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THE ROMAN ARMY AND THE ROMAN SMITH: SOME EVIDENCE FROM BRITAIN

W. H. Manning

The army was one of the major consumers of iron in the Roman world, but its most obvious iron equipment, the armour and weapons of its soldiers, represented only a fraction of the iron which it required. Most soldiers were equipped with a variety of entrenching tools; their heavy equipment and *ballistae* were carried on carts which had iron fittings, and all of the units, both legionary and auxiliary, had large numbers of trained craftsmen who used iron tools, as well as wide range of agricultural implements, cooking equipment and the like. When the army arrived in Britain in AD 43 it brought all of this equipment with it. In the Roman world metals were far too valuable not to be recycled, and the army will have continued to use the iron which came with it through the centuries which followed, not in the form in which it arrived but as a major source of scrap which could be used repeatedly to manufacture new equipment. Indeed it is probably true to say that most of the iron which was used by the invading army of AD 43 is still in use today. Newly smelted iron will only have been necessary to top-up this the endless cycle of use and re-use. But there was one area, construction, where, at least for the first century of the Roman occupation, the army will have required large quantities of new iron, most of it almost certainly newly smelted. Even in the early years of the conquest the army had winter quarters and in these early forts almost all of the buildings were of wood. The amount of iron which was used in such timber buildings was dramatically shown in 1960 by the discovery of a pit in the late first-century legionary fortress at Inchtuthil containing some 10 tons of nails, many of them bent and distorted as a result of their being withdrawn from timbers during the demolition of the fortress (Pitts and St Joseph 1985, 109–13, pls xix–xx; 289ff.)

Much of the iron needed for the construction of the first forts to be built after the invasion probably came from the Continent, for although iron figures in Strabo's list of exports from Britain to the Roman world at the beginning of the first century AD (Strabo 4.5.2.) it is unlikely that the Iron Age iron industry had much spare capacity. However, within a few years of the conquest the demands, not only of the Roman army but of the rapidly developing urban structure of the new province, will have led to a commensurate increase in iron smelting. No fewer than 10 legionary fortresses, not to mention scores of smaller forts, were built in the 60 or so years after the invasion of AD 43. Then came the construction of Hadrian's Wall with its associated forts and a few years later the Antonine Wall. But after that only a handful of new bases were built, perhaps most notably the forts of the Saxon Shore, suggesting that after the mid-second century the army's demands for iron for use in construction work will have declined rapidly. In fact this reduction probably began before then for as each old fort was demolished much of the iron used in its construction will have been reused elsewhere.

The demand for iron created by the developing urban infrastructure of the province will have run in parallel with the military requirements, and from the end of the first century when the cantonal capitals were developing, civilian consumption probably greatly exceeded the military. A major factor in the growth of the iron industry will have been the developed economic infrastructure of the Roman Empire. In the largely *laissez faire* economy which prevailed in the Roman world, the greatly increased demand for iron which followed the Roman conquest will have resulted in a corresponding increase in its production. Cleere and Crossley estimated the annual production of the iron

industry in the Weald of Kent before AD 100 at around 150 tons a year rising to 700 tons a year in the first half of the second century (Cleere and Crossley 1985, 81). Such figures cannot be exact, but they probably give an idea of the quantities involved.

The furnace normally used in Roman Britain was a simple shaft furnace. A few larger forms are known, such as those found at Laxton in Northamptonshire which Peter Crewe has suggested could have produced up to five 20 kg blooms at a time (Crew 1998, 51), but these appear to have been exceptional and we still await experimental confirmation that they were capable of producing blooms on this scale.

