FIREWOOD AND CHARCOAL IN CLASSICAL ATHENS

FUEL FOR HEATING AND COOKING is one of the most basic, irreducible needs of settled human existence.[1] Most of the ancient world relied on firewood (*ξύλον*) and charcoal (*ἄνθρακες*) to satisfy its energy requirements, and in major urban centers like Athens this must have been a major (and potentially quite profitable) industry. Fuel had to be gathered and processed in the countryside, transported into the city, and marketed and distributed there, with possibilities for employment and entrepreneurship at every stop. In part because the evidence is so fragmentary and scattered, however, the charcoal and firewood industries in Attica in the Classical period have never received systematic scholarly attention.[2] This paper is an attempt to draw together and analyze what can be known about the business and its part in the larger Athenian economy.

Technical Background: Charcoal and Charcoal Burning

Unlike wood, which many modern American households still use as a primary fuel for heating and even cooking, charcoal and the way in which it is produced are relatively unfamiliar to most residents of the developed world today.[3] Charcoal is the solid residue that remains when wood (or other organic matter) is "carbonized" or "pyrolyzed" under controlled conditions in a closed space.[4] The crucial difference between this "burning" and the sort of wood burning with which we are mostly familiar (in a fireplace, for example) is that very little air is allowed to come into contact with the fuel during the carbonization process. If this condition is not observed, the wood (or other raw material) is simply reduced to ash and its fuel value lost. Charcoal remains the household fuel of choice in many underdeveloped and developing countries today, especially in urban areas, and enjoys a number of important advantages over wood and other conventional fuels. First of all, unlike other fuels and petroleum products in particular, which must generally be imported for hard currency

[1] Works cited frequently are abbreviated as follows:

Emrich, 1985 = W. Emrich, *Handbook of Charcoal Making: The Traditional and Industrial Methods* (Solar Energy R&D in the European Community, Series E, *Energy from Biomass* 7), Dordrecht 1985

Meiggs, 1982 = R. Meiggs, *Trees and Timber in the Ancient Mediterranean World*, Oxford 1982

Simple Technologies = *Simple Technologies for Charcoal Making* (FAO Forestry Paper 41), Rome 1983

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[2] Meiggs (1982) concentrates his attention on the large pieces of wood used for building and shipmaking, although he does make some important and useful comments on firewood on pp. 188–190, 203–206.

[3] See *Simple Technologies*, p. 3, table 1, which shows that in 1978 the least developed areas of Africa used 1.18 m.^{3} of wood and charcoal per capita, equal to 85.7% of per capita energy consumption, while the least developed areas of Asia used 0.26 m.^{3} per capita, equal to 63.9% of per capita energy consumption. In developed-nation market economies like that of the United States, charcoal use stood at 0.07 m.^{3} per capita, which amounted to less than one percent of per capita energy consumption. Even the "charcoal briquets" familiar to America's backyard chefs are not pure charcoal but carbonized scrap wood and sawdust, combined with a starch binder and coal dust and molded into their distinctive roundish shape for packaging reasons.

[4] My discussion throughout this section is heavily indebted to *Simple Technologies* and Emrich, 1985.

and carefully refined, charcoal can be produced locally using inexpensive or free raw materials and extremely primitive technology. Charcoal also has a heat value of 6,500 to 7,200 kilocalories per kilogram, roughly comparable to that of bituminous coal, and thus yields much more heat per kilogram than even dry wood.[5] This means that transport costs per kilocalorie are much lower for locally produced charcoal than for locally gathered wood, an important consideration for a product whose production cost consists almost exclusively of the labor invested in it.[6] Finally, charcoal creates a much hotter, more even, and (with the help of bellows) more easily controlled heat than wood, which means that it is much better suited for domestic cooking and grilling and a virtual *sine qua non* for blacksmithing and particularly ironworking.[7]

