Counter Arguments and Numerical Patterns in Early Celtic Inscriptions: A Re-examination of *Christian Celts: Messages and Images*

By HELEN McKEE *and* JAMES McKEE

WE present an analysis of Professor Charles Thomas's recent work on the inscribed stones of western Britain, with our emphasis being on the mathematical patterns which he has identified. We conclude that there is no reason to suppose that these are anything other than coincidences, although of course one cannot preclude the possibility that any particular numerical device might have been intentional.

Just occasionally . . . something unsuspected and unknown may turn up; when that happens it can demand a speedy account in print of all the known details, and (a harder need) the willing abandonment of notions that, however long cherished and defended, can be exposed as erroneous.[1]

Professor Charles Thomas's recent book *Christian Celts: Messages and Images* represents this 'speedy account in print' of a radically new interpretation of the early inscribed stones of Britain. Briefly, this new interpretation involves the identification, in many of the inscriptions, of what is now known as the 'Biblical style'. This compositional mode (whose modern name derives from its original use in the Hebrew Bible) was first identified and described by Professor David Howlett. He inferred ten principal 'rules of Biblical style' (based on parallelism and chiasmus), in addition to five 'adjuncts', of which the first three involve mathematics, the fourth rhythm, and the fifth the physical layout and decoration of the manuscript text.[2]

Although Thomas does identify chiasmus, parallelism, and various rhythmical features in the British inscriptions, it is the mathematical element which looms largest in his discussion: for example, a mathematical analysis of the very first Celtic inscription mentioned in his book (that at Llanerfyl in Powys, commemorating a girl called *Rostece*)[3] produces numerous instances of multiples of thirteen —

[1] C. Thomas, *Christian Celts: Messages and Images* (Stroud, 1998), 20–1.
[2] D. R. Howlett, *The Celtic Latin Tradition of Biblical Style* (Dublin, 1995), 1–54.
[3] This inscription is number 294 in V. E. Nash-Williams, *The Early Christian Monuments of Wales* (Cardiff, 1950).

the age of Rostece at her death — as well as square numbers, a triangular number,[4] and extreme ratio (the golden section).[5]

In addition, Thomas finds much of interest in the physical layout of the inscriptions. Sometimes, particular letter-forms may be shown to be potentially significant: for instance, the **A**s reminiscent of asses' ears in the allegedly scurrilous *Catamanus*.[6] On one occasion, an inscription appears to contain an infixed *display profile* of the person commemorated, a profile produced by drawing a line through important letters.[7] More often, however, *devised profiles* — of the person commemorated, of his or her grave, or of another relevant image — may be generated by rearranging the text in a grid.[8]

The implications of Thomas's work for our understanding of cultural life in sub-Roman and early medieval Britain are considerable. In this article, we shall avoid most of his questions of historical interpretation — which are viewed in some quarters as controversial[9] — and shall instead attempt to examine his theories from two fairly practical directions. First, we shall attempt to establish whether the creation of an inscription in the 'Biblical style' would have been practical at this period, based on our current knowledge of how these inscriptions were produced. A relevant field of enquiry here is the evidence for interest in cryptographic texts and the like in medieval Celtic society. Secondly, we shall look at the inscriptions from the point of view of a mathematician, in search of evidence that might substantiate some of the claims in *Christian Celts* that the inscriptions display numerical infixing. One aspect of the 'Biblical style' which appears with great frequency here is the use of 'letters as numbers' ('LaN' for short). Following Howlett, Thomas has been able to extract significant numbers from inscriptions in various ways — by counting lines, words, letters, syllables, the proper names in the text, the feet, and so on[10] — but his most fertile source has been 'letters as numbers', a method of assigning numbers to letters according to their position in the alphabet (it is first attested in Hebrew, where it is known as *gematria*). For example, **A** equals 1, **B** equals 2, **C** equals 3, and so forth. The numerical values of letters later in the alphabet may vary depending on whether an author was using '20-letter LaN' (from a twenty-letter Latin alphabet, pre-dating the introduction of **K**, **Y** and **Z**) or '23-letter LaN'.[11] It is worth noting that LaN occupies a relatively minor place in Howlett's work; in Thomas's analysis of the 'Christian Celtic' inscriptions, however, it is the most frequently cited mathematical feature.

[4] The nth triangular number is $n(n+1)/2$. See further note 32 below.

[5] Thomas, op. cit. in note 1, 14–21 and 76. At page 31 Thomas explains that, as the 'Biblical style' of literary and inscriptional texts diverged, the mathematical element became more prominent in the latter.

[6] Op. cit. in note 1, 168–9. See also D. R. Howlett, *Cambro-Latin Compositions: Their Competence and Craftsmanship* (Dublin, 1998), 18, citing Thomas's observation that the **C**s and **O**s of *Carausius* resemble a heap of stones in a cairn — which is elaborated on in Thomas, op. cit., 144–5.

