

<sup>12</sup> W. C. Lukis, 'On some Anglo-Saxon graves on Howe Hill, near Carthorpe, in the parish of Burneston, North Riding of Yorkshire', *Yorkshire Archaeol. J.*, 1 (1870), 180, figs 10, 11; H. Shetelig (ed.), *Viking antiquities in Great Britain and Ireland*, IV (Oslo, 1940), 15, fig. 4.

<sup>13</sup> Wilson, *op. cit.* in note 7, 50 and Appendix A.

<sup>14</sup> J. Dent, 'Skerne', *Current Archaeol.*, 91 (Vol. VIII, No. 8, March 1984), 251–53.

<sup>15</sup> Wilson, *op. cit.* in note 7, 51. It is worth noting that the report by the British Museum Conservation Department records that the Gilling sword arrived with a ten degree bend about half way down the blade, which was straightened as part of the restoration work. This bend was interpreted by the Conservation Department as fairly recent because of the new corrosion in the area of the bend, so, like the other swords discussed by Wilson, the Gilling West sword would seem not to have been ritually 'killed'.

## THE METROLOGY OF ANGLO-SAXON CRICKLADE<sup>1</sup> (Fig. 6)

In a recent analysis of three late Saxon planned towns (Winchester, London and Colchester), P. Crummy has argued for the ubiquitous use of a module of four poles (in standard measurement  $16.5 \text{ ft} \times 4 = 66 \text{ ft}$ ) in the planning of street grids.<sup>2</sup> This hypothesis is tested here by a metrological analysis of Cricklade (Wiltshire), a new Saxon burh probably of late 9th-century origin which was laid out without having to be accommodated to pre-existing Roman defences or other features. The only major constraints on its siting and layout were the limits of the flood plain of the R. Thames on the N. and E. sides, defined now by the 80 m O.D. contour.

From the results of excavations by the writer on the SW. corner of the defences<sup>3</sup> it can be inferred that an intra-mural walkway or wall street was the first structural element to be set out on the ground. The relative positions of other elements of the defensive system can also be reconstructed (albeit with some degree of reinterpretation) from evidence of a series of excavations on the defences since 1948.<sup>4</sup> These also demonstrate the presence of the walkway on all four sides of the defences. From this it is possible to draw a detailed plan of the Saxon defences to a degree of accuracy of about 10 ft (3 m) in 1500 ft (457 m), or about 0.7%.<sup>5</sup> The primacy of the intra-mural walkway implies that it would have provided the physical framework around and in relation to which other elements in the layout of the burh were set out on the ground, since the construction of the bank would have made measurement from the fronting palisade to internal features difficult. It would also be expected that it would have been planned in accordance with a basic modular measurement.

Measurements taken between the external corners of the walkway (i.e. those nearest to the bank) establish, firstly, that the walkway was planned, and for the most part laid out, as an almost perfect square (ABCD in Fig. 6: note that D is a notional point placed on the line of the S. defences at the fourth corner of the square figure whose other three corners are points A, B and C); and secondly, that the sides of this square are 96 poles in length, to an accuracy of between 0.06 and 0.7% (for measurements, see Table). The significance of the figure 96 is that it is divisible by the numbers 2, 3, 4, 6, 8, 12, 16, 24, 32, and 48, and is six times the 16-pole module which Crummy has detected in the layout of other burhs. Furthermore, the length of the diagonal A–D on the ground is exactly the length of the hypotenuse (2,240 ft) of a theoretical right-angled triangle with two sides of 96 poles (1,584 ft) in length, to which the length A–C very nearly conforms (C–D being a notional length), while the diagonal BC is only 24 ft (1.07%) longer. The only major irregularity in the square is that the line of the southern defences extends eastwards to E from the corner of the square at D by about 126 ft, or nearly eight poles (132 ft). This must have been with the intention that the E. side of the defences should be placed as near as possible to the edge of the flood plain of the river. The W. side is the straightest; the alignments of the others, while conforming at least at their corners to the square, appear to have been influenced to a certain extent by the configuration of low ground outside the enclosed area.