Wood is composed largely of lignin, cellulose, and water; the higher the lignin content and the denser the wood, the higher the yield and quality of the charcoal produced from it.[8] Undried hardwood contains an average of about 30% water, while softwood contains about 42%,[9] although some of this can be removed by sun or kiln drying. Even with sun-dried hardwood, however, charcoal production using traditional methods is remarkably inefficient. Modern research suggests that the average yield for traditional technologies is only about 15% (which is to say that seven kilograms of wood yield only about one kilogram of charcoal) and that claims of efficiency over 20% must be viewed with suspicion.[10] The product that results, which is about 3–5% ash, 30% tarry residues, and 65–70% fixed carbon, is of low grade and corrosive and burns with a dirty, smoky fire. If the wood is somehow heated to about 500 degrees Centigrade during the carbonization process (as opposed to the approximately 400 degrees Centigrade usually attained), a product of about 85% fixed carbon will result. This is very difficult to do with traditional technologies, however, and it is primarily low-quality charcoal that is produced in the third world today and that was probably produced in the ancient world as well.[11]

The process of carbonization or pyrolysis, once underway, continues by itself but only begins at about 300 degrees Centigrade. Hence a kiln of some sort must be used to raise the temperature of the raw materials to the point at which they will begin to decompose (or "burn") spontaneously. There are two basic primitive technologies for making charcoal, the

[5] Emrich, 1985, p. 15. According to *Simple Technologies*, p. 4, one metric ton (1000 kg.) of charcoal has the energy output equivalent of 0.83 tons of bituminous coal, 1.65 tons of dry (15% water) wood, or 2.5 tons of green (60% water) wood.

[6] See especially the comments of J. E. M. Arnold and J. Jongma, "Fuelwood and Charcoal in Developing Countries," *Unasylva* 29, no. 118, 1978, pp. 4–5; J. C. Allen, "Wood Energy and Preservation of Woodlands in Semi-arid Developing Countries: The Case of Dodoma Region, Tanzania," *Journal of Development Economics* 19, 1985, pp. 69–70; W. Elkan, "Alternatives to Fuelwood in African Towns," *World Development* 16, 1988, pp. 528–529.

[7] Cf. Theophrastos, *Hist. Plant.* 3.8.7, 5.9.3. It is thus no accident that Aristophanic heroes regularly grill their thrushes, eels, and other delicacies over charcoal (e.g., *Ach.* 891f.) or that charcoal became a standard image for the intense "burning" of erotic love (e.g., *Anth. Pal.* 12.17). So too the male semichorus in Aristophanes' *Lysistrata* carry charcoal in their firepots, since it can be easily stirred up into flame (315; cf. 293–305).

[8] *Simple Technologies*, p. 28.

[9] Emrich, 1985, p. 22.

[10] Emrich, 1985, p. 21.

[11] Compare Aristophanes, *Pl.* 819–822, where Cario is driven out of the house by the smoke from what must be charcoal cooking within, "for it bit my eyes" (ἔδακνε γὰρ τὰ βλέφαρα μου).

pit and the mound, both of which can be used on a small or large scale. In each case, earth is used to restrict the amount of air available to the wood being burned. The two processes are suited to slightly different situations, and each has its own drawbacks.

Charcoal pits are best suited to areas in which the soil is deep and soft and thus easily excavated. For a small pit, a hole (typically about one meter square) is dug, a fire started in it, and more wood laid on top. While the fire is still burning strongly, a layer of leaves or other vegetation (typically about 20 cm. in depth) is laid over the wood, followed by a layer of earth (again about 20 cm. in depth). The pit smolders for two days or so and is then uncovered and cooled and the charcoal in it sorted and marketed. Pit burning can also take place on a much larger scale, with burning taking place from one end of the pit to the other. A typical pit of $6 \times 2.7 \times 1.2$ m. requires twenty to thirty days for burning, with another sixty days or so needed for cooling.