In recent years there have been a number of experiments in smelting iron using reconstructions of Roman shaft furnaces. Of these the work of the Americans, Lee Sauder and Skip Williams is among the best quantified and it is instructive to apply their figures to the Inchtuthil nails (Sauder and Williams 2002). They found that the production of an artefact weighing 1.0 kg required 8.3 kg of iron ore. All of the stages in this process used charcoal, which was the only fuel suitable for metallurgical processes available to the Romans, and the creation of their 1 kg artefact consumed no less than 82 kg of charcoal. The estimated weight of the Inchtuthil nails was 10 English tons but it was an estimated weight and it is possible to substitute the metric tonne of 1,000 kg without creating any significant error in the calculations. Taking the figure of 82 kg of charcoal being required to produce 1 kg of finished artefacts, the production of ten tonnes of nails will have consumed 820 tonnes of charcoal. Some 6.5 kg of wood are needed to make 1 kg of charcoal, which means that around 5,330 tonnes of timber will have been consumed in the production of the Inchtuthil nails. In medieval and later times the wood used was almost always coppiced. Whether this technique was used in the Roman period is uncertain, but if it was not practiced the major iron smelting industries, which, for obvious reasons, were concentrated in the areas where the ores were found, would rapidly have destroyed the suitable timber in their area. In fact the evidence from the Weald of Kent, which is the mining area which has been most extensively studied, suggests that production continued unabated for several centuries (Cleere and Crossley 1985, 60ff.). The evidence for the type of charcoal used is limited, but Sim and Ridge cite work which suggests that oak was the wood preferred in the Weald of Kent in the Roman period (Sim and Ridge 2002, 38). In modern practice, a hectare of coppiced oak trees, which are harvested on a cycle of between 25 and 30 years, will yield around 3 tonnes of wood each year. If that figure is applied to the Inchtuthil nails the area required to produce the re-

quired 5,330 tons of wood is 1,777 ha or 4,390 acres. This is an area almost 13 times the size of Hyde Park, and Inchtuthil is only one of at least 10 legionary fortresses built in the 50 years after the invasion of AD 43. David Sim and Isabel Ridge (2002, 115), who have made replicas of the types of nails found at Inchtuthil, estimate that forging the nails in the hoard would have taken some 60,000 hours of work.

A question of fundamental importance is whether the army produced the iron objects which they used or simply bought them from contractors? The answer provided by literature and archaeology is that they probably made quite a lot of their own equipment, but by no means all of it. There are two key documents; the first is in the *Digest* which, although compiled in the sixth century AD cited many earlier authorities (*Digest* 50.6.7). The relevant passage dates from the late second century and refers to *immunes*, men who were exempt from some routine military duties because they were specialists who had more important commitments. It begins: 'Certain soldiers are granted by their conditions of service some exemption from the heavier fatigues.' Then comes a long list of craftsmen: 'Glaziers, craftsmen (the word used is the generic term *fabri*), arrow-makers, copper-smiths, helmet-makers, wagon-makers, makers of wooden roofing shingles (*scandularii*), sword-smiths, trumpet-makers, horn-makers, bow-makers, lead-workers, blacksmiths, lime-burners, wood-cutters and charcoal burners.'

The number of trades involved confirms that the *Digest* was referring primarily to the legions, which, with around 5,000 men, had the capacity to maintain a large number of specialists, many of whom would already have had a trade when they were recruited. Most soldiers were in their late teens or early 20s when they enlisted and, as they came from the working class, most of them will have been working for several years before they entered the army. One of the interesting points about the list in the *Digest* is the high degree of self-sufficiency which it reveals; not only are there metalworkers but there are the woodcutters and charcoal burners necessary to ensure a constant supply of the fuel needed by the smiths. It also reveals a high degree of specialisation; the copper smiths do not make the trumpets and horns which the army used to communicate commands. Nor did the ordinary blacksmiths make helmets or swords, these were the preserve of specialised craftsmen.