[7] *Carausius* (Thomas, op. cit. in note 1, 142–9). See also *Rostece* (ibid., 20–1): lines drawn through parts of letters in this inscription produce the image of the Cross.

[8] See, for example, *Idnert* (Thomas, op. cit. in note 1, 26–31, 175–6); *Senacus* (ibid., 92–5); *Catamanus* (ibid., 162–8); and *Voteporigis* (ibid., 195–8).

[9] Cf. D. N. Dumville, review of Howlett, op. cit. in note 6, and *Liber Epistolarum Sancti Patricii Episcopi: The Book of Letters of Saint Patrick the Bishop* (Dublin, 1994), in *English Hist. Rec.*, 116 no. 466 (April 2001), 405–8.

[10] For a more detailed discussion of this point, see below, 35–6 and 38–9.

[11] This (the 'third adjunct' of Biblical style) is discussed briefly in Howlett, op. cit. in note 2, 21.

We know little about the circumstances behind the production of the Celtic inscriptions: no contemporary (or subsequent) account of the process has survived. However, we do have some evidence that an inscription would (in some cases, at least) have been painted on to the stone as a guide to the stonecutter. The most overt indication probably comes from the so-called 'Pillar of Eliseg'. This memorial (datable to the second half of the 9th century) includes the line *CONMARCH PINXIT HOC CHIROGRAFV(M)* ('Conmarch painted this writing'):[12] Nash-Williams suggested that *pinxit* refers to the practice of painting in the letters after they had been carved, but if we turn to the letter-forms in certain inscriptions we can find additional evidence that stonecutters sometimes followed a painted model. The most striking examples come from the *Catamanus* inscription at Llangadwaladr, Anglesey:[13] Gifford Charles-Edwards has shown that the outline of some of its carved letters — especially **A** — has copied faithfully the rounded edges which would have been produced by a brushstroke. (She has experimented with painting the same sort of letter-forms on to various types of stone, and has produced identical results.) Seven other stones have been identified by Mrs Charles-Edwards as brush-lettered.[14]

Other inscriptions look as if they were transferred on to the stone from an original on parchment or (more probably?) wax. A particularly good example is the cross to *Margiteut* (Maredudd) at Carew, Pembs.: here the top part of the **R** in *MARGITEVT* was cut as an outlined triangle, the stonecarver apparently being ignorant of the precise nature of a pen-formed Insular wedge.[15]

There is, therefore, evidence to indicate that inscriptions were at least occasionally painted on to their stones as a guide for the stonecarvers. Even when the mason's template came from a wax tablet, it appears that he could be faithful to the point of clumsiness in representing exactly what had been drawn for him. This suggests that, even if a stoneworker were illiterate, the composer of an inscription would if necessary have been able to determine its precise layout. The author of an inscription containing (for example) a display profile need not have had any difficulty in ensuring that the text was appropriately arranged. Similarly,

[12] Nash-Williams, op. cit. in note 3, no. 40. Another phrase in the inscription, *MANESCRIPTVM LAPIDEM* ('hand-written/hand-carved stone'), is drawn from the language of manuscripts and illumination. See also John Higgitt, 'The stone-cutter and the scriptorium: early medieval inscriptions in Britain and Ireland', 149–62 in W. Koch (ed.), *Epigraphik 1988: Fachtagung für mittelalterliche und neuzeitliche Epigraphik, Graz 10–14 Mai 1988* (Österreichische Akademie der Wissenschaften, Philosophisch-Historische Klasse, Denkschriften, 213) (Wien, 1990), 151 and 160.

[13] Nash-Williams, op. cit. in note 3, no. 13.

[14] These are numbers 35, 164, 193, 220, 223, 233, and 248 in Nash-Williams, op. cit. in note 3. See D. G. Charles-Edwards, The Epigraphy of Wales 550–1000 (unpubl. M.Phil. thesis, 2000, University of Wales College, Newport), 57–62.

[15] This is number 303 in Nash-Williams, op. cit. in note 3. See Charles-Edwards, op. cit. in note 14, 62 and 73, and cf. also p. 27 (the scribe of the 'Springmount Bog Tablets', though obviously proficient with a stylus and wax, seems to have been unfamiliar with the broad pen, since he drew an Insular wedge on the wrong side of the downstroke).

if he needed for any reason to use a particular version of a letter-form, he would presumably have been able to ensure that this was done as well.[16]

Having confirmed that it would apparently have been possible for a compositor to have ensured that his complex inscription was carved on to stone in precisely the right way, it is now necessary to consider Thomas's theories from a different angle: do we have any evidence — excluding inference — for interest in infixed messages, hidden meanings, and so forth, in the Insular world? If one were able to show that Insular Celts were interested and adept in what one might call the 'hermetic' arts — ciphers, anagrams, and the like — then this might lend additional credence to the suggestion that they were also accustomed to produce inscriptions containing layers of hidden meanings.