Small charcoal pits are simple to construct and require no capital investment beyond the labor expended in digging them; they are thus well suited to the very low-level entrepreneur, whose primary resource is his own labor.[12] Pits are highly inefficient, however, since some of the wood (all of which would ideally be converted into charcoal) must be used as fuel to raise the temperature of the rest to the point at which self-sustaining carbonization begins. It is also impossible to regulate temperature in the pit, and as a result some of the wood may be reduced to ash while some is left as unburned brands.[13] Pit burning, moreover, has a tendency to produce an excessive quantity of "fine" or charcoal dust (called μαρίλη by the Greeks), rather than the more valuable chunk charcoal (ἄνθρακες). Large pits are also potentially dangerous for unwary animals or passersby, who may walk onto them and fall through into the burning mass beneath the surface.[14]

Mound burning employs the same basic principles as pit burning but is better suited for areas where the soil is rocky, hard, or shallow, where pits are not easily dug. For a small charcoal mound, a central stake is driven into the ground and a platform of wood laid down around it to serve as a corridor for air circulation. Wood is then leaned or stacked as densely as possible about this central pole, and the heap is sealed first with grass, leaves, or straw and then with 10–20 cm. of earth. A number of small vent holes are left around the lower diameter of the mound to control burning. The central stake is then pulled out, and burning wood or charcoal is dropped into the resulting hole. A mound 4 meters in diameter at the base and 1–1½ meters high at the center will burn for several days, during which it must be watched for hot or cold spots. If any are detected, the neighboring vent holes are closed or opened appropriately, in order to inhibit or encourage burning. Care must also be taken to patch any holes that develop in the earth casing, to keep the wood within from burning conventionally. When the smoke from the central hole turns clear (indicating that burning is complete), all the holes are plugged and the mound is allowed to cool for several days. After that, it can be opened and the charcoal sorted and sold. A similar process is used for

[12] Compare the situation discussed by O. Panya, G. W. Lovelace, P. Saenchai, and P. Promburom, *Charcoal Making in Rural Northwest Thailand: Rapid Rural Appraisal of a Wood-based, Small-scale Enterprise*, Khom Kaen, Thailand 1988, esp. pp. 7–34.

[13] It is of course possible to reburn these brands, but they still mark a significant inefficiency in the conversion process.

[14] Cf. footnote 16 below.

much larger mounds, which are generally burned from one end to the other, with vent holes opened gradually along the sides as the burning proceeds. Small-scale mound burning is particularly appropriate for the small farmer, who can slowly accumulate a small pile of wood and then burn it at his leisure. Mound burning too is inefficient, however, since some wood must be sacrificed to raise the temperature of the rest and the process requires constant careful supervision over the course of a number of days.

Charcoal, Wood, and the Athenian Economy

Attica, with its relatively dense over-all population, its large urban sector, and its concentration of industrial production, was a fuel-hungry society. Individual households needed heat and a way to cook their food; businesses such as bakeries and bathhouses required supplies of wood and charcoal on a daily basis; industries like metalworking and refining and pottery making were absolutely dependent on a steady supply of fuel to heat forges and fire kilns and often needed specialized types of charcoal made from particular woods (Theophrastos, *Hist. Plant.* 5.9.3). Much of the process by which this tremendous and never-ending demand for fuel was satisfied can be traced and offers interesting insights into the organization of the Athenian economy in the late 5th and early 4th centuries B.C.

The 4th-century writer Theophrastos provides evidence for both pit burning and mound burning of charcoal in Attica during the Classical period. He describes mound burning (which would have been particularly suited to the rocky Attic soil) specifically, telling how chunks of wood are packed closely together, and then

> ὅταν δὲ περιαλείψωσι τὴν κάμινον ἐξάπτουσι παρὰ μέρος παρακεντοῦντες ὀβελίσκοις
>
> when they cover (them) over [presumably with dirt or clay], they fire the kiln section by section, piercing it periodically with spits [apparently as a way of releasing moisture] (Theophrastos, *Hist. Plant.* 5.9.4).[15]

Theophrastos also refers to pit burning in his description of the process of pitch extraction in Macedonia (*Hist. Plant.* 9.3.1–3), during which large pieces of wood (κορμούς) were split and stacked closely together, covered over with dirt, and then burned, with a careful watch being kept to make sure the fire never broke through the earth. The whole procedure, he says, was like that used by charcoal burners, "except not in a pit" (πλὴν οὐκ ἔμβοθρον).[16] Theophrastos is also aware of some of the more technical aspects of charcoalmaking, and emphasizes that the best varieties of wood for the purpose are those that are πυκνώτατοι

[15] This is a very difficult passage to understand. The parallel account of Pliny (*NH* 16.8.23) is somewhat clearer:

> acervi consertis taleis recentibus luto caminantur, accensa strue contis pingitur durescens calyx atque ita sudorem emittit
>
> piles of freshly cut sticks are fitted closely together and made into an oven with clay, and the structure is set fire to, and the shell as it hardens is prodded with poles and so discharges its moisture (trans. H. Rackham).

