AGM Papers.

As the AGM this year will be held at the conference, it is essential that we stick to the timetable. To make this easier, the officers' reports will be published in this Newsletter rather than read out at the meeting. We would ask members to read through these papers in advance. Please note that the minutes of the last AGM appeared in Newsletter 51.

A consistent theme is the need for extra help. Please consider if you can give some time to helping to run the Society. If you can, either by standing for the committee or by volunteering to help in any specific way, please give your name to any member of the committee any time before the commencement of the AGM.

Report on the Society's Activities.

2009 was a mixed year for the Pictish Arts Society. The Duchess Ann Hall in Dunkeld provided a picturesque venue for the autumn conference. Speakers Mark Hall, Rachel Butter, Birgitta Hoffman Alice Blackwell and Ewan Campbell presented a range of papers covering topics linked by a connection with the Perthshire/Tayside area (reported in detail in Newsletter 53). The Hall, in the centre of the village, is just a short walk from Dunkeld Cathedral. The weather was kind to us, and to the happy couple whose wedding in the Cathedral complicated our timetable, which included a visit to the collection of stones housed in the Chapter House museum there. Unfortunately, earlier heavy rain ruled out the possibility of walking to the standing stone or the King's Seat, in the grounds of Dunkeld House hotel.

The winter programme of talks at Pictavia continued to be well supported. A varied selection of talks ranged from the sculpture of the Spey valley (from John Borland), through a view of what it means to be a stone carver from the expert Bruce Walker, to excavations of sites for the living and the dead of Pictish times (Fraser Hunter on his work at Birnie, and Alastair Becket on excavations at Victoria Park, Arbroath. Unfortunately, two of our intended speakers were unable to make it to Pictavia; Andy Heald entrusting his presentation on Forging the Picts—on metalwork—to the committee to be given in his absence and Heather Pulliam, who hopes to be able to present her talk in the coming season, and whose place was taken by Norman Atkinson who spoke on the place names of Dunnichen parish. We also had a near disaster on one occasion, when only one member of the committee was able to attend and see to the opening up of Pictavia, arranging the seating, teas and coffees, welcoming our speaker, and so on.

That incident leads on to what is becoming a familiar theme for societies such as ours.

When the day-to-day running of the Society depends on a small number of people, there is always a danger that the work will overwhelm the individuals who are involved. Although we have made great strides over the past few years in setting the Society on a firm footing, both in terms of a degree of financial stability and in terms of trying to ensure that we only promise what we can deliver for members, we have had a couple of setbacks this year. The ill-health of one of our most valued and hardworking committee members has caused some disruption in the processing of memberships and in the cataloguing of the library. This is now well on the way to being resolved, and we wish to acknowledge the great debt that the Society owes to Joy Mowatt and to wish her a speedy return to full health and fighting fitness. In the case of the website, the pressures of work meant delays in achieving what we had hoped to have in place. Again we have taken steps to redress this, and hope to have a website that will deliver what were identified as the needs of the Society in the near future.

On the positive side, the Newsletter continues to flourish in the capable hands of David Henry. His editorial skills, his patience, and the dedication with which he has given of his time have seen a regular quarterly publication which brings news of Pictish stones, short articles of interest to Pictish studies, reviews of books, reports of meetings of the Society, Ron Dutton's fiendish crosswords and

information about events of potential interest to our members. This has been a major success story for the PAS in recent years, and our thanks go to David and all the members who have contributed to making this our major channel of communication.

Although we have retreated from the position which suggested that the Society could produce a regular journal, it gave us pleasure to see the publication of Stuart Kermack's *The Pictish Symbols and the Vita Sancti Columbae* (with the generous assistance of the author) as Number 1 in what we hope will be a new series of irregular publications.

Other aspirations have also been trimmed. It may be that in future we will be able to do more in the way of planning field trips or joint meetings, or even (re)starting winter lecture series in venues other than Pictavia, but this will require volunteers who are able to make the commitment in time and effort required – either as members of the committee or as individuals prepared to come up with a solid, affordable and achievable plan.

Finally, we would like to thank all of the members of the committee with whom we have worked over the past year, and all the members of the Society whose participation makes all the effort worthwhile.