The second source, Vegetius, wrote at the end of the fourth century AD but referred to an earlier period. In his day the production of military equipment was concentrated in great factories run by the state and his work reflects his rather futile longing for the glories (as he saw them) of the past. He wrote:

‘The legion also had workmen, carpenters, masons, wagon-makers, blacksmiths, painters and other craftsmen for the construction of buildings in the winter-quarters (i.e. the legionary fortresses) ... to make new arms, wagons and other kinds of torsion-engines, or repair them when damaged. They also used to have workshops for shields, cuirasses and bows, in which arrows, missiles, helmets and arms of every type were made.’ (Vegetius II, 11)

A papyrus from Egypt, probably written in the second or third century AD, provides some confirmation of what Vegetius and the *Digest* tell us. Although fragmentary it is a record of two days’ activity in a legionary *fabrica*; 100 men were employed making among other things swords, two sorts of shields, iron-plates, bows, and catapult fittings (Bishop 1985).

The *Digest* and Vegetius were concerned with the legions, and the question of specialised craftsmen within the auxiliary units remained somewhat obscure until the discovery of the Vindolanda Tablets. Indeed it was possible to argue that the auxiliary units, which usually had no more than one-tenth of the number of men in a legion, did not have the necessary craftsmen to have been self-sufficient in more than the most basic of tasks. But the Vindolanda tablets, which date from between AD 90 and 120, are concerned with auxiliary units. Most are no more than tantalising fragments and even the better preserved ones are rarely complete, but a few contain references which are directly relevant to the question of workmen in the *auxilia*.

The first is fragmentary but it contains a specific reference to the *Fabricae* – the workshops (Bowman and Thomas 1983, 81ff.).

April 25, in the workshops, 343 men. Of these shoemakers, 12; builders, to the bath-house 18; for lead ...; to the kilns ...; for clay ...; plasterers ...; for rubble ...

None of these men were concerned with smithing, but the list does indicate a degree of specialisation not only in the building crafts but also in shoe-making, a craft omitted from the *Digest* and Vegetius. It is interesting to note that although the list begins with a reference to *fabricis*, translated as ‘in the workshops’, most of these men were actually working outside on kilns (probably producing tiles) and building a bath-house. In effect, the word was being used to refer to men who were exercising their crafts rather than a specific building.

The second reference (Bowman and Thomas 1983, 81ff.) is even more fragmentary but it contains a number of

significant words including three references to *faber*, the generic Latin word for a craftsman, and one to a [...]*utarius*. Although the word is incomplete almost certainly it was *scutarius* a shield maker; a suggestion which is strengthened by references in other tablets to *Lucius scutarius* and *Crescens scutarius*. (Bowman, Thomas and Tomlin 2010, 207). Another word is *gladi*..., again incomplete but a word which can be safely identified as a swordsmith, a craft mentioned in the *Digest*. This tablet leaves little doubt that the unit then in garrison at Vindolanda had specialist craftsmen including swordsmiths and shield makers, and by a logical extension, facilities for them to work in, a *fabrica*.

Perhaps the most informative of the Vindolanda tablets is No. 862 (Bowman, Thomas and Tomlin 2010, 210ff.) which provides details of the work done in the *fabrica* by the century of Firmus on 20 April in an unknown year.

20 April, craftsmen for
The work of the workshop (*fabricae*),
Century of Firmus.
A *uocros* made for a vehicle,
By order of Musurunus, centurion.
[*c*] *ircolas* made ... to the number of 8.
Huennius (?) craftsman (*faber*).
Cross-bars (*trauersaria*) made, to the number of 5.
Also iron drawn out. (*item ferrum [p]roductum*)
Andauer craftsman, (*faber*)
Tagomas craftsman (*faber*)

Some of the technical terms are extremely obscure and one of them, *vocris*, is otherwise unknown. It probably refers to part of the framework of a wagon which could have been made of wood but was more probably of iron. Roman wagons could have a surprising number of elaborate iron elements in their frames, as the pieces found in the great deposit from the Rhine at Neupotz showed (Künzl 1993, Teil 1, 257ff.), and the *vocris* may be one of them. The *ircolas* were obviously circular and the editors suggested that they were tyres, but if we are dealing with the products of a single day, as the provision of the date, 20 April, suggests, eight tyres seems an improbably high number and some other circular fitting such as nave hoops may be more likely. The line *item ferrum [p]roductum*, translated by the editors as ‘Also iron drawn out’, probably refers to the preparation of bars and rods from the billets. All of the workmen are called *faber* which in this context probably means master craftsmen. That they were smiths may be deduced from the reference to the working of iron.

