIDE]**

The *chiffonnier* used his *crochet*, or hook to root through and recover refuse, placing this material in his *hotte*, a wicker hamper that he wore on his back. **[SLIDE]** When he had filled this he returned to his residence to sort his take, often assisted by the members of his family. **[SLIDE]** When the *chiffonnier* had accumulated a certain amount of one kind of recycle he or a family member visited a middleman who specialized in the bulking of that particular kind of material. **[SLIDE]** The middleman purchased the material and resold it to an establishment that required it for some productive process.

**[SLIDE]**

By the 1850s the system had become more elaborate, with the emergence of the *chiffonnier placier*, a more elevated form of the occupation, comprised of men who struck agreements with wealthy households to gain access directly to the refuse that they generated rather than scavenging in the street, and employed a wagon to move about the city. While many *chiffonniers* were destitute, this was by no means the case with all, and many higher-order pickers and middlemen earned a comfortable living and, in, some cases, succeeded in amassing a considerable fortune.

**[SLIDE]**

One interesting aspect of Parisian *chiffonnage* was the extent to which municipal government sought to regulate it. Beginning in 1828 *chiffonniers* were required to register with the police. Upon registration they were issued a copper plaque that they were required to wear on their person. One side of this was inscribed with the *chiffonnier’s* name and registration number, the other with the year, the *chiffonnier’s* age, and his or her physical characteristics.

[SLIDE]

Thanks to this registration system we possess detailed information regarding the number of *chiffonniers* active each year and their breakdown by age and sex. In 1829, for example, the second year of the system, the number of *chiffonniers* registered with the police – presumably some fraction of the total number of persons active in the occupation - came to 1,841, including 1,201 males and 641 females. A very small number were children – both boys and girls - under the age of 10. Quite sizable portions consisted of persons – here predominantly males - between the ages of 10 and 20, and of individuals - here more evenly divided between males and females - above the age of 60, with some of these older than 70. Data collected during the early 1890s indicate that in Paris no fewer than 84,795 persons earned their living in one way or another through *chiffonnage*, and that nearly 295,000 did so across the whole of France. As the country then had a population of 38.4 million, we can calculate that circa 0.75 percent of its inhabitants were engaged in work of this kind.

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In my view, the following six aspects of Parisian *chiffonnage* are of potential interest with regard to recycling in the Roman world:

1. Waste picking in a large city with refuse roughly analogous to that in a Roman town supported a small, though not insignificant portion of the population.
2. This activity offered employment to persons of both sexes and all ages.
3. Although this activity focused on a single recyclable, practitioners also recovered a wide array of other recyclables.
4. This activity involved a complex system that included waste pickers of different kinds and middlemen specialized in the collection and supply of specific categories of recyclables.
5. Although most practitioners were economically marginal, the size and hierarchical nature of the system permitted some to earn a substantially more remunerative living.
6. Municipal administration was interested in and regulated this activity.

In considering how this information might be relevant to the Roman case it is important to acknowledge three ways in which the circumstances within which Parisian *chiffonnage* operated would or might have differed from those present in Roman towns. First, the principal focus of the *chiffonniers*' activity – and that of waste pickers elsewhere in early modern Europe, such as the *cenciaioli* of Italy, the *Lumpensammler* of Germany, and the rag and bone men of the British Isles – namely the recovery of cloth manufactured from vegetal fiber that could be recycled for the production of paper – would have had no close Roman analog. Second, studies of contemporary waste pickers show that there is a negative correlation between the availability of public assistance for the urban poor and the disposition of such persons to engage in waste picking. Support of this kind would not have been available to the Parisian poor in the 19th century, and we should consider how the existence of the grain dole at Rome and of the institution of *clientela* more widely in the Roman world might have discouraged the participation of poor and unskilled persons in waste picking.

Third, the *chiffonniers* were able to scavenge for recyclables along city streets, as Paris had a municipal refuse collection service. We know surprisingly little about practices of refuse discard in Roman towns, and it is by no means certain that municipal administrations maintained some sort of regular refuse collection service that would have permitted a similar approach to waste picking.

**[SLIDE]**

A good case can be made that workers known as *centonarii* attested in many Roman towns were, in fact, waste pickers. *Centonarii* are mentioned in a small number of literary and legal texts, and are widely attested in the epigraphic record. A sizeable corpus of inscriptions indicates the existence of *collegia* of *centonarii* in roughly 80 municipalities in Italia, including Rome, and in several provinces in the western empire, with a particularly robust presence in central and northern Italia and in Gallia Narbonensis. The earliest attested of these *collegia* is the one at Rome, which existed already in the time of Augustus. An entry in the *Theodosian Code* indicates that *collegia* of *centonarii* were still active in multiple towns in Italia at the close of the fourth century AD.

The nature of the work carried out by the *centonarii* has been the subject of considerable scholarly debate. This occupational title clearly derives from the Latin word *cento* (*centones* in the plural), which normally refers to a patch, rag, or patched or heavily worn garment, and many scholars who have concerned themselves with this question have drawn the logical conclusion that the *centonarii* were rag collectors and/or dealers in second-hand clothing. The fact that some *centonarii* were *Augustales* and some even may have been *equites*, however, led other scholars to doubt this interpretation, and the fact that *cento* was also employed to refer to the type of heavy blanket employed in fire-fighting and the fact that *collegia* of *centonarii* are in many inscriptions linked with those of the *fabri* – builders – and also in a few cases with those of the *dendrophori* – carpenters - led them to conjecture that the *centonarii* were, in fact, firemen.