[16] Compare the story preserved in Aelian, *NA* 1.8, about the unfortunate Nikias, who was out hunting (clearly in wild unsettled country) and fell into a charcoal pit (ἀνθρακευτῶν κάμινον) where he was burned to death.

and στερεώτατοι ("most close grained and most solid") and naturally lowest in water content (*Hist. Plant.* 5.9.1–2).[17]

Not all segments of Athenian society, of course, were dependent on the urban cash economy to satisfy their fuel needs. Many wealthy landed citizens were certainly able to supply most of their household's requirements from their estates. Thus Alkibiades' property included unspecified quantities of ξύλα καύσιμα ("burnable wood"), φρύγανον ("brushwood"), and a ῥυμός ("log"), all of which were sold off to the highest bidder when his goods were confiscated.[18] Even a simple peasant in the countryside could, in the best of situations, gather virtually all his fuel in the form of cuttings and prunings from his own land or nearby common lands to which he had access.[19] As Menander remarks,

> Δρυὸς πεσούσης πᾶς ἀνὴρ ξυλεύεται
>
> After an oak falls, every man gets wood for himself
>
> (Menander, Μονόστιχοι 123 Meineke).

The woodcutter carried a metal tool of some sort and a strap to bind together what he gathered into a bundle or to form a sling for larger pieces. Thus someone says at Aristophanes, fr. 610 K-A,

> ἀλλ' ἱμάντα μοι
> δὸς καὶ ζμινύην. ἐγὼ γὰρ εἶμ' ἐπὶ ξύλα
>
> But give me a strap
> and a chopping tool. For I am going after wood.[20]

Even in the countryside, gathering and carrying wood was regarded as extremely heavy, undesirable labor, more suitable for slaves than free citizens. Thus the difficult life of the old peasant misanthrope Knemon in Menander's *Dyskolos* is characterized by the fact that he must do this work for himself:

[17] Theophrastos recommends holm oak, although he then seems to reverse himself (*Hist. Plant.* 5.9.1; cf. 5.9.3). Cf. Ion, *Trag.* fr. 29 N²: ἐξανθρακώσας πυθμέν' εὔκηλον δρύος ("having reduced to charcoal the well-burning [or easily split?] root of an oak") and the name of one of the old charcoal bearers in Aristophanes, *Ach.* 612: Πρινίδης, from πρῖνος "holm oak".

[18] See the discussion of W. K. Pritchett, "The Attic Stelai, Part II," *Hesperia* 25, 1956 (pp. 178–317), pp. 296–297, 300–301, 305.

[19] This would not always have been possible, of course, in which case the peasant would have been forced either to trade with others who did control fuel resources (particularly large landholders near by) or to resort to the cash economy either locally (at small regional trading fairs, for example) or in the city. On country markets, see most recently L. De Ligt and P. W. deNeeve, "Ancient Periodic Markets: Festivals and Fairs," *Athenaeum* 3–4, 1988, pp. 391–416.

[20] Cf. Homer, *Il.* 23.114–115:

> οἱ δ' ἴσαν ὑλοτόμους πελέκας ἐν χερσὶν ἔχοντες
> σειράς τ' εὐπλέκτους
>
> And they went, holding wood-cutting axes in their hands,
> and well-twisted ropes,

which they then used to carry logs (23.123). For a σμινύη used for chopping, cf. Aristophanes, *Clouds* 1485–1489.

