

‘Fit for the task’: equipment sizes and the transmission of military lore, sixth to tenth centuries

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The interpretation of the measurements given in Byzantine military manuals from the sixth to the tenth centuries has been a problematic matter. If the main conclusions of currently accepted scholarship are applied, an appearance is created of equipment much too large to be usable. When the measurements are compared to equipment which practical experience and comparable history show to be functional, it can be seen that as the middle Byzantine period progressed units of measurement were devalued. The sources also reveal the processes whereby military lore was transmitted, including accidental corruption and deliberate revision.

Weapons are the hand-tools of butchery. But hand-tools they are, and as such there are only certain forms, and, more particularly, only certain sizes, that can be used effectively by the average man. The authors of Roman military manuals were mindful of this fact, and so, often made recommendations as to the characteristics of the troops’ armament. Sometimes those recommendations were quite vague,¹ but elsewhere specific measurements are given. These measurements have posed a problem for modern readers, a problem with ramifications that go beyond the study of arms and armour.

How big?

It has been previously noted that if one applies the conclusions of the standard work on the subject, Erich Schilbach’s *Byzantinische Metrologie*,² there are patently absurd results in certain cases.³ Such results partly ensue from applying Schilbach’s conclusions in a

1 For example, the recommendation of the *Strategikon* of Maurice that bows be ‘suited to the strength of each man, more in fact on the weaker side’, *Strategikon* 1.2: G.T. Dennis (ed.) and E. Gamillscheg (tr.), *Das Strategikon des Maurikios* (Vienna 1981) 78; G.T. Dennis (tr.), *Maurice’s Strategikon* (Philadelphia 1984) 12.

2 E. Schilbach, *Byzantinische Metrologie* (Munich 1970) 19f.

3 E. McGeer (tr.), *Sowing the Dragon’s Teeth* (Washington 1995) 63; T. Dawson, ‘Suntagma Hoplon: equipment of regular Byzantine troops, c.900–c.1204’, in D. Nicolle (ed.), *A Companion to Medieval Arms and Armour* (Woodbridge 2002) 83, n. 20.

simplistic manner, and partly from Schilbach's own understandable aim of producing simple and consistent conclusions from complex and inconsistent sources. The problems are resolvable by the synthesis of some of Schilbach's observations with practical experience and experimentation, and by comparable material.

The crux of the problem concerns the sizes of various pieces of equipment. All the units of measurement most commonly used in the manuals, that is, the 'cubit' (*pekhus*/πῆχυς), the 'span' (*spithamel*/σπιθαμή) and the 'fathom' (*orguia*/ὄργυια), to some degree reveal the same difficulty. The problem is that applying Schilbach's primary conclusions to most of the manuals, especially the later ones, produces in almost every case equipment so large that it would be very difficult, if not impossible, to use.

Shields

Take shields, for example. By the fourth century the infantry *skoutarion* was oval, and by the ninth century it had been further modified into the teardrop shape so familiar from the Bayeux Tapestry. Surviving oval shields found at Dura-Europos ranged from 107–118 cm in length and 92–97 cm in width, with the usual grip in the centre.⁴ The background image of Fig. 1 is a detail of the 'Missorium of Theodosius'. As the two identical overlaid scales show, if one assumes that the man is 180 cm tall, his shield is indeed 109 cm in the long axis and 72 cm across. The sixth-century anonymous treatise *Concerning Strategy* tells us that the front rank infantryman's shield should 'not be less than seven spans in diameter'.⁵ Taking the 'diameter' as the long axis and applying Schilbach's 12 *daktyl* 'royal span' of 23.4 cm produces a height of at least 164 cm. An average modern man would have trouble seeing over a shield that size (Fig. 1, dashed outline A), let alone fighting around its 120 cm breadth! Schilbach's other possibility, the 10 *daktyl* 'common span' of 19.5 cm, is scarcely better — shoulder to ankle, 135 cm (Fig. 1, dashed and dotted outline B). Moving on to the tenth century, while the *Taktika* of Leo the Wise does not specify sizes for shields, the other manual associated with him, *Sylloge Tacticorum*, does, as does the *Praecepta Militaria* attributed to Emperor Nikephoros II Phokas. *Sylloge Tacticorum* says that the 'rectangular' or 'triangular' shields of the *hoplitai* shall be 'as near as possible to six spans'.⁶ Similarly, *Praecepta Militaria* says they should be 'no less than six spans'.⁷ The solid line D and dashed line E on Fig. 2 show the royal and common span conversions respectively, 140 cm and 117 cm, while the background image is a precisely proportioned eleventh- to twelfth-century icon showing a shield just about 90 cm long.⁸ Even with