PAS Pictavia lecture programme 2010–11

15 October: Dr Heather Pulliam *Spiritual Nourishment in the Book of Kells and the Art of the Picts*

12 November: Dr Sarah Winlow *Title tbc*

10 December: Prof Jane Geddes *A Long Walk to God: understanding St Vigeans 11 and Drosten's stone*

2011 – 21 January; 18 February; 18 March

Doors open at 7pm; talks begin at 7.30. Tea and coffee available from 7.

Funding problems hit museums

What is likely to be only the beginning of hard times ahead for those interested in preserving our cultural heritage has already been seen in Highland Region, where two important small, independent museums are threatened with the loss of a valuable contribution to their funding by cuts in Highland Council's Leisure and Cultural Services budget. The Council is currently exploring ways of making savings in the administration of this part of the budget, and the threatened museums are currently pursuing ways of increasing their financing from other sources. However, the difficulties experienced by small teams of dedicated volunteers working to preserve excellent museums in rural Scotland are not to be underestimated. Their invaluable collections are a major ingredient of the tourism industry that is vital to the local economy in Scotland. In addition, they are increasingly contributing to the collection and preservation of material of great importance to the understanding of our past. Groam House, home to many of the Rosemarkie stones, is well knowntoo for its collection of objects, designs and archives related to George Bain and 20th-century artists and craftsmen who followed his revival of Celtic-inspired art.   *SH*
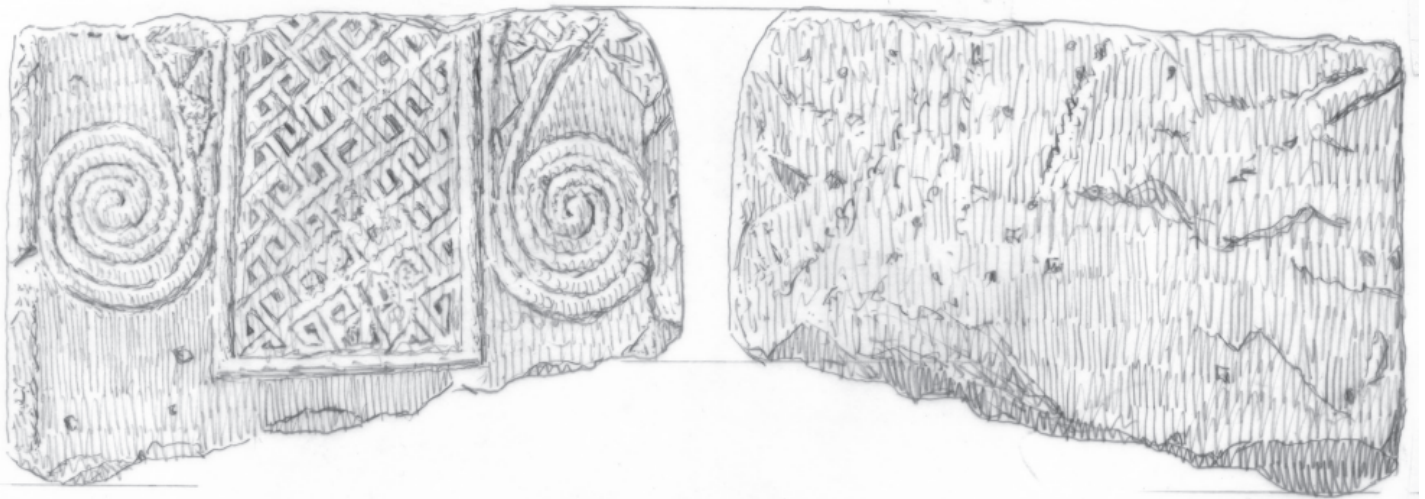
Another carved stone discovered at Wester Denoon, Glamis, Angus

The discovery of a second early medieval sculptured stone here, while not a complete surprise, is nevertheless exciting. It adds to our understanding, not only of the history of this area, but also to the relationship of this type of early 'chapel' site to its environment.