ζῇ μόνος
... ξυλοφορῶν σκάπτων τ'
ἀεὶ πονῶν

He lives alone
... carrying wood and digging,
always laboring (Menander, *Dys.* 30–32).[21]

So too the servant in Menander, *Her.* 52 mentions the man ᾧ ξυλοφορῶ ("for whom I carry wood"), and Dikaiopolis' phallic rural fantasy in *Acharnians* includes a slave girl whom he refers to as ὑλοφόρον, "a wood carrier" (Aristophanes, *Ach.* 272).[22] Nonetheless, an abundance of free fuel was a clear advantage to rural life and is accordingly one of the basic features of the idealized Aristophanic vision of life in the country,

ὃς οὐδεπώποτ' εἶπεν, "ἄνθρακας πρίω, ..."
ἀλλ' αὐτὸς ἔφερε πάντα

which never said, "Buy charcoal! ...",
but produced everything itself (Aristophanes, *Ach.* 34, 36).

Many urban residents and most urban industries would not have enjoyed similar advantages. For the individual household, fuel was a basic necessity of life and is listed as such by the impoverished chorus in Aristophanes' *Wasps*:

ἀπὸ γὰρ τοῦδέ με τοῦ μισθαρίου
τρίτον αὐτὸν ἔχειν ἄλφιτα δεῖ καὶ ξύλα κὤψον

For from this little wage [i.e., from the lawcourts]
it is necessary that I and two others get barley groats and wood and other food
(Aristophanes, *Wasps* 301f.).

It is thus a basic sign of poverty to be unable to buy enough fuel to keep one's own home warm and so be reduced to huddling about the stoves at the local bathhouse (Aristophanes, *Pl.* 535; 951–954). Metics, as well as landless free citizens (of whom there were an increasing number in the late 5th century B.C.)[23] and citizens who had land but were either unable or unwilling to go out to it to bring in domestic supplies on a regular basis, would have been forced to rely on the market place to obtain their fuel. The need to buy charcoal (and along with it other goods imported from the countryside) is thus one of the basic complaints of the unhappy urbanized peasant farmer Dikaiopolis in the passage from the *Acharnians* quoted above.

Individuals who controlled land or labor or both served this urban market by setting up continuously operating firewood-gathering and charcoal-making operations, keeping what they needed to run their own households and selling the excess for cash.[24] The speaker of

[21] Compare the comment of St. John Chrysostom: ἔργον ... χαλεπὸν, οἷον σκάπτειν ἢ ξυλοφορεῖν ... ἢ ὑδροφορεῖν ("hard work, such as digging or gathering wood or bearing water").

[22] Unfortunately no fragments of Aristomenes' comedy Ὑλοφόροι, performed at the Lenaia in 424 B.C., are extant.

[23] Dionysius of Halicarnassus in his comments on Lysias, 34 says there were about 5000 such Athenians in 403 B.C.

[24] On the Athenians' willingness to enter into businesses of this sort, see esp. W. E. Thompson, "The

[Demosthenes], 42.7 says that the wealthy Phainippos had six men and donkeys who took wood from his property into the city and claims he made two drachmas a day per team in this way.[25] As Meiggs points out, this may be an exaggeration, since the intent of the speech is to show Phainippos' tremendous wealth.[26] Nonetheless, the figures given the jury could not have been entirely unbelievable and do not seem altogether out of line with our other limited information about the price of wood in the period.[27] It is probably to this sort of operation that the speaker of Euripides, fr. 283 N^2 refers as well:

τοὺς ὄνους τοὺς λαρκαγωγοὺς ἐξ ὄρους οἴσειν ξύλα

the donkeys carrying charcoal baskets to bring wood from the mountain.[28]

Similar arrangements were apparently made for charcoal production. The ἀνθρακεύς Syros who plays a central role in Menander's *Epitrepontes* is the οἰκέτης of a rich landowner (*Epitr.* 407f.) and seems to work full time at his occupation in order to produce an excess of charcoal for sale.[29] Not all charcoal burners were necessarily slaves. Some were probably free men with no other way of making a living, who gathered their raw materials from common lands and sold or bartered their product to local consumers or middlemen.[30] Whether slave or free, however, the charcoal burner was a marginal individual with no

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Athenian Entrepreneur," *AntCl* 51, 1982, pp. 53–85. Thompson does not discuss Phainippos or the fuel industry.