4 P. Southern and K.R. Dixon, *The Late Roman Army* (London 1996) 99.

5 *Anonymi Peri Strategias* 16: G.T. Dennis (ed. and tr.), *Three Byzantine Military Treatises* (Washington 1985) 52.

6 *Syll. Tact.* 38.1: *Sylloge Tacticorum, quae olim 'inedita Leonis Taktika' dicebatur*, ed. A. Dain (Paris 1938) 59.

7 *Praecepta Militaria* I.28: McGeer, *Sowing the Dragon's Teeth*, 14–15.

8 After A. Bank, *Byzantine Art in the Collections of Soviet Museums* (Leningrad 1985) pl. 147.

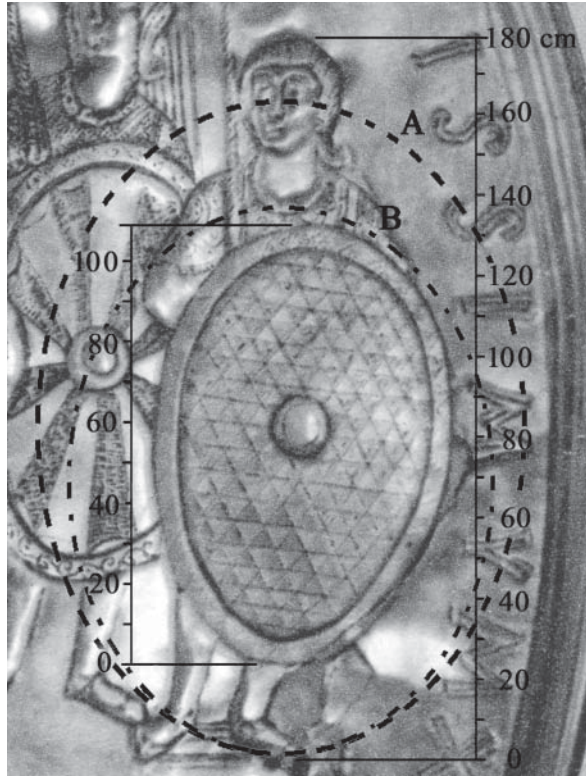


Figure 1 Shield sizes from *Concerning Strategy* overlaid on a guard from the Missorium of Theodosius. A = 7 royal spans of 23.4 cm = 164 cm; B = 7 common spans of 19.5 cm = 137 cm; the guard's shield = 109 cm = 7 dikhai of 15.6 cm

the less obstructive shape (for the user) of the teardrop form, the greatest size is unusable. The lesser is somewhat usable, and, in fact, virtually the same size as the largest of the Dura-Europos shields. A larger shield, however, always trades off defence against offensive effectiveness, so, while we do not know how normal the largest Dura shield was, we do know that the European fashion for kite shields about 120 cm long (but much narrower) in the early twelfth century was short-lived and that shields soon returned to the 90–100 cm range that had prevailed in the eleventh century and were then reduced still further to create the ‘heater’ shield of the thirteenth and fourteenth centuries.