The first piece of relevant evidence comes from the *Vita Prima* of St Samson of Dol, part of which provides us with an intriguing account of the education of a British boy in the late 5th century (the text's historic core, according to Thomas, was composed in Britain in the early 7th century).[17] Both Charles Thomas and David Howlett have used part of this text as evidence for the teaching of 'letters as numbers' (henceforward 'LaN') in monastic schools: if their interpretation is correct, it would certainly suggest that the Insular Celts were being taught in a way that would have enabled them to compose material in the 'Biblical style'.

The relevant passage (I.10) has been discussed at some length by both Thomas and Howlett. We are told that, when Samson was a small child (which would probably have been in the late 5th century), he was taken to school at Llanilltud Fawr. At this school, he apparently mastered the *uicenas eleas* [*sic*] *thessarasque*, which Thomas translates as the 'the dice and the little square pieces[,] twenty-of-each'.[18] This has been interpreted as an allusion to the schoolroom teaching of the numerals 1–20 and the twenty letters of the alphabet (since at this period the Latin alphabet had not yet acquired **K**, **Y** or **Z**); Thomas suggests that it implies the inculcation of

[16] Cf. Thomas, op. cit. in note 1, 164, 167–8. Thomas's suggestion that the **A**s of the *Catamanus* inscription were deliberately selected to mimic asses' ears cannot, therefore, be dismissed out of hand. However, these **A**s are not quite so unusual as he suggests: they are very close in form to display **A**s in Insular manuscripts such as the Cathach of St Columba and the Lindisfarne Gospels (cf. Higgitt, op. cit. in note 12, 153). Moreover, as indicated above, part of their atypical appearance must be due to no more than the mason's slavish copying of the brushstrokes in his model.

[17] Thomas, op. cit. in note 1, 58–9. David Howlett has tacitly supported the 8th-century dating of the text's recent editor, Pierre Flobert: 'A Brittonic curriculum: a British child's ABC 123', *Cambrian Medieval Celtic Stud.*, 40 (2000), 21–6. Cf. *La Vie Ancienne de Saint Samson de Dol*, ed. and trans. P. Flobert (Paris, 1997).

[18] Thomas, op. cit. in note 1, 58. Or, as David Howlett has translated this, 'the twenty-unit dice and all the little squares' (op. cit. in note 17, 23). Lewis and Short's *Oxford Latin Dictionary* defines *tessera* as 'a square, square piece (of stone, wood, etc., for various purposes)'. The primary and most frequent meaning is 'die' (cf. *tesseras iacere*); a secondary (and military) sense is of a square tablet on which the watchword was written, and hence (transferred) the watchword itself. It can also mean a square tablet or block (for the construction of pavements, ornamenting, etc.); and a token, ticket, or billet (for the distribution of corn or money). *Eleas* does seem best interpreted as an alternative spelling of *aleas* — although Flobert wondered if it could represent *elementa* (op. cit. in note 17, 162–3), and Howlett suggested a coded version of *litteras* (op. cit. in note 17, 24). *Alea* is defined in Lewis and Short as a game with dice (in general a game of hazard), and in the Irish context we have of course the 'Gospel Dice': *alea euangelii quam Dubinsi episcopus Bennchorensis detulit a rege Anglorum id est a domu Adalstani regis Anglorum depicta a quodam Francone et a Romano sapiente id est Israel* — 'Gospel Dice which Dub Innse, bishop of Bangor, brought from the king of the English, i.e. from the household of Athelstan, king of the English, drawn by a certain Franco [or Frankish man] and by a Roman scholar, i.e. Israel' (Oxford, Corpus Christi College, MS. 122, fol. 5v [*saec.* Xii]: cf. M. Lapidge, *Anglo-Latin Literature 900–1066* [London, 1993], 19, 89). The dice in a game of *alea* were most often the *tesserae*, which had six sides marked I-VI (there were also tali, rounded on two sides and marked only on the other four). Clearly the sense of *[a]leas tesserasque* in this passage is not the usual one.

LaN values — the twenty letters **A–Z** and the numerals 1–20 being learnt concurrently — and he has been supported in this interpretation by Howlett.[19] The use of *eleas thessarasque* (with *eleas* most probably representing *aleas*) appears to indicate that the letters and numbers were each on little tiles; the assumption may be that each tile would have had a number on one side and the corresponding letter on the other, which would certainly have facilitated this kind of learning.