This makes it all the more important that such finds are reported to the museum service promptly, in order that all circumstances can be recorded, and, as far as possible, a search can be undertaken to ensure that all relevant evidence is gleaned.

Unfortunately, the circumstances of the reporting of this stone were far from ideal.

Whilst demolishing a steading, the farmer found the stone which had been built into the walls. He did mention this to a local amateur historian, who, through misplaced loyalty – not wanting the farmer to be bothered by 'council officials' – did not report the find, allowing the rest of the steading to be demolished and, indeed, fed through a stone crusher before others knew of the discovery the carved stone. This seems to have happened by the weekend of 17-18 October 2009, but Angus Museums were not informed

2

Wester Denoon 2, preliminary drawing by John Borland (Scale 1:5) © Crown Copyright: RCAHMS

until January 2010, when I received sufficient information regarding the stone's location to allow me to investigate it.

Fortunately one of the 'Friends' of one of our museums told me of the discovery of 'a stone' which led me to contact the Treasure Trove secretariat (TT) in order to confirm the finding and visit the location.

We will never know now if any other similar stones were built into the steading, and it is all the more frustrating when an individual, who claims to be interested in local history, actually covers up such a find long enough to potentially lose crucial information.

However, to return to the stone – it is a wee cracker! This is my notebook entry at the time I first examined it:

> [I was] surprised that it was fairly dry and clean, although there is some mortar and more recent cement here and there. There is an algal flush on the carved face which must have been the exposed part when it was built into the now demolished steading. The photograph is upside down, and what we have is the bottom third or so of a cross-slab, the lower part of the shaft of the cross being infilled with diagonal key-pattern, while two spiral-tailed beasts flank it. The break cuts off their upper bodies, although the right one has part of what seems to be an upper limb. The carving is fairly sharp, and is not really worn.

> The other face is very worn, and looks like it may have been re-used as part of a floor. There may be some very faint carving.

I found it standing upside down by the farmhouse door, and both the farmer and TT were more than happy for it to come into the safekeeping of Angus Museums, so I took it to the Meffan in Forfar where Wester Denoon 1

had gone. The TT panel duly declared it Treasure Trove, and Angus Museums successfully bid for it to be added to the Meffan collections. I contacted John Borland of RCAHMS in order that he could draw/photograph and fully record the stone, and his excellent drawing accompanies this note.

This discovery re-enforces my thoughts on the 'chapel' at Wester Denoon. O.G.S. Crawford had wrongly attributed a location for this site on the flood plain of the burn nearer Easter Denoon. Wester Denoon 1 was found upstream of this just by the steep-sided ravine made by the burn, where a row of gean trees grow by the fence. Stirton in his *Parish History of Glamis* mentioned a row of cherry trees which Crawford took to be of the ornamental variety connected with the castle, but the gean trees fit the bill for such an early church site much better. Wester Denoon 1 is decorated with Pictish symbols, which leads me to consider a late 9th or early 10th century date for its manufacture. Wester Denoon 2 does not bear symbols, but is similar in size. The traces of mortar and cement on it show that it has been re-used on at least two occasions, and it may even have been built into the castle before it ended up in the steading. A fair number of stones from the castle have survived and lie in a heap not far from the farm.

Other than these two stones, we know little of this Pictish church for no traditions have survived regarding its dedication and its exact location. We must remain vigilant of any developments in this area and trust that any future discoveries are reported promptly to Angus Museums.

Norman Atkinson
August 2010

Pictish symbols and language

Bob Henery

Pictish symbols are revealed as a written language through the application of Shannon entropy, according to Rob Lee, Philip Jonathon and Pauline Ziman, writing in the *Proceedings of the Royal Society*. Most of us would probably accept this conclusion, though we might have difficulty in understanding how the authors arrive at it. However, the most important question is this: can information theory pinpoint those properties of Pictish symbols that most resemble a language? The short answer is no: entropy and information measure apply to the whole assemblage of words, or syllables, or letters. Ideally we would like a breakdown of entropy into constituent parts, each part identifiable with an aspect of language: this amount for grammatical structure; that amount for spelling rules; another amount for differing Classes, etc. The authors split the data in Classes I and II, which is good, but still do not identify what, to my mind, are the most language-like properties of the symbols, which apply equally well to both classes. These language-like properties are: (i) a single symbol on a stone can form a complete Pictish text; (ii) the *mirror* symbol has a meaning related to females; (iii) the *mirror* symbol is special in that it generally appears after two other symbols; (iv) with only one exception the *mirror* symbol is never repeated on a stone; (v) the archetypal Pictish stone has only two symbols that are almost always different. Entropy or information measures on pairs of symbols would miss out on all these points except the last. Only that part of my argument concerning pairs of symbols would appear as a component in the Shannon entropy, but it is not identified as such, so I cannot reconcile their argument with mine. Let me say a little more about my argument before I return to the complexities of entropy.