In his passing comments Schilbach offers a solution to this difficulty. He notes that Pediasimos equates the common span with another term, *likhas* (λιχᾶς). Schilbach defines *likhas* as 10 *daktyls* (19.5 cm), but the sources he draws upon give a less clear picture by his own account. There is another unit called *dikhas* (διχᾶς) which is 8 *daktyls* (15.6 cm). Schilbach notes that some sources do equate *likhas* and *dikhas*, and while he chooses to regard this as an error, he does admit that there is a practical foundation for the conflation

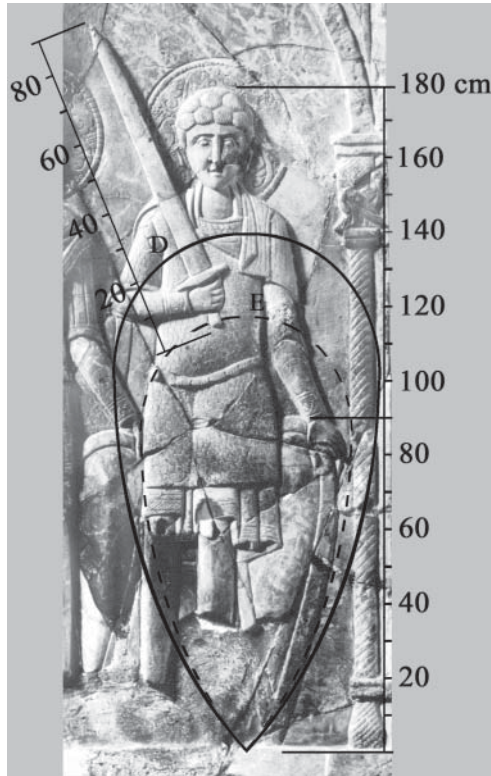


Figure 2 Shield sizes from *Praecepta Militaria* overlaid on an accurately proportioned eleventh- to twelfth-century ivory in the Hermitage Museum, St Petersburg. D = 6 royal spans of 23.4 cm = 140 cm; E = 6 common spans of 19.5 cm = 117 cm; the saint's shield = 90 cm = 6 dikhai of 15.6 cm. The scale shown beside the sword is the same as that beside the saint

of these two units. Therefore the possibility *dikhas* = *likhas* = span must also be considered. Once we do this, we find that the shields described in *Concerning Strategy* are then a much more practical 109 cm, precisely the size of that of Theodosius's guard in Fig. 1 and the smaller Dura-Europos shields, and close to the 94 cm of shields in *Sylloge Tacticorum* and *Praecepta Militaria*.

Teardrop shields are not the only ones shown in middle Byzantine pictorial sources; round shields are quite as prevalent. They are generally depicted as being of modest size — approximately 50 to 80 cm in diameter.⁹ As an alternative to the 'rectangular' or 'triangular' shields of the infantry, *Sylloge Tacticorum* mentions convex round shields three spans in diameter, and 'oblong' shields four spans in diameter for cavalry. Conversion to any of the units under consideration would be functional, with most falling within the range supported by the pictorial sources, and so are less amenable to a specific conclusion as to which unit is being used.

There is another category of foot soldier described in *Praecepta Militaria*, the *menauliatos*, who functioned as 'flying squads'. Sometimes *menauliatoi* were to come to

⁹ For example, the *Khludov Psalter*, f.67r, an ivory casket in the Metropolitan Museum (inv. 17.190.237), the front panel of the Metropolitan Museum Joshua casket (inv. 17.190.137a), and a fresco from the church of the Dormition, Episkopi, now in the Byzantine Museum, Athens, which helpfully shows the inside fittings.



Figure 3 The front two hoplitai of the formation, reinforced in front with a *menauliatos*, braced to resist cavalry. Based upon *Praecepta Militaria*

the forefront of the formation to resist cavalry attack, and at other times they were a reserve force sent to reinforce or support other troops where needed. *Praecepta Militaria* says that the shields of the *menauliatoi* should be smaller than those of the *hoplitai* but does not specify their shape.¹⁰ A round shield in the range indicated by the pictorial sources and *Sylloge Tacticorum* would be highly suitable for the lighter and more flexible role the *menauliatoi* were to perform (see the *menauliatos*, Figs. 3 and 4). Note especially in Fig. 3 how the 76 cm round shield covers the *menauliatos* neatly when the man is braced