The 96-pole module creates further regularities in the overall dimensions of the defended enceinte. In the first place, the width of the bank between the outer edge of the added wall and the outer edge of the intra-mural walkway (nearest to the bank) is on average a little over two poles in width.<sup>6</sup> A notional two-pole width for the bank would make each side of the facing

rampart or wall exactly 100 poles in length. This is  $2\frac{1}{2}$  furlongs, giving a total length for the square of 10 furlongs (though the actual length is greater owing to the increase in length of the southern defences). In the second place, the distance between the outer edge of the intramural walkway and the outer edge of the outer ditch, observed in excavation on the SW. corner in 1975, was 134 ft, or very nearly 8 poles (132 ft), a distance mirrored in the centre of the W. side.<sup>7</sup> On two sides of the defences a line of stones appears to have marked the inner edge of a zone around the inner perimeter of the defences, which was arguably intended to enable free movement for military purposes.<sup>8</sup> This zone was very nearly one pole in width,<sup>9</sup> and has parallels with zones of similar dimensions kept free around the inside of the defences of other burhs of similar dimensions.<sup>10</sup>

Further regularities can be recognised in the positions of the main streets and gates. The centres of the present streets passing through the northern and southern defences lie nearly at the centre points of the lengths of the defences (A-F + F-B = 48 + 48 poles; C-H + H-E = 52 + 52 poles). The original line of the street at the N. gate can probably be established by its relation to a chapel of Saxon origin on its western side;<sup>11</sup> the street passing through the S. gate has probably not shifted, since the road heads straight southwards from this point. The two Saxon gateways are likely therefore to have been under the present streets. This implies that both the gates and the main N.-S. street were laid out in relation to the sides of the defences after the positions of their corners had been established, rather than in relation to the initial 96-pole square. The centre of the eastern side of the defended enclosure is however 20 ft south of the modern street passing through it. Given the regularities noted above, it is therefore probable that this street has shifted northwards by some 20 ft from its original position in the Saxon period, possibly because of a tendency to become aligned with the north-easterly direction of the road outside the gate (not shown in Fig. 6) after the disuse of the defences in the medieval period. By contrast, however, the centre of the western street (Q) is 370 ft (22 poles and 7 ft) north of the SW. corner (C). That this does not fit with any regular module provides some validation of the hypothesis advanced independently that the Saxon defences incorporated at this point an earlier street leading to a middle Saxon settlement around the church.<sup>12</sup>

The pattern of streets on the eastern side of the main N.-S. street also shows some regularity,<sup>13</sup> although their original lines are in part a reconstruction based on other topographical factors.<sup>14</sup> The centre point, K, on a line between points F and H (the N. and S. gates) is 860 ft from point F (52 poles, or 48 poles [half of 96] + 4 poles, to within 2 ft).<sup>15</sup> From point K to point M is about 198 ft (12 poles), from M to N is 265 ft (16 poles = 264 ft) and from N to G is 388 ft (24 poles = 396 ft).

### Conclusions

There are several inferences which can be drawn from these measurements. Firstly, the use of the mathematical sequence 2-4-8-16, etc., seems to have been accepted as the basis for surveying calculations of the period in southern England. Secondly, as is already apparent from the close approximation of the *Burghal Hidage* figures to the actual measurements of Saxon defences,<sup>16</sup> the pole of 16.5 ft, as well as the 4-pole unit of 66 ft, was used as a standard measurement in the late Saxon period. Thirdly, the laying out of a 96-pole (1,584 ft) square on the ground to within an accuracy of less than 0.7% error in the dimensions of its sides, and of only 1% error in one of its diagonals, must be recognized as being a considerable feat of practical surveying. Its use implies the ability to survey both right angles and possibly also angles of 45 degrees, and to set out isosceles triangles on the ground over distances of 2,265 ft or more. This technical sophistication provides grounds for postulating the existence in the later 9th century of a group of specialist surveyors, attached probably to the king's court, whose duty it would have been to provide the expertise necessary both to plan and to lay out the burhs on the ground.