What do Pictish symbol stones look like?

Let us remind ourselves what typical Pictish inscriptions look like. There are about 30 or 40 Pictish symbols, and there is some debate about which Pictish designs are symbols and which are not[1]. Most often the inscriptions consist of either two standard symbols alone, or two standard symbols with a *mirror* or *mirror and comb*. Table 1 below shows some arrangements, as they appear on at least one Pictish carved stone of Class I. The typical stone has exactly two symbols, one above the other, either with or without a *mirror* below. In all there are 114 typical Class I stones, 42 of which have *mirrors*, and 72 do not. 54 stones have exactly one symbol, but only eight of these have a *mirror*. One-symbol stones are mostly fragments, or small stones with a single animal symbol, like the Burghead *bulls*, which are never accompanied by a *mirror*. In Class I, six stones

have more than three symbols, and these are usually on opposite sides of the stone, so may constitute different 'texts'. None of the six has two *mirrors*.

Table 1 *Examples of Class I Pictish stones, at Burghead; Nether Corskie; Fiscavaig; Knockando 2; and Knockando 1.*

One symbol n=46	One symbol and *mirror* n=8	Two symbols n=72	Two symbols and *mirror* n=42	Three symbols n=4
Burghead	Nether Corskie	Fiscavaig	Knockando 2	Knockando 1

On the other hand, there are many combinations of Pictish symbols that might conceivably occur but have not been observed so far. Table 2 shows some of these possibilities.

Table 2 *Theoretically possible, though unobserved as yet, arrangements of Pictish symbols.*

Possible but unobserved sets of Pictish symbols					
Two symbols			Two symbols plus *mirror*		
Cno	Cno	Cno	Cno	Cno	Cno

Cno = Combination not observed

What we do not know is whether unobserved pairs, like those in Table 2, are not observed simply by chance, because they involve very rare symbols, like the *stag* or *bull,* or whether there is some grammatical rule that forbids these pairs. For instance, the *crescent+V* is relatively common, but it never appears twice on standard stones (with exactly two symbols). Nor does the *elephant.* In language terms, we must distinguish between syntactic or structural zeros (combinations that are banned by the language structure) and sampling zeros (combinations that by chance have not been observed so far). This gets to the root of the question: is there a 'grammatical rule' that forces the second symbol to be different from the first? The fact that the *mirror* normally accompanies a pair of symbols, and, if it does, appears below that pair, seems inherently structural also, as part of the grammar of the symbols.

Do Pictish symbols have a meaning?

The *mirror* seems to have a specific meaning, related to females[2]. With such an everyday meaning it is hard to explain why the *mirror* is entirely absent from the

East Wemyss caves, where there is a profusion of standard symbols. Nor does the *mirror* occur on silver, or bone, or natural rock, or carvings depicting a single animal (like *bear, bull, horse* or *deershead*), or small stones generally. This suggests that the *mirror* is only used in certain contexts, perhaps when the symbols are inscribed on memorial stones. So we have a meaning for the *mirror* (female)*,* we have a context for its use (accompanying a pair of symbols on standard sized stones), and we have a structure or grammar determining how it appears in relation to the other symbols (after a pair of standard symbols). By contrast, we have very little idea about the meaning of the other symbols, except perhaps the *crescent+V*, which might just possibly be associated with the Christian cross. A related observation is that some symbols are relatively more common in some regions, or in Class II (stones that have a Christian cross).

Singleton symbols.