Table 1 summarizes these observations with the most plausible figures in bold type

Table 1	<i>spithame</i> = <i>dikbas</i> = 15.6 cm	<i>spithame koine</i> = 19.5 cm	<i>spithame vasilike</i> = 23.4 cm
Concerning Strategy shield: >7 <i>sp.</i>	>109 cm	>136 cm	>164 cm
<i>Syll. Tact.</i> long shield: 6 <i>sp.</i>	94 cm	117 cm	140 cm
<i>Syll. Tact.</i> Infantry round shield: 3 <i>sp.</i> in diameter	47 cm dia.	59 cm dia.	70 cm dia.
<i>Syll. Tact.</i> Cavalry round shield: 4 <i>sp.</i> in diameter	62 cm dia.	78 cm dia.	94 cm dia.
<i>Praec. Mil.</i> shield: >6 <i>sp.</i>	>94 cm	>117 cm	>140 cm
Ouranos, <i>Tactica</i> shield: >6 <i>sp.</i>	>94 cm	>117 cm	>140 cm

10 McGeer, *Sowing the Dragon’s Teeth*, 18–19.



Figure 4 A *menauliatos* in skirmishing mode

to resist cavalry with the butt of the *menaulion* grounded in the manner described for the formation of the *foullkon*,¹¹ whereas a 90 cm teardrop shield would come into contact with the ground.

Swords

It is a curiosity that the manuals discuss swords in much less detail than other equipment. Only the tenth-century *Sylloge Tacticorum* specifies a size — the maximum length of a cavalry *spathion* or *paramerion* shall be ‘4 spans without the handle’.¹² If one applies the ‘royal span’ of 12 *daktyls* to this and adds a handle (~18 cm), the result is 112 cm. There are surviving single-handed swords of such size from this period, but they are quite localized to nomadic peoples of the Caucasus. If one applies the two alternative spans, the figures yielded are overall lengths of 96 cm and 80 cm. These figures bracket the most common size for a single-handed sword, 90 cm, as indicated by both surviving Western examples and Byzantine art, as the background picture to Fig. 2 shows.¹³

11 *Strategikon*, XII A 7, ll. 52–57: Dennis and Gamillscheg, *Strategikon*, 410; Dennis, *Strategikon*, 134.

12 *Syll. Tact*, 39.2: Dain (ed.) 61.

13 Another clear illustration of this is the triumphal portrait of Basil II from the psalter in Saint Mark’s Library in Venice (Z 17, f IIIr) where the emperor is standing with the end of the scabbard of his *spathion* on the ground, and his hand upon the cross-guard with his elbow slightly bent. A sword 93 cm long would make Basil 176 cm tall.

Spears

Spears in the various manuals from the sixth century onwards also share to some extent this problem of conversion. In the earlier manuals, lengths for spears are given in cubits. As with the span and fathom, Schilbach gives two different sizes of the cubit in use from late antiquity and beyond, and once more there is a third possibility for resolving the outstanding difficulties.

The sixth-century manual *Concerning Strategy* does not give a recommended measurement for this piece of equipment, but it does say that the spears of the first four ranks should project out of the front of the formation and that the ranks should be a cubit apart. In this case the antique cubit of 62.46 cm must prevail, for any lesser interval would create a formation too densely packed for the men to fight effectively. Hence, the spear must be no less than 1.9 m in length, and may be conjectured to be no more than 2.6 m long, since any greater length would allow the spears of five ranks to project beyond the front.

In the tenth century, *Sylloge Tacticorum* recommends the Roman spear (*doru*) be 8–10 cubits. This is another case where using the largest version of the unit produces implausible results, 5.0–6.2 m. The bottom end of this range just touches the length of the very longest pikes that are known to have been used in Europe. The later, lesser cubit of 46.8 cm gives lengths of 3.7–4.7 m. Spears of such lengths can be made and used, and we shall see such lengths being recommended by the manuals, so it remains a possibility to be considered in the light of other sources.