The lengths of the defences established by measurement (Fig. 6) can be compared to those given by the *Burghal Hidage*. The length around the outer edge of the bank at Cricklade

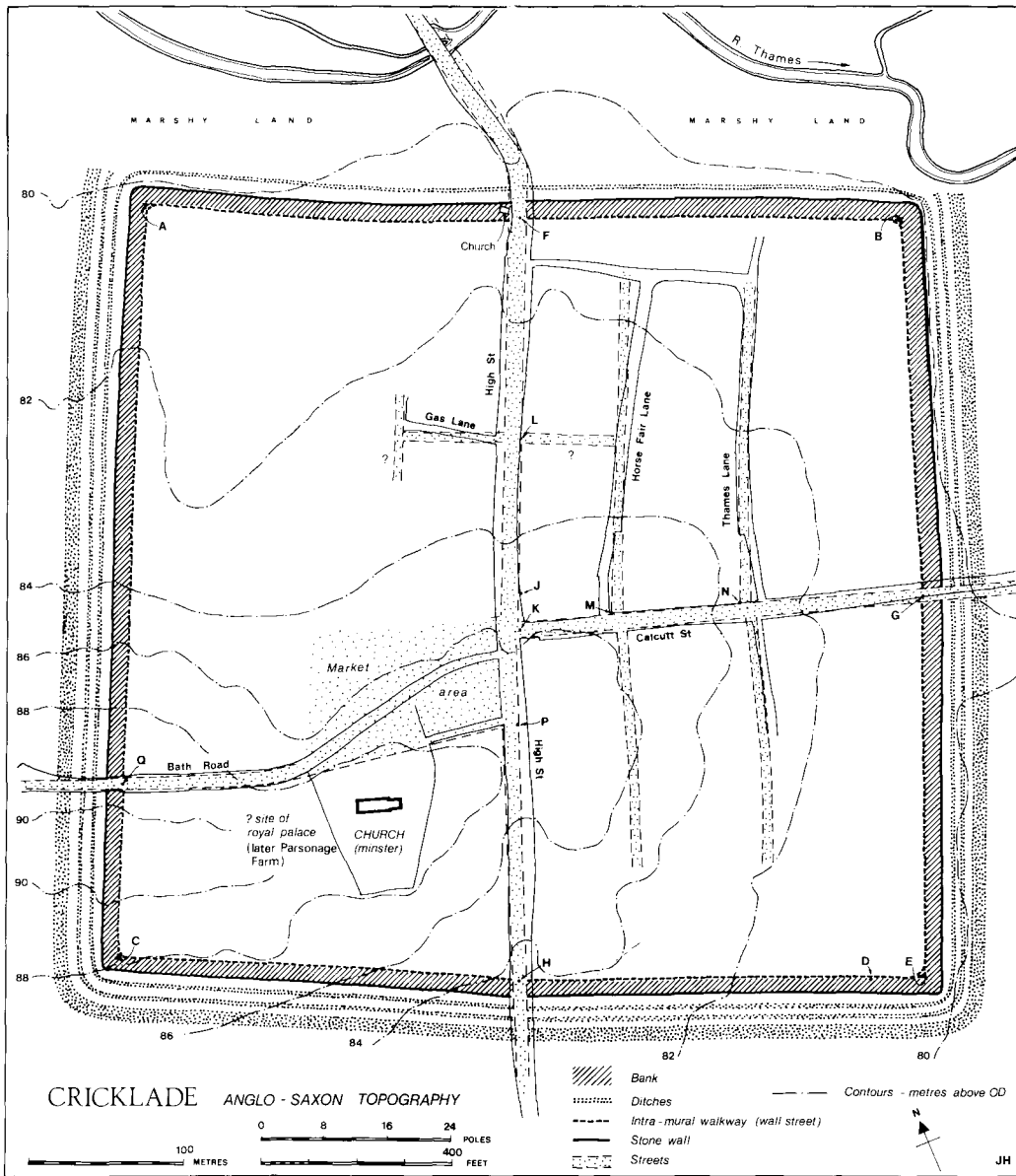


FIG. 6  
CRICKLADE, WILTS.

Cricklade, Wiltshire: Anglo-Saxon topography. Plan of Saxon defences and probable line of Saxon streets and other features.

Points A, B, C, — External corners of intra-mural walkway — NW., NE., and SW. corners respectively; D — notional point on outer edge of walkway located 96 poles (1,584 ft) east of C; E — external corner of intra-mural walkway (SE. corner); F — centre point between A and B; G — centre point between B and E; H — centre point between C and E (F, G and H placed on line of outer edge of walkway); J — centre of straight line F—H; K — centre of E. end of Calcutt St; L — point on line F—H opposite N. side of Gas Lane; M — W. side of Horse Fair Lane (probable original position); N — W. side of Thames Lane (probable original position); P — S. side of lane N. of church yard; Q — centre of street (Bath Road) probably leading through W. gate