A singleton symbol can hardly represent a constituent part of a word (e.g. letter), it must represent a word at least. Indeed, it must comprise the whole Pictish statement on the stone, and so must carry a meaning[3]. But it is doubtful if the single animal symbols have the same kind of meaning as the geometric symbols, for example, for the simple reason that the *mirror* never accompanies a single animal symbol[4].

Can we make anything of the pairings of symbols, even if we know little about the meaning of the symbols? Can we make anything out of the fact that symbols occur almost entirely in pairs, and indeed one pair of symbols to a stone seems to be the order of the day? Information theory might be useful here, as it is concerned with the information contained in sequences of text, typically measuring the average information carried by a letter, or by a pair of letters. Before we can assess what information theory can do for Pictish symbols, and what its limitations are, we should state all that we know about the pairing of symbols (it's not very much). Apart from the existence of a few localised fashions for a particular pair of symbols, the only general rule we know about the pairing of symbols is the following.

Table 3 *Frequency of pairs of symbols on complete two-symbolled stones (most popular symbols only).*

Lower symbol	Upper symbol						
	0	7	0	2	0	0	0
	5	0	1	4	2	1	4
	1	0	0	0	1	1	0
	2	7	2	0	4	1	0
	0	1	0	0	0	0	1
	0	1	0	0	0	0	0
	0	1	0	0	0	0	0

Pictish symbols never occur as twins.

On a standard Pictish stone that has exactly one pair of symbols, the two symbols are never the same. Table 3 gives the number of pairs of symbols for symbol stones with exactly two symbols. For reasons of space, only the most common symbols are listed. For reasons of sparseness of data, the count includes stones from both Classes. There are far too few examples to make any firm conclusions, but there is just a hint that, if a stone has a *rectangle* and a *crescent+V* symbol, the *rectangle* tends to be at the top (4 cases to 1). More importantly, note that more than half of the possible pairs of common symbols have never been observed, and it's even worse for pairs involving the least common symbols. The only hope is if we can find a pattern that involves many cells, for we can combine them, and make much more informed conclusions. So we concentrate on the principal diagonal of Table 3, i.e. we look at those pairs where both symbols are the same. All the entries on the principal diagonal are zero, and not just for the common symbols – for the whole table.

What we have here seems like a universal property of Pictish symbols.

The lack of repeated symbols smacks of a general rule. Each symbol has a particular meaning, and repeating that symbol would carry no new information. Do these characteristics of Pictish symbols have anything in common with words or letters in written language? Successive words are almost always different in English, but successive letters are often the same. This ban on repeated symbols has a corresponding property of the *mirror* symbol.

Apart from a single exception, the mirror never appears twice on the same stone.

We are perhaps so used to the fact that the *mirror* appears only once on standard stones that we do not appreciate the full significance of this. The rule seems to be that two standard symbols are chosen for the pair, and either no *mirror* or exactly one *mirror* is appended. With a single exception, when *more than two* standard symbols are inscribed, the same rule seems to apply: at most one *mirror* is appended. That single exception is Rosemarkie, which has two *mirrors,* and is almost unique among Pictish stones in having no less than three *crescent+V* symbols, two of which form a pair[5]. Rosemarkie is also among the very few stones with a Christian cross on both sides of the stone, perhaps suggestive of a connection with the multiplicity of *crescent+V* symbols. Whatever message is transmitted by a *mirror*, it is never repeated in a single statement.

Calculation of the entropy.

To calculate the entropy, we need to calculate the quantity $-p \times \log_2(p)$[6], where p is the probability of a symbol, or pair of symbols, or whatever, and sum these quantities over all symbols, or all pairs of

symbols, etc. And if we have all this information, i.e. if we know all the symbol probabilities, we should be able to pinpoint which specific symbols, or pairs of symbols, or triplets of symbols, are common, and which are rare. We can make reasonable guesses at symbol probabilities by looking at all known symbol stones and counting the number of *elephants,* or *crescent+V*s, and so on. But we restrict our attention to complete standard stones, i.e. stones that have exactly two standard symbols and, most importantly, are not just fragments, so we can be sure that there were never more than two symbols on the stone, when complete. This reduces the number of 'texts' available for analysis, but results in a purer group of stones.