In his *Taktika*, Leo the Wise mentions three spears. In discussing the equipment in very general terms, Leo recommends a ‘small spear’ (*kontarion mikron*) of 8 cubits.¹⁴ Neither of Schilbach’s two sizes for the cubit are viable in this context. As just noted, spears of 3.7 and 5 metres are feasible, yet they certainly cannot be said to be ‘small’. Schilbach suggests a solution in noting the confusion that can occur when writing and reading the ligatures employed in manuscripts for *pekheis* and *podes*, or feet.¹⁵ If we conjecture such an error in transmission and correct Leo’s recommendation to 8 feet, we then have a weapon of 2.5 metres, a very serviceable size for skirmishing spears, and in line with what we have seen in *Concerning Strategy*.

The difficulty occurs again with the spear called *menaulion* in *Praecepta Militaria* (and hence the *Taktika* of Ouranos). *Praecepta Militaria* has a lacuna at the point where the specification of the overall length ought to be, but Ouranos says that the length of the *menaulion* shall be 1.5–2 fathoms (*orguiai*).¹⁶ The very fact that Ouranos uses *orguia* in this context is unusual, for it is normally applied to much longer intervals than this. The problems of interpretation of the *orguia* are similar to the span, with Schilbach giving lengths of 187.4 and 210.8 cm.¹⁷ The longer form, 3.2–4.2 metres, is quite impractical as

14 *Taktika* of Leo the Wise, ch. 5, para. 5; MPG 107, col. 717.

15 Schilbach, *Byzantinische Metrologie*, 20.

16 *Taktika* of Nikephoros Ouranos, 56.82–84; McGeer, *Sowing the Dragon’s Teeth*, 92

17 Schilbach, *Byzantinische Metrologie*, 22–3.

a skirmishing weapon. Even the shorter version, 2.8–3.7 metres, is really only just practical as a skirmishing weapon at the lower end of its range. The discussion on the various versions of the span have suggested that in the middle Byzantine period there was a distinct tendency for units of measurement to be shortened and conflated with lesser intervals. This idea leaves open the possibility that the *orguia* meant by Ouranos may actually be the unit that Schilbach calls *diploun vema* (διπλοῦν βῆμα), an interval of 80 *daktyls* or 156.2 cm. This would make the *menaulion* 2.3–3.1 metres, a much more serviceable range for individual skirmishing. We might compare this with the injunctions given by the English author of the late sixteenth century, George Silver. Silver’s martial practice was much more posited on warfare than on the civilian duelling of so many of his contemporaries, and so he discusses not merely swords, but such weapons as the short staff, glaive or half-pike. In order to establish the optimum length for such weapons, he instructs: ‘stand upright, holding your staff upright close by your body with your left hand, reaching with your right hand as high as you can, and then allow to that length a space to set both your hands’.¹⁸ Deeming ‘a space to set both your hands’ to be 50 cm, this instruction produces a weapon of 2.7 metres in overall length for a man of average height (180 cm), and a weapon of great effectiveness and potential dexterity in the experience of the author (and many of his opponents!). The shaft of the *menaulion* in illustrations 3 and 4 is 2.4 metres.

Sylloge Tacticorum states that in addition to an 8 *spithame doru*, the Macedonians of old also used a *sarissa* of not less than 14 cubits. Leo likewise supplements the mention of the ‘small spear’ with the information that the Macedonians and ancient Romans used

Table 2 summarizes the conclusions regarding the shorter spears with the most plausible figures in bold type

Table 2	<i>pekhus</i> = <i>pous</i> = 31.23 cm	<i>pekhus</i> = 24 <i>daktyls</i> = 46.8 cm	<i>pekhus</i> = 32 <i>daktyls</i> = 62.46 cm	<i>orguia</i> = <i>diploun</i> <i>vema</i> = 156.2 cm	<i>orguia</i> = 96 <i>daktyloi</i> = 187.4 cm	<i>orguia</i> = 108 <i>daktyloi</i> = 210.8 cm
Concerning Strategy				1.9–2.5 m		
<i>Syll. Tact.</i> <i>doru</i> : 8–10 <i>pekheis</i>	2.5–3.1 m	3.7–4.7 m	5.0–6.2 m			
Leo, <i>Tact.</i> short <i>kontarion</i> : 8 <i>pekheis</i>	2.5 m	3.7 m	5.0 m			
Ouranos, <i>Tact.</i> <i>menaulion</i> : 1.5–2 <i>orguiai</i> .				2.3–3.1 m	2.8–3.7 m	3.2–4.2 m