[25] Compare the man referred to at Strabo, 14.2.24, whose father left him a ἡμίονον . . . ξυλοφοροῦντα καὶ ἡμιονηγόν ("a wood-bearing mule and a mule driver"), on whose labor he was able to support himself.

[26] Meiggs, 1982, p. 206. The two drachmas per day would not be all profit but gross income from which pay or upkeep for the donkey drivers and the animals would have to have been deducted. The speaker naturally ignores this fact.

[27] Our best evidence comes from inscriptions from Delos dating from the late 4th and 3rd centuries B.C., discussed by G. Glotz, "Le prix des denrées à Délos," *JSav* 11, 1913 (pp. 16–29), pp. 23–24, and summarized by Pritchett ([footnote 18 above] p. 296). Firewood on Delos cost between 1 dr. 1 ob. and 1 dr. 2 ob. per talent (= approx. 80 lbs.) throughout this period, although this price was certainly increased by shipping costs. For the wood and charcoal trade on Delos in the last half of the 3rd century B.C., see the inscription published by E. Schulhof and P. Huvelin, "Fouilles de Délos," *BCH* 31, 1907, pp. 46–93, also discussed by A. Jardé, "Note sur une inscription de Délos," *BCH* 47, 1923, pp. 301–306.

[28] Compare the remarks of the male semichorus at Aristophanes, *Lys.* 289–291, who complain that the wood (τὼ ξύλω) on their shoulders ought rather to be carried by a donkey; the use to which the narrator (who has been magically transformed into an ass) is put at [Lucian], *Asinus* 29, 32; and the woodcutters in Homer, *Il.* 23.115, 120–121, who use mules. The Euripides passage is somewhat obscure, since a λάρκος is properly a charcoal basket, but the donkeys are said to be bringing ξύλα down from the mountains. Perhaps the real point for us is that the two industries were closely enough connected that such confusion was possible.

[29] Unlike Phainippos' men (who clearly work on private land), however, he frequents τὸ δάσυ, rough and overgrown territory equally suited for herding goats (*Epitr.* 242–243), which is probably common, "public" land. It seems a reasonable assumption that all this wood gathering contributed to the gradual deforestation of Attica; see the discussion of Hamish A. Forbes and Harold A. Koster, "Fire, Axe, and Plow: Human Influence on Local Plant Communities in the Southern Argolid," in *Regional Variation in Modern Greece and Cyprus: Toward a Perspective on the Ethnography of Greece*, M. Dimen and E. Friedl, edd. (Annals of the New York Academy of Sciences), New York 1976, pp. 109–126.

[30] See the comment of Themistios (1.10b3–5), about the ultimate fate of the bad shepherd:
ἔσται μισθωτὸς ἀντὶ βουκόλου, ἀχθοφόρος τις ἴσως ἢ ἀνθρακεύς, ὀδυνηρῶς καὶ μόγις παρατρεφόμενος.

He will be a day-laborer instead of a cowherd, perhaps a porter or a charcoal burner, living miserably and by the skin of his teeth.

proper place in the city.[31] Thus Andokides says that one of the ultimate low points of war is the moment at which "we see the charcoal burners coming from the mountains into the city" (*ἴδοιμεν . . . ἐκ τῶν ὀρῶν τοὺς ἀνθρακεύτας ἥκοντας εἰς τὸ ἄστυ*: fr. 4 Blass).[32]

As the description of Phainippos' operations and the fragment of Euripides quoted above show, donkeys were used to bring wood (and probably charcoal as well) into the city. Charcoal, which was a concentrated, secondary product which brought a higher price per kilogram than wood and could thus be profitably transported in smaller loads, was also regularly carried into the city in *λάρκοι*, "charcoal baskets", on the backs of human bearers.[33] The Chorus of old peasants in Aristophanes' *Acharnians* in particular are not just farmers (esp. *Ach.* 232; 994–999) but also retired charcoal carriers (*Ach.* 212). Indeed, the hero holds them at bay only by threatening a charcoal basket, identified here as their fellow demesman (*Ach.* 331–335; cf. 384f.). They accordingly reminisce about their youth,