is 2,235 yards (6,705 ft), and 2,159 yards (6,478 ft) around the inner edge (the outer edge of the intra-mural walkway).<sup>17</sup> On the formula appended to the *Burghal Hidage* this last figure would have required men from 1,572.6 hides to garrison the defences. However, the basic 96-pole square would have required men from only 1,536 hides. This is sufficiently close to one of the *Burghal Hidage* figures of 1,500 hides as to suggest that this figure, rather than the alternative figure of 1,400 hides, was the original.<sup>18</sup> This is further supported by the Wiltshire assessment of 4,800 hides given in the later *County Hidage*,<sup>19</sup> which appears to be the sum of the figures for the four Wiltshire burhs — Malmesbury (1,200 hides), Wilton (1,400 hides), Chisbury (700 hides) and Cricklade (1,500 hides).

These considerations raise the question as to whether the *Burghal Hidage* figures of the hidages appended to each burh were worked out as being the nearest 'round number' equivalent to the 'ideal' modular arrangement on the ground, or whether the modules by which burhs were planned were worked out to fit a pre-determined hidage required by wider considerations of administrative geography. This is however a matter for more general discussion.

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#### NOTES

<sup>1</sup> I am grateful to Philip Crummy and the Editor for comments on earlier drafts of this article.

<sup>2</sup> P. Crummy, 'The system of measurement used in town planning from the ninth to the thirteenth centuries', *Anglo-Saxon Studies in Archaeology and History* (Oxford, Brit. Archaeol. Rep. Brit. Ser. 72, 1979), 149-64.

<sup>3</sup> Summarized in J. Haslam, 'The towns of Wiltshire', in J. Haslam (ed.), *Anglo-Saxon Towns in Southern England* (Chichester, 1984), 107-10. See also the forthcoming excavation report (J. Haslam, 'Excavations on the defences of Cricklade, Wilts., 1975', *Wiltshire Archaeol. Mag.*, forthcoming).

<sup>4</sup> Excavations prior to 1963 have been described by C. A. R. Radford, 'Excavations at Cricklade, 1948-63', *Wiltshire Archaeol. Mag.*, 67 (1972), 61-110. Many of Radford's interpretations have however had to be reassessed as a result of the writer's excavations on the SW. corner of the defences in 1975.

<sup>5</sup> This is a subjective estimate, but allows for inaccuracies in Wainwright's plotting of his trenches (on a 1:1250 plan of the town; original in Cricklade museum), changes in the dimensions of paper plans due to changes in the weather, and other inevitable inaccuracies of measurement on such a relatively small-scale plan.

<sup>6</sup> The ranges for variation in width of the bank in different areas are as follows:

NW. corner — 32-37.5 ft (9.7-11.4 m) — 5 measurements; NE. corner — 39.5-43 ft (12.0-13.1 m) — 3 measurements; SE. corner — 32.5-34.5 ft (9.9-10.5 m) — 3 measurements; SW. corner — 26.5-33 ft (8.0-10.0 m) — 3 measurements.

<sup>7</sup> In Knocker's trench K1 — see fig. 10 in Radford, *op. cit.* in note 4, 86. That this is the equivalent feature to that in the SW. corner is argued in the forthcoming excavation report. The postulation of the existence of this ditch elsewhere is an inference from these two observations.

<sup>8</sup> Haslam, *op. cit.* in note 6, 109.

<sup>9</sup> Section WI, 15 ft; section WIII (E.-W.), 16 ft.

<sup>10</sup> For Exeter see C. G. Henderson, 'Paul St. excavations — late Saxon intra-mural lane', *Archaeology in Exeter 1983-84* (Exeter Museum, 1984), 12-13. For Oxford, Canterbury and Winchester see M. Biddle (ed.), *Winchester in the Early Middle Ages* (Oxford, 1976), 279 and n. 4 and refs there. For London see P. E. Jones, 'The Estates of the Corporation of London', *Guildhall Miscellany*, 7 (1956), 3-16. Two such strips of land at London, one inside and one outside the walls, were each about 16 feet or 1 pole in width.

<sup>11</sup> T. R. Thomson and H. M. Taylor, 'St Mary's church Cricklade, pt. II', *Wiltshire Archaeol. Mag.*, 61 (1966), 38-42; J. Haslam, 'A ward of the burh of Cricklade', *Wiltshire Archaeol. Mag.*, 76 (1981), 77-81.