a *kontarion* of 16 cubits, and later recommends that the *peltasts* have a spear of 14 to 16 cubits in length. These figures unquestionably reflect the implausibility of the length being in the older cubits as defined by Schilbach, for they would equate to staves of 7.5–10 metres long, which is quite impossible. Yet, again, if we take it that feet were actually meant, the result is weapons of 4.4–5 metres — viable for a pike used in a static phalanx. And, just as the anonymous author of *Concerning Strategy* and Leo say, the ancient infantry *sarissa* of the Macedonians does seem to fall within this range.¹⁹

A little later in the tenth century, *Praecepta Militaria* states that the *kontarion* of the infantryman (*hoplite*) should be between 25 and 30 spans. Schilbach’s royal and common spans produce from this the impossible sizes of 5.9–7.0 metres and 4.9–5.9 metres respectively. Should one apply the *dikhas* = span conversion, the result is a weapon of 3.9–4.8 m. This is then a more functional size, overlapping with the range of Leo’s *peltast kontarion*, as well as with later European pikes used in a similar square formation to that described in *Praecepta Militaria*. The two standing soldiers in Fig. 3 are equipped with *kontaria* precisely 4 m long in the shaft plus their points. The *Taktika* of general Nikephoros Ouranos, compiled partly from the *Taktika* of Leo the Wise but more from *Praecepta Militaria*, carries over the size of the *hoplite kontarion* unchanged from the latter source.

Praecepta Militaria asserts that the head (*skhipharion*/σκιφάριον) of a *menaulion* should be 2–2.5 spans. Our source seems to imply that these are to be somewhat more substantial than the *kontarion* heads, which are only to be ‘fit for the task’. As royal spans

Table 3 sets out the results for the longer spears, with the most plausible figures in bold type

Table 3	<i>Pekhus</i> = <i>pous</i> = 31.23 cm	<i>Pekhus</i> = 24 <i>daktyls</i> = 46.8 cm	<i>Pekhus</i> = 32 <i>daktyls</i> = 62.46 cm	<i>Spithame</i> = <i>dikhas</i> = 15.6 cm	<i>Spithame</i> <i>koine</i> = 19.5 cm	<i>Spithame</i> <i>vasilike</i> = 23.4 cm
<i>Syll. Tact.</i>	4.4 m	6.6 m	8.7 m			
Macedonian <i>sarissa</i> : 14 <i>pekheis</i>						
Leo, <i>Tact.</i>	5.0 m	7.5 m	10 m			
old <i>kontarion</i> : 16 <i>pekheis</i>						
Leo, <i>Tact.</i>	4.4–5.0 m	6.6–7.5 m	8.7–10 m			
<i>peltast kontarion</i> : 14–16 <i>pekheis</i>						
<i>Praec.</i>				3.9–4.8 m	4.9–5.8 m	5.9–7 m
<i>Mil kontarion</i> : 25–30 <i>sp.</i>						
Ouranos, <i>Tact.</i>				3.9–4.8 m	4.9–5.8 m	5.9–7 m
<i>kontarion</i> : 25–30 <i>spithamai</i>						

19 P. Connolly, ‘Experiments with the *sarissa* — the Macedonian pike and cavalry lance — a functional view’, *Journal of Roman Military Equipment Studies* 11 (2000) 103–6.