However, the next piece of evidence to be marshalled in this connection suggests that LaN values would not have been over-familiar to the average Celtic scholar. This is unfortunate, since the evidence in question provides incontrovertible confirmation of a Celtic interest in hidden meanings. It is the cryptogram known as 'Dubthach's Cryptogram', consisting of a message allegedly enciphered by an Irishman called Dubthach. *En route* between Ireland and the Continent, Dubthach seems to have visited the court of Merfyn Frych in Gwynedd; either at that time, or after he had reached the Continent, he composed a cryptogram in order to perplex other Irish scholars at the Venedotian court. Merfyn's regnal dates (825–44) incidentally appear to indicate that this cryptogram was composed by Dubthach at some point during the second quarter of the 9th century.[20]

Dubthach's enciphered message is a simple greeting from Merfyn to Cyngen (king of Powys, 808–854/5), and when transliterated reads *MERMEN REX CONCHN SALVTEM* 'King Merfyn greets Cyngen'. The cipher Dubthach used is based on the Greek characters for 1–23, each of which replaces the appropriate Latin letter (so that, for example, **a** is replaced by α/1, **m** by ιβ/12, and **z** by κΓ/23). It will be noted that this cipher actually involves writing (in Greek) the 23-letter LaN values of the Latin letters; but it cannot easily be used to support Charles Thomas's theory that LaN was a relatively familiar concept at this period. First of all, this cipher was obviously regarded by Dubthach as a difficult one to break (and Professor René Derolez has pointed out that the four Irish scholars who eventually succeeded in deciphering it had to consult a table of Greek numerals in order to do so).[21] Moreover, even Dubthach seems to have found it challenging: he made a mistake when enciphering *CONCEN*,[22] and it is noteworthy that he did not attempt to encipher anything very lengthy in the first place. This suggests a very basic level of sophistication. It is instructive to compare it with the degree of expertise which would have been needed to scan an inscription, convert it into a grid,[23] and produce a meaningful devised profile — let alone count the letters, syllables, words, and so on, and then perform calculations with the resulting figures.

[19] Howlett, op. cit. in note 17, 24–6.

[20] See M. Lapidge and R. Sharpe, *A Bibliography of Celtic-Latin Literature 400–1200* (Dublin, 1985), 181 (no. 687) and references there, especially R. Derolez, 'Dubthach's cryptogram: some notes in connexion with Brussels MS. 9565–9566', *L'Antiquité Classique*, 21 (1952), 359–75. The Dubthach of the cryptogram may be identifiable with the scholar of that name who was one of the scribes of the 'Leiden Priscian' (Leiden, Universiteitsbibliotheek, MS. 67), in A.D. 838: Derolez, op. cit., 371–2; B. Bischoff, *Mittelalterliche Studien*, 3 (Stuttgart, 1980), 44–5.

[21] Op. cit. in note 20, 273–4 (. . . *per annalem Grecorum libellum atque alphabeti eandem inscriptionem inuestigantes*).

[22] The generally accepted view of *CONCHN* appears to be that Dubthach's spelling of the name has been influenced by his Irish heritage: for a recent reaffirmation, see R. Derolez, 'Language problems in Anglo-Saxon England: *barbara loquella* and *barbarismus*', 285–92, in M. Korhammer et al. (eds.), *Words, Texts and Manuscripts: Studies Presented to Helmut Gneuss* (Cambridge, 1992), at p. 286. However, it is surely more probable that, confused by the alternation of Latin and Greek letters, he accidentally copied an *eta* — the usual non-enciphered equivalent of Latin **E** — when he should have represented it by an *epsilon*.

[23] Although Thomas does admit that one would have needed to '[scratch] out the grid' (op. cit. in note 1, 167).

However, we should note that Dubthach's cryptogram appears to have been something of a learned success: its code travelled from the court at Gwynedd to the monastery (perhaps in south-eastern Wales) where the 'Cambridge Juvencus' (Cambridge, University Library, MS. Ff.4.42) was copied and glossed between the second half of the 9th and the middle of the 10th century, and it also reached Brittany, making an appearance in Angers, Bibliothèque Municipale, MS. 477 (461) (datable to A.D. 897).[24] As with Dubthach's original cryptogram, in neither of these manuscripts was the cipher employed perfectly. Cyfeilliog, the scribe responsible for the cryptogram in the Cambridge manuscript, missed out several letters, while the Angers cryptographer (deliberately?) used ordinary Latin **L** instead of enciphering it as ια. Whether or not these various Celtic scholars were able to master Dubthach's cryptosystem, there was clearly an appetite for such things at this period.

Another clue to the importance of ciphers in medieval Britain comes from the 'Corpus Martianus Capella' (Cambridge, Corpus Christi College, MS. 153), which is one of the best-known manuscripts from pre-Conquest Wales.[25] An extremely substantial manuscript, containing a heavily glossed copy of the monumental handbook on the liberal arts by Martianus Capella, it was produced by a number of scribes working in a Welsh scriptorium some time in the later 9th (or possibly the early 10th) century.

One very interesting item in this manuscript has, so far as we are aware, yet to be discussed in print. This is a Greek alphabet which was added to the bottom of fol. 7v by the manuscript's principal glossator. Over each Greek letter, the scribe put a roman numeral — so α is **i**, β is **ii**, Γ is **iii**, and so on. Each letter of the Greek alphabet had a corresponding numerical significance (just as do the Latin letters **I**, **V**, **X**, etc.) and it is obvious from the Corpus Martianus Capella that at least one Welsh scribe was aware of this.[26] At the top right-hand corner of the folio where he copied out the Greek numerical alphabet, we can watch him putting this into practice, and copying out φιλολογια in roman numerals as well as Greek letters.