ὅτ' ἐγὼ φέρων ἀνθράκων φορτίον
ἠκολούθουν Φαύλλῳ τρέχων

when I, carrying a load of charcoal,
used to follow after Phayllos,[34] on the run (*Ach.* 212–214),

and one of them is even named *Εὐφορίδης*, "Son of Good at Carrying" (*Ach.* 609). There is no suggestion that the old men produced the charcoal they used to carry. Instead, they were simply bearers, and it seems likely that this functioned for poor peasants as a form of short-term wage labor, which allowed them to earn hard money to buy goods they needed but could not produce on their own.[35]

Once in the city, charcoal and wood would have been taken to a central market spot and sold, probably first to retailers (*κάπηλοι*), who could afford to buy relatively large quantities at a time, and then to individual householders, who could not.[36] Aristophanes, fr. 403 K-A (*ἐπεὶ ἐγενόμην οἷπερ ἦ ἐπὶ ξύλα*) has often been taken to provide evidence for the

[31] Thus Photios (*Bibl.* 279 [530a30–38]) lists, among other individuals who rose from absurdly low occupations such as donkey driver, cook, and slave to positions of authority, a certain Bradyllis, who became a general of the Illyrians *ἀνθρακεὺς γέγονως* ("although he had been a charcoal burner"). The cleaner in Aesop's Fable 29 [Perry] refused outright to live with one, on the grounds that what he got clean his prospective housemate got dirty.

[32] Thus Menander's Syros wears the *δίφθερα* of a poor country man (*Epitr.* 229, 328; cf. Menander, *Dys.* 415; Aristophanes, *Clouds* 72). Unfortunately the appearance of this character on the fresco from the House of Menander on Delos tells us more about 4th-century dramatic costuming than about how real charcoal burners dressed. For the mosaic, see the illustrations in *BCH* 86, 1962, p. 875; S. Charitonides, L. Kahil, and R. Ginouvès, *Les mosaïques de la Maison de Ménandre à Mytilene* (*AntK-BH* 6), Bern 1970, pl. 4 and pp. 79–81.

[33] Glotz ([footnote 27 above] p. 24) gives prices on Delos for charcoal of 8 dr. per basket in 279 B.C., 9½ dr. per basket in 269 B.C. Although the size of the basket is unknown, it is hard to believe it weighed more than a talent. Charcoal would then have been at least six times as expensive as firewood. For the *λάρκος*, cf. Pollux, 7.110, who says the generic term *φορμός* could also be used for a charcoal basket. For *λάρκος*-bearing as a base occupation, cf. Dio Cassius, 52.25.

[34] Phayllos was a famous runner, also mentioned at Aristophanes, *Wasps* 1206. See E. N. Gardiner, "Phayllus and his Record Jump," *JHS* 24, 1904 (pp. 70–80), pp. 77–80.

[35] On peasants and their economic coping mechanisms, see esp. T. W. Gallant, *Risk and Survival in Ancient Greece: Reconstructing the Rural Domestic Economy*, Palo Alto 1991.

[36] Other arrangements may well have been made for direct delivery to businesses or industries that use large quantities of fuel, but we have no evidence for this. See Aristophanes, *Wasps* 301f., cited on p. 416 above.

existence of an area in the city known as "the wood market".[37] Since the proper expression for "wood market" would be *τὰ ξύλα*, on analogy with *τὰ κρόμμυα*, "the onion market", and *τὰ σκόροδα*, "the garlic market" (Eupolis, fr. 327 K-A), however, the line should probably be translated "Since I was in the place I was going after wood."[38] Given the Athenian habit of localizing the sale of individual commodities in particular places in the city and of naming those areas after the commodity sold there,[39] however, it is still a reasonable hypothesis that Athens had a central wood market called *τὰ ξύλα* and a place (perhaps near by) where charcoal was sold as well. Certainly there were urban tradesmen whose specialty was charcoal, as the list of occupations in fr. 13 K-A of the late 5th-century comic poet Philyllios (quoted at Pollux, 7.110) shows:

ἀνθρακοπώλης, κοσκινοποιός, κηπεύς, κουρεύς

charcoal seller, sieve maker, gardener, barber.[40]