these would equal 47–58 cm. This is, admittedly, possible, for spear-like heads of such sizes are seen on pole-arms in later medieval European use, but rather larger than the norm for anything known to be middle Byzantine. A 10 *daktyl* conversion equals 39–49 cm, which is still rather large. It also seems unlikely that the author of a newly drafted text, as *Praecepta Militaria* appears to be, would mix his units, so if the observation made in respect of the shield and *kontarion* holds, one will apply an 8 *daktyl* (15.6 cm) conversion, giving 31–39 cm. Such a size would be well supported by archaeological evidence, for some of the spear heads recovered from the early eleventh-century Serçe Limani shipwreck had blades ranging from 25–30 cm in length, which would make them *kontarion* heads, slightly smaller than *menaulion* heads. Figs. 3 and 4 show a *menaulion* with a 32 cm blade mounted on an entire sapling as *Praecepta Militaria* recommends.

Ouranos states that the *menaulion* blade shall be 1.5–2 spans.²⁰ This is a notable departure from the compiler’s practice of simply carrying over figures from his earlier models. Ouranos’s intention here is hard to discern. He probably simply decided that the rather large blade in *Praecepta Militaria* was unnecessary, and scaled it down. That course would keep his use of the *dikhas* sized *spithame* consistent with the majority of other items he mentions. It would also produce a spearhead of identical proportions to those found in the Serçe Limani shipwreck.

Table 4 sets out the results for the *menaulion* blade, with the most plausible figures in bold type

Table 4	<i>spithame</i> = <i>dikhas</i> = 15.6 cm	<i>spithame koine</i> = 19.5 cm	<i>spithame vasilike</i> = 23.4 cm
<i>Praec. Mil. menaulion</i> blade: 2–2.5 <i>spithamai</i>	31–39 cm	39–49 cm	47–58 cm
Ouranos, <i>Tact. menaulion</i> blade: 1.5–2 <i>spithamai</i>	23–31 cm	29–39 cm	35–47 cm

Implications

These conclusions shed considerable light on the formations and tactics described in the sources, and on the continuity of lore and practice in the Eastern Roman army.

Let us first consider the use of the *menaulion* in isolation. In attempting to fill the lacuna in *Praecepta Militaria*, Michael Anastasiadis concluded that this weapon was a type of javelin, and the same as the third leg of a tripod defence devised to surround encampments by an earlier General Nikephoros, that was to be 5 or 6 spans.²¹ In this he

²⁰ *Taktika* of Nikephoros Ouranos, 56.84–82: McGeer, *Sowing the Dragon’s Teeth*, 93.

²¹ Leo, *Taktika*, XI.26 (MPG 107, col. 800): M P. Anastasiadis, ‘On handling the *menaulion*’, *BMGS* 18 (1994) 7–8.

omitted a crucial part of the Greek. It is stated clearly in Leo’s description that the third leg is not itself a *menaulion*, but it is τᾶξιτιν μεναύλου — ‘arranged like a *menaulion*’. If length is not the correlation, then what is? The ‘arrangement’ is the key, for it refers to the similarity of the way the two items are deployed, with the butt braced against the ground and the point raised to strike the attacker. This tactic is entirely familiar in very similar Renaissance and early modern military formations, and in the comparable practice of boar hunting, and, as noted above, is described in the *Strategikon*. The practice must have been the same in the tenth century for the simplest practical reasons. If the *menauliatos* were to hold his weapon in the manner of an ordinary spear when confronting a cavalry charge, the advantage of a heavy head and shaft would vanish. In that case, the resistance to impact is merely his own body weight, which is no match for the weight and impetus of a charging horse (perhaps armoured) and rider. Having the butt braced against the ground is the only viable counter to a frontal cavalry attack.

The *menauliatoi* were sent to assist other troops where needed, as in support of slingers and archers clearing enemy skirmishers from broken ground. Anastasiadis believes this to support the suggestion that the *menaulion* was something like a javelin. In the first place, even had the *menaulion* been as short as he proposes, its weight alone would make it impossible to throw for any distance, or with any accuracy. In fact, Anastasiadis misconceives the tactical expediency of the situation. The presence of the *menauliatoi* is not as a superfluous third type of projectile troop, but to fend off any attempt by the enemy soldiers to disperse the lightly armoured and lightly armed projectile men by direct assault. This does show that the *menaulion* could also be used in a manner like a *kontarion*, that is as a thrusting weapon, but with greater flexibility because of its shorter length (see Fig. 4).