We might take this to be concrete proof for familiarity with LaN in Wales at this period. However, it is Latin rather than Greek LaN that was (allegedly) used in the Christian Celtic inscriptions. And Greek numerical alphabets are actually fairly commonplace occurrences in medieval manuscripts (there is one in the *Enchiridion* of Byrhtferth of Ramsey, for example);[27] where we find Latin numerical alphabets, they consist of the conventional roman numerals (**I V X L C D M** . . .) rather than Latin letters accompanied by their LaN values.[28]

A search for evidence that might corroborate Thomas's theories has, therefore, been inconclusive. On the one hand, it seems probable that the author of a 'Biblical' inscription would have been able to get it carved on to the stone in

[24] On the 'Cambridge Juvencus', see H. McKee, *The Cambridge Juvencus Manuscript, Glossed in Latin, Old Welsh, and Old Irish: Text and Commentary* (Aberystwyth, 2000), 27–9. On Angers 477, see P.-Y. Lambert, 'Les commentaires celtiques à Bède le Vénérable', *Études celtiques*, 20 (1983), 119–43, at 140–1, with a plate at p. 143.

[25] See T. A. M. Bishop, 'The Corpus Martianus Capella', *Trans. Cambridge Bibliographical Soc.*, 4 (1964–8), 257–75.

[26] Cf. Howlett, op. cit. in note 2, 21.

[27] Cf. W. Berschin, *Griechisch-lateinisches Mittelalter* (Bern and München, 1980), 41; *Byrhtferth's Enchiridion*, P. S. Baker and M. Lapidge (eds.) (Oxford, 1995), 188–9 and 334–5.

[28] Ed. cit., 187 and 334.

precisely the way that he wanted, which would have been essential if its various hidden dimensions were to be recoverable. On the other hand, we do not have a great deal of evidence for this kind of 'hermetic' knowledge in the Insular world, and the evidence that we have suggests an insufficient level of sophistication, even amongst the best educated, for the sort of construction required by Thomas.

Now we turn to the mathematics. Lest anyone be unfamiliar with Thomas' work, we shall use two inscriptions as illustrations of what Thomas has been able to do: he has undoubtedly seen things in Celtic Latin inscriptions which have escaped the attention of many. We shall then discuss the mathematical significance of the numbers found by Thomas. For this we shall use two approaches, one for each inscription. First we shall attempt to give some feel for the likelihood that the patterns spotted by Thomas might have arisen by chance. For the second inscription, we shall illustrate how easy it is to find patterns by mimicking Thomas's style to find a key number that Thomas appears to have overlooked.

Our first inscription is the first one treated by Thomas: the *Rostece* inscription at Llanerfyl in Powys.[29] Using underlining to denote ligatures, the seven lines of text are reconstructed (restoring flaked-off letters) as:

HIC[IN]
TVM[V]LOIA
CIT.R[O]STE
CE.FILIA.PA
TERNINI.
ANIXIII.IN
PA

This memorial to a thirteen-year-old girl is memorably poignant; but it also has several slightly unusual features, such as the use of the phrase *Hic in tumulo iacit* (rather than the standard *Hic iacit*) and the mention of the age of the person commemorated, which Nash-Williams commented is 'exceptional on a Welsh monument'.[30] And Charles Thomas has pointed to some very striking numerical features that may be extracted from the inscription. They all involve the number *thirteen*, which was the age of the deceased:

- if we look at the inscription, we can count thirteen instances of **I**, the Roman numeral for 1;
- similarly, there are three instances of **C** and one of **M**, giving **MCCC** = 1300;

[29] Nash-Williams, op. cit. in note 3, no. 294; Thomas, op. cit. in note 1, 14–21.

[30] Nash-Williams, op. cit. in note 3, 10 and 178. The formula *hic in tumulo iacit/hic iacit in hoc tumulo* appears on just two other extant inscribed stones in Wales — ibid., Nos. 41 and 289 — in addition to number 409, which is lost. For variations on this formula, see number 101, which appears to include the phrase *in hoc congeries* (though Howlett has challenged the traditional interpretation of this inscription: op. cit. in note 6, 17–19), in addition to Nash-Williams, op. cit. in note 3, no. 32, whose text may be reconstructed *Hic . . . se/pultus/ iacit*. The reference to the age of the decedent in the Llanerfyl inscription, while unique in Wales, is attested on monuments from Cornwall (R. A. S. Macalister, *Corpus Inscriptionum Insularum Celticarum*, 2 vols. [Dublin, 1945/9], no. 479) and Scotland (ibid., no. 520). In an earlier survey of inscribed stones in Britain, Thomas cited the use of *hic (in tumulo) iacit* with its variants, in addition to the decedent's age, as characteristics of his 'extended Latinate' style of inscription, modelled on 5th- and 6th-century monuments from Gaul: C. Thomas, *And Shall These Mute Stones Speak? Post-Roman Inscriptions in Western Britain* (Cardiff, 1994), 200–3.