The evidence for smiths within both the legionary and auxiliary elements of the Roman army is clear, but what does archaeology have to tell us of the *fabricae* in which they worked? Both legionary fortresses and auxiliary forts contain buildings of fairly standard types which were almost certainly either workshops or store buildings or, quite probably, both (Petrikovits 1974, 82ff.). The British legionary fortresses of which we have the most complete plans are Caerleon and Inchtuthil. Recent geophysical surveys undertaken by Dr Tim Young and the Department of Archaeology at Cardiff University have filled most of the major gaps in the plan of the masonry phase of Caerleon and we now know of no fewer than four large buildings which can be identified as workshops and stores within the fortress (Burnham and Davies 2010, 163, fig. 7.3). Too little work has been done on most of them for any useful discussion of their precise functions but they provide ample space for all of the crafts listed in the *Digest*. The only thoroughly excavated part of any of them is one of the outer buildings of the complex to the east of the granaries which was excavated by Andrew Gardener and Peter Guest, who showed that it was probably a stores building. The discovery of fragments of *lorica segmentata*, spearheads and other military material in one of the rooms would accord with its having been a store for material collected for recycling but abandoned with the building (Chapman 2011, 324).

The late first century timber-built fortress at Inchtuthil in Scotland had a characteristic *fabrica*, with three great basilical halls around a central courtyard which was fronted by four large rooms. It was there that the pit with the great deposit of nails was found, no doubt because the *fabrica* was the place where scrap metal was stored ready for re-use (Pitts and St Joseph 1985, 104ff.). Continental fortresses contain very similar buildings although few of them have been sufficiently thoroughly explored to have produced firm evidence of smithing, or indeed of any other craft (Petrikovits 1974, 82ff.).

The Vindolanda Tablets leave no doubt that auxiliary units had their own skilled craftsmen, and possible *fabricae* have been identified in a number of auxiliary forts. Such buildings are usually similar in size to a barrack block but have far fewer internal partitions. Perhaps the most complete ones are the four pairs of double workshops, each 72 ft (22 m) long and 10 ft (3 m) wide, in the Severan military works compound at Corbridge. They contained small water tanks and furnaces but there was no obvious sign of hearth bases. However, the evidence of sculpture and frescoes indicates that the Roman smith, like his modern

successors, did not crouch on the floor when working but had both his hearth and work-bench raised to a convenient height so that he could work either standing or sitting. The floors of the Corbridge *fabricae* had been flagged and later robbing, which removed many of these flags, will have destroyed the evidence for any masonry bases which stood on them.

A number of questions remain. What were these military smiths using as their raw materials? What were they producing? Were the military units actually self-sufficient in making the multiplicity of iron tools, weapons and fittings which even the smallest unit required? It is clear that in the ancient world (as in later periods) it was normal practice to recycle scrap metal. This is shown by the Inchtuthil nails and it can also be seen in the fort at Newstead where James Curle's excavations discovered a mass of equipment buried in a pit (Pit XVI) outside the fort (Curle 1911, 119). In almost all cases this equipment was either hopelessly damaged or in need of repair, often perhaps no more than the replacement of a wooden handle but, none-the-less, a repair which required some degree of expertise. The obvious explanation is that it was material which had been returned to the fort's *fabrica* as scrap or for repair and was still there when the fort was dismantled early in the second century.

However, newly smelted iron will have been needed not only to top-up the scrap material but to make the great number of iron structural fittings needed when a fort or fortress was built, and here again Newstead provides the evidence for this in the form of five billets, blocks of iron each weighing between 6 and 7.5 kg (Curle 1911, 288, pl. lxx, 9). Such billets are rare, although a few others are known including four from the fort at Strageath (Frere and Wilkes 1989, 176), but they must represent the form in which newly smelted iron reached the Roman army.