As noted above, a primary case of their reinforcing function was for the *menauliatoi* to be dispatched to the front of a phalanx when cavalry attack was anticipated, or when one had taken place and the *kontaria* of the *hoplitai* had proven inadequate to fending off the assault.²² The *taxiarchy* of *Praecepta Militaria* is calculated to form 100 files of two *hoplites*, three light troops and again two *hoplites*, and each *taxiarchy* was to have 100 *menauliatoi*. Hence, in theory, the *menauliatoi* could cover the full frontage of the formation. When this was done, the difference in length between the two weapons produces a line of points, with those of the foremost *kontaria* being approximately in line with the points of the *menaulia* as shown in Fig. 3. As noted above, the *menaulion* would be used with its butt grounded, because this is the only successful method for breaking the impact of a mounted charge. This is an optimal arrangement for engaging an attacking force. The heavy, robust *menaulia* solidly braced will break the impetus of the attackers, either by impaling the horses of cavalry, or perhaps by lodging in and immobilizing the shields of infantry. The *kontaria* can then engage to inflict further wounds and fatalities.

I fully accept Eric McGeer’s argument that the composition of the *Taktika* of Nikephoros Ouranos was a considered affair in which older sources which he deemed still

22 *Praecepta Militaria*, I.114–119: McGeer, *Sowing the Dragon’s Teeth*, 18–19.

relevant were supplemented by Ouranos' own practical experience,²³ yet the treatment of the *menaulion* when he does not simply carry over figures from an earlier source may shed further light upon how that document was prepared. Past scholars have recognized that even when an emperor had direct involvement with the creation of a text that appears in his name (and when it is not simply attributed to him out of respect) he is rarely likely to have actually done any of the *physical* labour in creating the work. Rather, he commonly functioned as 'supervising editor'.²⁴ This might well also be the case with a highly placed and busy general such as Nikephoros Ouranos, and this volume suggests that it was in fact so. Ouranos evidently designated which portions of the *Taktika* of Leo the Wise and the *Praecepta Militaria* of Nikephoros Phokas he wanted to incorporate into his own work, and scribes then took over the task of paraphrasing the texts, copying the measurements given verbatim. Had the general been more immediately involved, he would surely have made some effort to make his mensural practice consistent. Coming to the *menaulion* in *Praecepta Militaria*, the redactor found the very same lacuna as appears in the versions that have come down to us, and consulted his master. This brought Phokas' preferences more acutely to Ouranos' attention, and, in addition to supplying a length for the *menaulion*, using fathom rather than the span of the other texts, the general revised Phokas' figure for the *menaulion* head. Whether he did this to bring it into line with the (perhaps) more usual 10 *daktyl* common span, thereby preserving the length, or to make the head less extravagantly large, is impossible to say with complete certainty, but the latter seems more likely.

Applying practical parameters to the measurements given in military manuals from the sixth to tenth centuries, and correlating the results against more conventional historical evidence reveals several important observations. On the one hand, it shows that there was a high degree of functional continuity in military practice from late antiquity to the middle Byzantine era, employing multi-layered formations using both long pikes and shorter spears in co-ordination. On the other hand, it extends the work of Schilbach by suggesting that there was a more widespread tendency for deflation in a number of units of measurement across the same period than he has noted. Finally, the comparison of these revised figures to pictorial sources incidentally shows that at times there can be a remarkably high degree of realism in Byzantine art.

23 E. McGeer, 'Tradition and reality in the *Taktika* of Nikephoros Ouranos', *DOP* 45 (1991) 129–39.

24 Dennis, *Strategicon*, p. XVII; A. Toynbee, *Constantine Porphyrogenitus and His World* (London 1973) 575; Constantine Porphyrogenitus, *De Administrando Imperio*, ed. G. Moravcsik and tr. R.J.H. Jenkins (Washington 1967) 10.