- and, in the part of the inscription immediately preceding the age, there are 39 letters in total (that is, counting the ligature **M**+**V** as a single letter, but not including the punctuation marks in this tally) = 3 x 13.

These interesting numerical features have all been extracted from the *display* text: that which actually appears on the stone (with ligatures and abbreviations), rather than that which we can write out in full. If we write out the full, or *model*, text, we get (expanding *XIII* to *TREDECIM*, *ANI* to *ANNI*, and *PA* to *PACE*):

HICIN
TVMVLOIA
CIT.ROSTE
CE.FILIA.PA
TERNINI.
ANNITREDECIM.IN
PACE

From this, yet more thirteens are extracted:

- the first and last letters are **H** and **E**, which (taking their numerical equivalents in the old 20-letter Roman alphabet)[31] correspond to 8 + 5 = 13;
- within the first twenty letters (this number selected because it mirrors the number of letters in the old alphabet), the only two whose numbered positions correspond to their LaN values are **C** and **L**, which correspond to 3 + 10 = 13;
- the four words describing Rostece (*filia Paternini anni tredecim*) have 26 letters (not counting punctuation marks) = 13 x 2;
- the four corner letters in the model text (arranged in the same way as the display text) are
  H N P E = 8 + 12 + 14 + 5 = 39 = 13 x 3;
- the letters which begin each of the seven lines are
  H T C C T A P = 8 + 18 + 3 + 3 + 18 + 1 + 14 = 65 = 13 x 5.

Thomas next produces a full analytical table for *Rostece*, noting the number of words, syllables and letters in the display text and letters in the model text, denoted *W*, *S*, *LD*, *LM* respectively. He finds *W* = 11, *S* = 25, *LD* = 47, *LM* = 55, and notes that:

- the four totals added together produce 91 = 13 x 7;
- they also include squares (*S* is 5 squared, *W*+*S* is 6 squared) and a triangular number (*LM* is 55, the triangular number from 10).[32]

Next, Thomas shows how the inscription may be arranged into a seven-by-seven grid, containing a devised profile of Rostece's grave, with the Cross standing by it and the words *in pace* (not included in the 49-letter grid) marking where her body lies; the letters of her name *CE/ROSTE* are pendent from the Cross. And, as a final touch, he shows how we may draw a line through parts of the letters in the display text to produce another infixed image, once more of the Cross.

[31] For the use of 'letters as numbers' ('LaN') see p. 30 above. Here we are using '20-letter LaN', that is, LaN from a twenty-letter alphabet, before the introduction of **K Y** and **Z**.
[32] Cf. note 4 above. Here (10x11)/2 = 55.

There may be some argument here about whether or not these infixed messages might have been intended to be hidden. But we surely cannot imagine that the number-play and hidden images identified by Thomas would have been recognisable to the ordinary passer-by in sub-Roman and early medieval Britain. Apart from anything else, they would have required comfortable literacy (including familiarity with the LaN concept) and non-trivial mathematical knowledge — such as the ability to recognise triangular numbers,[33] and the ability to calculate golden ratio (Thomas suggests that this would have been done via memorised Fibonacci number sets).[34] And at least one of the inscriptions discussed by Thomas — the *Catamanus* stone at Llangadwaladr — is claimed to contain an extremely rude devised profile that would undoubtedly have caused the compositor some difficulty if it had been noticed by the Venedotian ruling family.[35]

Leaving this question aside, we turn to a mathematical analysis of the likelihood that all of these thirteens could have appeared by chance. Charles Thomas actually advises his readers on several occasions not to consult a mathematician in connection with his work, as it would be a waste of time.[36] Fortunately, on one other occasion he remarks that a mathematician would be able to confirm his theories, so we feel legitimised in attempting to do this.[37] We shall be focusing here on Thomas's numerical discoveries, rather than on his display profiles and devised profiles, which are less susceptible to mathematical analysis, and might be thought to require more imagination than calculation.

The first thing that a mathematician might do, in attempting to determine whether Thomas's findings are the result of chance or of design, is produce a catalogue of the various ways in which he has been able to extract significant numbers. A trawl through *Christian Celts* has produced about 155 separate ways of finding significant numbers.[38] The majority of these methods (about 130) are *used only once*. Of course, not every method is applicable to every inscription, and sometimes a method may have two or (many) more applications in a particular inscription. So the total number of methods available to any given inscription will not be equal to 155, but this figure should give some sense of the number of options available. For *Rostece*, we were able to produce about 205 applications of Thomas's methods,[39] amongst which we found fourteen multiples of thirteen (including, of

[33] Cf. Thomas, op. cit. in note 1, 76–7 (suggesting that in the Roman *arithmetica-geometria* curriculum at least the first twenty triangular numbers were learned off by heart).