At the end of his list of craftsmen in the Roman legion, Vegetius wrote of the *praefectus fabrorum* who was in charge of the legionary workshops, 'His main responsibility was to ensure that nothing which the army was thought to require should be lacking in camp ...', which implies that the legion (and he was writing of the legions) was capable of producing all the equipment which it needed. Was he correct? After all, he was writing at least a century after the disappearance of the large legions of the early empire. The answer appears to be not completely.

To modern eyes it seems somewhat surprising that the Roman soldier had to buy his own equipment and clothing. The most specific statement on this occurs in Tacitus' *Annals* (I, 17) where he has the leader of a mutiny in AD 14 say that one of their grievances was the fact that out of

their daily pay of 10 *asses* they had to buy their clothing, their weapons and their tents. That this was indeed the case is confirmed by a number of texts from Egypt which record deductions for weapons and clothing (Watson 1969, 103; 220). That it was normal practice with the auxiliaries as well was confirmed by a recently published tablet from Vindolanda which lists the men who had bought spears and clothing and the prices they paid. The inclusion of a table and cloak in this list suggests that the transactions were between the soldiers and a civilian entrepreneur, as the editors suggested, rather than purchases from an official source. But whatever their source the key fact is that the men were paying for their weapons (Bowman, Thomas and Tomlin 2010, 204ff.).

A.m[]tus
Spears, denarius 1, asses 2
Goua[]us
Table (?), denarii 2
Spears, denarius 1
Alb[]us
Spears, denarius 1
Liber
Cloak, denarii 2
Tagomas the vexillarius
Spears, denarius 1
Victor, the huntsman
Spears, denarii 5

If such weapons were the personal property of the soldier one might wonder why so few are marked with any form of identification. Some are, a spearhead from Newstead, for example, has an inscription formed of punched dots which firmly states that it was the property of a cavalryman, one, Trinus (or Trinius), of the troop of Bassus (Curle 1911, 188, fig. 20, pl. xxxvi, 5; Frere and Tomlin 1991, 51, 2427.3). But the answer probably lies in the fact that all spears originally had wooden hafts where a name or identifying mark could have been cut.

Further evidence that soldiers owned their equipment is provided by an Egyptian papyrus of AD 143 which records the refunds for a soldier's equipment, including his share of a tent, which were made to his mother after his death (Bishop and Coulston 2006, 262). The *Lex Julia de vi publica* forbade the carrying of arms by civilians, save for spears which were used for hunting or necessary for self-defence on a journey (*Digest* xlviii, vi, i), and when a soldier retired or died his equipment was probably sold to his fellow soldiers, although it is clear that some of the cavalry were

allowed to retain their elaborate parade armour. Successive ownership of military equipment is shown by the fact that several helmets are known from Britain and elsewhere which bear a series of ownership graffiti (Frere and Tomlin 1991, 44ff., 2425.2 from London; 2425.3 from Verulamium; 2425.6 from Ribchester). To take one example, a cavalry parade helmet from the fort at Newstead has a series of graffiti on its neck-guard (Manning 2005, fig. 12). The longest one reads: *Rufi t(urma) Atinia(na)* '(Property) of Rufus, (former) troop of Atinus'. But there are four others. Three are simply numerals IIII, X, and XII, while the fourth is the beginning of a name, probably originally six letters long, reading IMA... Taken together they suggest that this particular helmet had had at least five owners before it became so dilapidated that it was scrapped (Frere and Tomlin 1991, 46, 2425.4; revised readings by R. S. O. Tomlin and the writer).