**[SLIDE]**

In her 2009 book on the *collegia centonariorum*, Jinyu Liu undertook a comprehensive review of the evidence for the activities carried out by the *centonarii*. While she devotes an entire chapter of her book to the rebuttal of the interpretation that they were firemen, she, in effect, sidesteps addressing the interpretation that they were rag collectors, and settles on the view that they were makers and sellers of low- and medium-quality textiles. Her interpretation is based on the observation that the word *cento* was also employed to refer to low-quality cloth and items made from this; the geographical distribution of the *collegia*, which she thought are primarily attested either in areas in which wool production figured prominently or in areas that represented important concentrations of demand for items manufactured in low-quality cloth; and the existence of what she regarded as a complementarity in the distribution of these organizations and the *collegia* of other groups involved in the textile and garment trade. While there is not the time to enter into a detailed evaluation of the strengths and weaknesses of Liu's position, I will state that I find it

unconvincing, in that the second and third of the points just noted are open to rebuttal, and that it fails to account in a satisfactory manner for some of the more salient aspects of the *collegia centonariorum*, [SLIDE] including their recurring association with *collegia* of the *fabri* and *dendrophori* - [SLIDE] and the fact that in the fourth century AD, as evidenced by three entries in the *Theodosian Code*, the imperial regime was concerned to shore up their membership as part of an effort to support town life in Italia.

[SLIDE]

The assumption that the *centonarii* were involved in waste picking, on the other hand, is entirely compatible with these two points, and, given the apparent etymology of the occupational title and what we know of Roman recyclables and craft production, I believe that the activities of the *centonarii* very probably focused on the recovery of rags – chiefly woolen - so that this material could be reprocessed and employed to manufacture low-quality cloth – Liu’s *cento* - analogous to the 19th century’s shoddy and mungo. If the activities of the *centonarii* to some significant extent involved the recovery of this material from mixed refuse deposits, as may very well have been the case, then it seems reasonable to suggest that they engaged in the recovery of other categories of recyclables that were to be found in deposits of this kind, and thus played a role broadly analogous to that of the *chiffonniers*.

These speculations leave unanswered many questions –Who, if anyone, would have carried out work of this kind in the parts of the empire in which *centonarii* are not attested? Where did the *centonarii* recover recyclables – directly from houses and manufacturing establishments, from refuse deposits along the sides of streets, from refuse dumps at informal or formally designated areas inside and/or outside of towns, in multiple locations? Was the role of the *centonarii* modified and codified by the state in some way during the late empire, when their organizations are referred to as a *corpus* rather than as a *collegium*? How does this interpretation stack up against the evidence provided by archaeological refuse deposits?

To close, I propose a general scheme for the organization of recycling operations first in Roman towns, and then in rural areas.

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In towns, residential groups and manufacturing establishments would have cached some of the refuse that they generated on the premises on a temporary basis, eventually transferring this and the other refuse that they produced either to a temporary discard site inside the town – if, for example, there was a municipal refuse collection service - or to a definitive discard site either inside or outside the town.

[SLIDE]

A certain amount of recycling presumably took place within residential groups and manufacturing establishments, with these recovering some portion of their cached refuse.

[SLIDE]

Some manufacturing establishments may have sent workers off the premises or engaged other persons to collect recyclant from other locations for their use – Here I can imagine lime burners collecting limestone and marble, or construction concerns engaging persons to collect potsherds so that these could be crushed to make *coccio pesto*.

**[SLIDE]**

Waste pickers who recovered a wide range of recyclables, but who focused their efforts on the collection of rags – called *centonarii* and organized as a *collegium* in some municipalities – recovered some categories of recyclables directly from residences and manufacturing establishments, temporary deposits inside towns – perhaps along the streets – and/or permanent deposits either inside or outside of towns. **[SLIDE]** They would have supplied these either directly to manufacturing establishments or to more or less specialized middlemen.

**[SLIDE]**

Other waste pickers focused their activity on a single type of recyclable, either because its recovery involved special skills or equipment, or because it was best collected prior to discard in a mixed refuse deposit. **[SLIDE]** Some of these practitioners – Here I think of Martial's glass *ambulatores* – may have supplied this material directly to manufacturing establishments or to middlemen. **[SLIDE]** Others – Here I think of *stercorarii* – would have discarded the excrement that they collected on dung heaps outside the town or provided it to agricultural establishments mostly outside the town. **[SLIDE]** Demolition specialists such as *subrutores* may have represented a separate category, given the special skills and tools required and the extremely large amounts of material to be recovered.

**[SLIDE]**

The middlemen who received recyclate may have retailed some of this for reuse – here I think of the *scrutarii* - provided this to manufacturing establishments, or wholesaled it to other middlemen who had a field of operations that extended beyond the town and its hinterland. Here I think of merchants and/or ship's captains, who may have acquired recyclate as cargo.

**[SLIDE]**

In rural areas – small settlements and farmsteads - there presumably would have been an elevated level of internal recycling. **[SLIDE]** These areas would also probably have been visited by ambulant waste pickers, some of these perhaps specialized.

This scheme omits some kinds of recycling, such as the recall by the state of coinage for reminting and recycling in connection with the operation of mines and quarries.

Articulating general comments regarding Roman recycling as I have done here is one thing, undertaking research directed at elucidating actual recycling practices in the Roman world quite another. **[SLIDE]** Understanding recycling practices at Pompeii and its environs

represents one of the main foci of a program of research that I have been directing in this area since 2012, the Pompeii Artifact Life History Project, or PALHIP. **[SLIDE]** Listeners interested in this work should visit RES ROMANAE, the website of the University of California, Berkeley Roman Material Culture Laboratory.

I hope that these remarks will prove to be of some utility in setting the stage for both the presentations and the discussion that follow, and I would like to thank the members of the audience for their kind attention.