<sup>12</sup> For further discussion of this, see Haslam, *op. cit.* in note 3. The assumption that there was a W. gate in the centre of the western defences has been repeatedly made (C. A. R. Radford, *op. cit.* in note 4, 88-89; T. R. Thomson, 'Early medieval Cricklade', *Bull. Cricklade Hist. Soc.*, II, no. 3 (1978), 28-34, esp. 31).

<sup>13</sup> Radford, *op. cit.* in note 4, p. 102-03; M. Biddle and D. Hill, 'Late Saxon planned towns', *Antiq. J.*, 51 (1971), 70-85.

<sup>14</sup> For further discussion, see Haslam, *op. cit.* in note 3.

<sup>15</sup> The two halves of the Saxon main N.-S. street probably diverged from this straight line to meet a little to the west at the postulated market area north of the church. Point K therefore probably represents the line of the eastern frontage of the High Street. This serves to emphasize the regularity of the positions of the N. and S. gates.

<sup>16</sup> M. Biddle, 'The towns' in D. M. Wilson (ed.), *The Archaeology of Anglo-Saxon England* (London, 1976), 99-150, at 129-30.

<sup>17</sup> Radford however gives a total length of the defences of 2,280 yards (6,840 ft) around the outer edge of the bank (*op. cit.* in note 4, 100).

<sup>18</sup> Documented variations are tabulated in D. Hill, 'The Burghal Hidage: The establishment of a text', *Medieval Archaeol.*, 13 (1969), 84-92.

<sup>19</sup> R. R. Darlington, 'Anglo-Saxon Wiltshire', in *V.C.H. (Wiltshire)*, 2, 1-34.

TABLE  
Measurements

line	feet	metres	poles
A-B	1595	486.2	96(+ 11 ft)
A-C	1585	483.1	96 (+ 1 ft)
C-D	1584	482.8	96 (notional length)
B-D	1585	483.1	96 (+ 1 ft)
B-E	1590	484.6	96 (+ 6 ft)
B-G	795	242.1	48 (+ 3 ft)
C-E	1712	521.8	104 (less 4 ft)
D-E	126	39	8 (less 6 ft)
F-K	860	262.1	52 (+ 2 ft)
F-L	460	140.2	28 (less 2 ft)
K-M	200	61	12 (+ 2 ft)
M-N	265	80.8	16 (+ 1 ft)
N-G	388	118.3	24 (less 1/2 pole)
J-P	200	61	12 (+ 2 ft)
C-Q	370	112.8	22 (+ 7 ft)
A-D	2240	682.8	(135.75)
B-C	2264	690.1	(137.2)

### IRON SPEARHEAD AND JAVELIN FROM FOUR CROSSES, LLAN-DYSILIO, POWYS (Fig. 7)

An iron spearhead and javelin were found in 1984 during excavation by the Clwyd-Powys Archaeological Trust of a pair of probably prehistoric ring-ditches near the Welsh border at Four Crosses, Llandysilio, Powys.<sup>1</sup> The site lies near the confluence of the Vyrnwy and Severn, just 100 metres to the English side of Offa's Dyke. The weapons are now in the National Museum of Wales, Cardiff.<sup>2</sup>

The weapons were both still serviceable when deposited, probably complete with their wooden shafts. Although the precise nature of their deposition is uncertain, it is likely that it was deliberate and associated in some way with a series of poorly-dated inhumation graves on the opposite side of the ring-ditch (Graves 2-6). Some of these were aligned E. to W., like those in a small cemetery of possibly Early Christian date attached to the neighbouring upland Bronze-Age barrows at Trelystan.<sup>3</sup> The spear and javelin lay side by side, about 0.1 m apart, in the upper filling on the N. side of the larger ring-ditch. They were at an angle of about 15° from the horizontal, sockets uppermost, and points towards the east. About half their length fell within the upper humic filling of the ditch (layer 2), and the lower half within a more gravelly secondary filling (layer 3), as though they had been thrust right into the ground. There were no indications of an accompanying burial or of other associated finds, but they could have been in an inhumation burial which eluded detection, as the graves were in acidic soil and little bone survived. Alternatively, they may have been hidden for some reason in the overgrown barrow ditch, and never retrieved. The upper humic layer of ditch fill produced numerous 2nd-/4th-century pottery sherds<sup>4</sup> and these provide a reasonably secure *terminus ante quem* for the stabilized secondary filling of the ditch.