[34] Cf. C. Thomas, *Penzance Market Cross: a Cornish Wonder Re-wondered* (Penzance, undated), 21. Fibonacci sets are those number sets in which each number from the third onward is the sum of the two preceding numbers. The first such set is 1 2 3 5 8 13 21 34 55 . . .

[35] 'Why he chose to perpetrate this, why he judged that he could get away with it — and because this stone was never defaced we can assume that his joke remained undetected, at least by Cadfan's descendants — remain unanswerable questions' (Thomas, op. cit. in note 1, 167).

[36] 'Do not . . . waste any professional mathematician's time by asking for calculations as to whether or not these results could have happened randomly or by chance . . .' (op. cit. in note 1, 16).

[37] 'Any mathematician could confirm that the results [of a study of the 'Penzance Market Cross'], which cannot conceivably have come about by accident, were deliberately produced' (op. cit. in note 34, 24).

[38] The numbers given for all such counts are preceded by the word 'about'. The trawl was done carefully, but in about 200 pages we may have overlooked something.

[39] Here there is some subjectivity in deciding which methods can reasonably be applied to *Rostece*.

course, the nine found by Thomas).[40] Finally, we might remark that some of Thomas's methods seem so contrived that one feels it would be possible to create any number of new ones.[41]

This number of available methods may put some of Charles Thomas's 'discoveries' into proportion: certainly he has been able to identify some remarkable things in every inscription he has looked at — such as the intriguing frequency of thirteen and its multiples in the *Rostece* inscription — but, if we consider the range of different methods for extracting numbers that he was able to use, the fact that, for each inscription, some of them have yielded interesting numbers, may strike us as less surprising. More precisely, out of 205 numbers we would expect about sixteen of them to be multiples of thirteen, and so finding fourteen is not a surprise. This analysis assumes simply that one-thirteenth of our numbers will be divisible by thirteen. Obviously this is only an approximate analysis, which makes certain assumptions which will not be exactly true,[42] but it *does* give a rough idea of the reason why it is easy to extract so many thirteens from the inscription — simply because there are so many ways of producing these numbers.

It is in fact extremely unlikely that all nine of Thomas's thirteens were placed intentionally, or we should expect about another fifteen examples from all the other methods available, rather than just another five. The chance of getting five (or fewer) thirteens from 196 attempts (again making the approximation of uniformity and independence) is only about one in five hundred. There is, therefore, some evidence to reject the hypothesis that *all* of Thomas' thirteens were placed intentionally. Of course, one cannot rule out the possibility that any *particular* multiple of thirteen was intentional.

The second inscription that we shall consider is the *Penzance Market Cross*, since Charles Thomas has recently produced a pamphlet for Penlee House Art Gallery and Museum dealing with this monument, expanding on his treatment in *Christian Celts*.[43] The display text (after some reconstruction) has three lines:

[P]C V M B V I N F O [R I S]
[Q] V I C V M Q : P A [C E]
[V] E N I T H I C O [R E T]

[40] Here are five new thirteens, the first of which might be viewed as generous: (i) the thirteenth letter (model text) is a square number ($A = 1 = 1 \times 1$); (ii) the sum of the initial and final letters of *ANNI TREDECIM* is $39 = 3 \times 13$; (iii) the sum of the initial letters of *FILLA PATERNINI ANNI TREDECIM* is $39 = 3 \times 13$; (iv) the number of letters (model text) plus the number of spaces between words is $65 = 5 \times 13$ (not that spaces appear in the inscription, but this method was used for *Idnert*); (v) the sum of the letters in the first row of the 49-letter square on page 19 (*HIC IN TV-*) is $78 = 6 \times 13$.

[41] Taking a selection from Thomas, op. cit. in note 1, we may note him extracting significant numbers from: the largest square below the number of letters in the model text (ibid., 19: not surprisingly, this number is always a square!); the number of lines plus two roundels, which appear on the same line (ibid., 44); the sum of the LaN values of the central letters in those lines with odd numbers of letters (ibid., 94); the number of letters in the display text, omitting two words from the middle of the inscription (ibid., 145); the number of letters in the longest word (ibid., 163); and so on. On many occasions, the sum of the numerical values of the letters **M**, **D**, **C**, **L**, **X**, **V**, **I** appearing in the text is considered. However, there are many variations: some subset of the Roman numerals is taken, and applied to some subset of the text (display or model). In fact, for any inscription, there are up to 31 subsets of **M**, . . ., **I** at our disposal: in *Christian Celts*, Thomas employs eleven different subsets. There are also often many different subsets of the text for which one could invent a reason for selection.

[42] More precisely, for the statistically-minded, this assumes both a certain uniformity in the distribution of the numbers obtained, and statistical independence of the various methods.

[43] Op. cit. in note 34.