In addition to their clothing and weapons, a soldier had a number of tools; including an entrenching tool, the *dolabra*, as well as, at least in some cases, craft tools, and it is clear that some of the tools used at Newstead were the work of civilian smiths for they are stamped with the maker's names. Thus two *dolabrae* bear the names of Atticus and Vindissus, while an axe carries the stamp LGR, the initials of the maker (Frere and Tomlin 1991, 58, 2428.3; 62, 2428.18; 59, 2428.4). This latter also has a punched inscription giving the name of its owner 'The century of Barrus, (property) of Compitalicus'. Tools stamped with the maker's mark are rare in Britain. The relevant section of *The Roman Inscriptions of Britain* (Frere and Tomlin 1991, 58ff.) records, in addition to the Newstead pieces, stamps on three chisels, two leather-worker's awls, two styli and eight knives, the great majority coming from London. No doubt some stamps have been concealed or destroyed by corrosion, but it is clear that most smiths never stamped their products, and the evidence suggests that after the first century AD stamping effectively ceased, at least in Britain. Given this, the absence of maker's marks does not imply that they were not the work of civilian smiths. All in all the evidence which we have indicates that some tools at least were acquired from civilian smiths and owned by the soldiers who used them, but whether this was the norm remains uncertain.

From all of this it would seem that the soldiers, both auxiliary and legionary, bought much of their own equipment, but the various texts make it equally clear that the *fabricae* of both the legions and at least some of the auxiliary units were capable of producing a wide range of equipment. Much of it, such as the carts being made at Vindolanda,

would have been the property of the unit, but other things, for example the work of shoe makers, or of the shield makers Lucius and Crescens, and the probable sword smith, was equipment which one would have thought was of the type which the soldiers would have been expected to buy. Did the troopers at Vindolanda have to buy the work of their fellow soldiers, or did these things fall into the category of equipment which was issued?

One thing which is clear is that even the auxiliary *fabricae* were extremely well equipped. Perhaps the best evidence for this from Britain comes from the fort at Newstead where we find examples of tools used in most of the processes involved in working iron, including the smith's rake, tongs, hammers of various weights, chisels, punches and files (Curle 1911, 285 ff. pl. lxiii). Carpentry, which will have been another major element of the work of the *fabrica*, is equally well represented with axes, chisels, gouges drill bits, saws (Curle 1911, 280 ff., pls lix, lxi, lxviii) and even the blade of a moulding plane, indicating that the carpenters of the fort were producing some relatively sophisticated work (Curle 1911, 281, pl. lix, 2). A similar blade from Vindolanda was found to have a steel edge (Sim and Ridge 2000). Many of these tools are of the highest quality and they are only a tiny fraction of those which must have been used in the fort. Clearly even in auxiliary units we are dealing with skilled specialists.

The use of tools which were produced by civilian smiths has already been discussed but there were probably other areas where specialists working outside the army regularly supplied equipment. The first is the production of chain mail, perhaps not the mail routinely used mainly by the auxiliaries, but the fine chain mail produced both in copper alloy and iron. The production of mail such as that found in the mid first-century fortress at Usk, with rings measuring around 2.5 mm in diameter, must surely have been the work of a specialist (Manning, Price and Webster 1995, 12 ff., pls i & ii). Another specialism may have been the production of the elaborately inlaid scabbards of the first-century legionary daggers (Manning, Price and Webster 1995, 22 ff.). But the most likely of all to be the work of specialist craftsmen are the splendid parade helmets worn by the cavalry (Garbsch 1978). In describing these helmets in the *Ars Tactica* Arrian makes it clear that they were not standard issue:

‘Those of the troopers who are distinguished in rank or are outstanding in horsemanship, come past armed with gilded bronze or iron helmets, so that in this way they draw the gaze of the spectators upon themselves. These helmets do not, like those made for battle protect only the head and the cheeks, but

coincide completely with the faces of the horsemen with openings at the eyes’ (Hyland 1993, 72).

Since they were private property which was not used in battle, such helmets could have been either sold to other troopers, as probably happened with the Newstead helmet referred to above, or retained when the owner retired from the army; a fact which is confirmed by the number which have been found in graves in the province of Thrace (Garbsch 1978; Manning 2005).

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