Urban residents of Athens with no other resources, as well as representatives of various industries, would have come to this central market to purchase their fuel, which they, their servants, or hired porters known as *ξυλόφοροι* would then have carried off to their homes or places of business. Carrying wood for hire must have been backbreaking labor with no job security whatsoever and was recognized as one of the lowest occupations available for a free man.[41]

Conclusions

Classical Athens was a fuel-hungry society, which developed an elaborate system to satisfy its constant need for charcoal and firewood. Peasants in the countryside or their slaves gathered wood on a day-to-day basis, either from their own property or from common lands to which they had access, or if necessary bought or bartered for supplies with neighbors or at local markets. Rich landholders were also probably able to supply most of their own fuel and thus to remain essentially economically self-sufficient in this sphere. Thousands of residents of the city of Athens and much of the industry within it, on the other hand, had no choice but to rely on the urban cash economy for fuel. To serve these markets, the slaves of wealthy landowners, as well as some free men without any other opportunities or

[37] See, e.g., LSJ, *s.v.* *ξύλον*, I.2.

[38] Cf. Aristophanes, fr. 610 K-A (quoted above, p. 415).

[39] See Pollux (9.47), who observes that sections of the city were regularly named *ἀπὸ τῶν ἐν αὐτοῖς πιπρασκομένων* ("from the things sold in them").

[40] Compare the mention of *ἀνθρακοπώλαις* at Athenaios, 3.126e, although this is only Meineke's conjecture for the manuscripts' *ἀκρατοπώλαις*.

[41] See Pollux, 7.130 for porters and the variety of goods transported in this way. The *ὑλοφόρος* Mikkalion specifically calls his occupation a miserable one (*ἐξ οἰζυρῆς ... ἐργασίης*; *Anth. Pal.* 9.335). The Scholiast to Aristophanes, *Eccl.* 77 describes Lamias (probably as a wild guess to explain the reference in *Eccl.* 77–79 to a *σκύταλον* [wooden staff or stick]) as *πένης καὶ ἀπὸ ξυλοφορίας ζῶν* ("a pauper and making a living from transporting wood"). Epikouros is said to have risen *ἐκ φορμοφόρου καὶ ξυλοφόρου ... γενέσθαι γραφέα Δημοκρίτου* ("from a charcoal-basket bearer and wood carrier to become the scribe of Demokritos"; Epikouros, fr. 172 [Usener] = Athenaios, 8.354b–c). On the functioning of the free-labor market in Athens, see esp. A. Fuks, "Κολωνὸς μίσθιος, Labour Exchange in Classical Athens," *Eranos* 49, 1951, pp. 171–173, reprinted in *Social Conflict in Ancient Greece*, Leiden 1984, pp. 303–305.

resources, remained more or less permanently in the hills, working full time at cutting wood from public and private lands and burning charcoal. Others brought these products into the city on donkeys or carried charcoal on their backs. Strong young peasant farmers in particular, whose access to coined money was limited but who were nonetheless forced into the cash economy from time to time to buy goods like salt, shoes, or iron tools, used this as a means of acquiring a small cash income. At a central market place in the city, this wood and charcoal were sold for cash to retailers, who then resold their goods for a profit and presumably in smaller quantities to poor urban residents and probably to businesses as well. If one of these consumers was unable or unwilling to carry his fuel himself, bearers could be hired to take these supplies to the homes and businesses where they were used.

The residents of Attica in the Classical period thus developed complex and relatively sophisticated ways of satisfying the city's constant need for charcoal and firewood. Wealthy landowners, slaves, small peasant farmers, free landless workers in both country and city, and urban merchants all worked together to satisfy the fuel needs of urban households and industries, doing their best at the same time to extract a profit from the business. Similar arrangements undoubtedly existed for other commodities which were imported into the city from the countryside on a regular basis but for which documentation is even less substantial. These elaborate economic structures were certainly not planned in advance and were probably simply taken for granted by the average resident of the city. Nonetheless, they represent part of the immensely rich social and economic network that effectively bound together Attica and those who lived within its boundaries into a single community.

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