These are expanded to give the model text:

PROCVMBVNTINFORIS
QVICVMQVEPACE
VENITHINCORET

One of the most important aspects of this inscription appears to be the way that the number *seventeen* has been infixed:

- line 1 has seventeen letters (model text);
- divide the eight words by mean ratio as 4:4, and the second four words *PACE VENIT HINC ORET* contain seventeen letters;
- the first and last letters are **P T**, which using 23-letter LaN gives 15 + 19 = 34 = 17 x 2;
- the first letters of each line are **P Q V** = 15 + 16 + 20 = 51 = 17 x 3;
- in line 1, **R** (= 17) falls in 2nd and 15th place = 2 + 15 = 17;
- the first and last letters of line 1 ('part a') are **P S**; the first and last letters of lines 2 and 3 ('part b') are **Q T**: **P S Q T**, giving 15 + 18 + 16 + 19 = 68 = 17 x 4;
- the first letters of all 8 words = 101 ; the last letters of all 8 words = 103: 101 + 103 = 204 = 17 x 12;
- the combined value of the seventeen letters in line 1 = 221 = 17 x 13.

We are told that one significance of seventeen is that *ADAM* = 17 (20-letter LaN — although it is worth noting that in all the computations above which produce this 17, it was 23-letter LaN that was used). Of more significance (supposedly) is the fact that the triangular number from 17 is 153, which immediately suggests the miraculous draft of fishes by the sea of Tiberias (John XXI.11).[44]

Thomas remarks that 'any mathematician could confirm that [these] results, which cannot conceivably have come about by accident, were deliberately produced. The aim was to ensure that key number 17, which is also the key to an inner meaning, would be noticed at an early stage'.[45]

However, in this case, we have been able to use different (though very similar!) methods of extracting numbers, in order to 'show' that the important number in this inscription is actually *thirteen*, as in *Rostece*:

- line 1 (display text) has thirteen letters;
- line 2 (model text) has thirteen letters;
- line 3 (model text) has thirteen letters;
- divide the eight words by mean ratio as 4:4, and the first four words *PROCVMBVNT IN FORIS QVICVMQVE* contain 26 (= 13 x 2) letters;
- the first and last letters of line 3 are **V T**, giving 20 + 19 = 39 = 13 x 3;
- the central letter in line 1 is **N** = 13;
- the combined value of the letters in line 1 = 221 = 13 x 17;
- adding all appearances of the Roman numerals **I C M**, we have **C + M + I + I + I + C + M + C + I + I + C** = 2405 = 13 x 185.

The most obvious significance of the number thirteen would surely be that it refers to Jesus plus his disciples. But, playing with this number a little more, we

[44] Cf. Howlett, op. cit. in note 2, 21.
[45] Op. cit. in note 34, 24.

could point out that the word PENZANCE is equivalent in 23-letter LaN to 78, that is *thirteen* times 6 (and the words ALIEN CODE are equivalent to 65, that is *thirteen* times 5!). Can this be a coincidence?

So, although Thomas says that the aim has been to make the importance of seventeen obvious, we would disagree, and claim that it has been possible to construct an equally convincing case for the primacy of thirteen. Although the preceding paragraph was facetious, the methods used to produce multiples of thirteen mimic closely (and sometimes just copy) the methods used by Thomas. This illustrates how easy it is to find patterns in such inscriptions, whether or not they were intentionally placed (or perhaps some would argue that some or all of the thirteens found above *were* intentional, indicating that thirteen is indeed a key number for this inscription?).

In conclusion, when one is searching for embedded numbers and the like in these inscriptions, there seem to be so many available methods that it is difficult *not* to find appearances of any desired number. Taking any one inscription in isolation, and considering only the methods used by Thomas for that particular inscription, one might be impressed by the number of times that one (or more) supposedly significant number(s) occur(s). But when one reflects on the number of methods that are available, the proportion which strike it lucky no longer seems remarkable.

When we were looking through all the different methods employed by Thomas, we were struck by the fact that the majority were used once only, with new methods being invoked for each new inscription: there was no evidence of any systematic method of embedding numbers.[46] Some methods did appear more than once, but most did not. We would claim that it is most reasonable to suppose that there are *no* numbers embedded in these inscriptions, and that one should read them at face value. It is all too easy, as we have found ourselves, to find curious patterns, even in short inscriptions, if one is allowed to employ Thomas-like techniques, and if one is free to invent new methods each time.

ACKNOWLEDGEMENTS

We are grateful for an invitation to present this paper in Cardiff in November 2000. During our work on this topic, we have benefited from the expertise and generosity of a number of scholars, especially Gifford Charles-Edwards, Nancy Edwards (who introduced H.M. to Welsh epigraphy in the first place), and Patrick Sims-Williams. In addition, the audiences at the original presentation in Cardiff, and subsequently in Aberystwyth in March 2001, provided us with invaluable feedback.

[46] Of course, one can argue that the various inscriptions were produced at different times and in different places, so one would not expect the same embedding methods to appear throughout. All one can say is that there is no evidence of any *systematic* method, and then one might go on to say that one has no evidence of anything at all.