The entropy of Pictish symbols is more in Class I than in Class II, the entropy being 4.12 bits in Class I and 3.56 bits in Class II, implying that Class II symbols are more predictable than in Class I. But these are global statistics, saying simply that Class II is more predictable, or less random. They give no clue as to how or why Class II is more predictable. We have to look at individual symbols to find the reasons for this change in predictability. For instance, if we consider the *elephant* symbol, it appears on 15% of Class I stones (27 stones among 180), and on $33^1/_3$ % of Class II slabs (23 slabs among 69). Now the first step in determining the entropy is to measure the probability p of every symbol, not just the *elephant*, and to sum the quantity *-p.log(p)* for all these symbols. The *elephant* contributes – 0.15 x log(0.15) = 0.41 bits to the entropy of Class I, and – 0.333 x log(0.333) = 0.53 bits to the entropy of Class II. In principle we could keep track of these individual contributions, and isolate those that contribute most to the difference in entropy. This involves further complications, and is rarely done. The usual approach is simply to quote the total entropy figures, namely 4.12 bits for Class I and 3.56 bits for Class II. A difference in entropies implies a difference in the set of probabilities, but it is important to remember that identical values for the entropies for two populations does not imply identical probability distributions.

The major difficulty in applying entropy concepts to Pictish symbols is the sparseness of data.

There are not even enough Pictish symbol stones to measure precisely the probability of observing every symbol, never mind the probability of observing every pair of symbols. Take the rare symbols (*dogshead, helmet, horse, square*), each of which occurs only once among a total of 316 observed Pictish symbols. We estimate the probability of any one of these rare symbols as 1/316, but we would get a more accurate estimate if we had, say, ten times as much data, so our estimate might look like 10/3160, 12/3160, or some such figure. The problem is much more severe for pairs of rare symbols. The

pair of symbols (*helmet* above a *square*) would have probability something like (1/316) x (1/316) = 0.00001, say. We need to expand our dataset to ensure that we observe a substantial number of (*helmet, square*) pairs, say at least five, to measure the true probability with some degree of confidence. To ensure that we observe about five pairs (*helmet, square*), we would need about 2000 times as much data as we have now, or about 500,000 stones. We might need even more data, if even rarer symbols turned up in the interim. Fortunately, with a sole exception, there is no pressing need to consider triplets, as Pictish symbols almost always occur in pairs, usually one pair on a stone. That single exception involves the *mirror.* There is always the possibility that a *mirror* has a higher probability of being attached to some pairs of symbols, and so has some special relevance to the message conveyed by those pairs. For an accurate determination of this for all possible pairs, you would need twice as many stones, i.e. about one million stones.

What would correspond to a grammar of Pictish symbols?

Would it be the rules governing which symbols appear on a stone, and in what order? In the English language, spelling conventions determine that some pairs of letters are very common (AB, BB, QU, SS, TH) but other pairs of letters never occur except perhaps in foreign words (QW, QB, CZ). But American and English spelling conventions differ though the word might be the same. For example, Americans might use 'thru' where English would use 'through', 'color' instead of 'colour', 'center' instead of 'centre', 'leveled' instead of 'levelled'. The general rule would be that American spelling is simpler. Discovering that general rule from a comparison of the frequency of occurrence for some letters, e.g. (ER, RE), (RU, RO), (OR, UR) would be possible in principle, but certainly not if we are told simply the entropies for English and American English.

Pairs of letters in English.

One measure of the structure of the spelling conventions is given by the entropy of the pairs of letters. The entropy of single letters in the English alphabet is about 4.14 bits, but the combined entropy of two successive letters is 7.70 bits, showing that the second letter contributes only 7.70 – 4.14 = 3.56 bits to the entropy. This reduced entropy of the second letter tells us that a letter is more predictable if we know the preceding letter, but it is not specific. It does not tell us that after Q the next letter is almost always U (very predictable); or that after T the next letter tends to be H (less predictable); and so on. The entropy of three successive letters in English is 11.0 bits, so the entropy of the third letter is 11.0 – 7.7 = 3.3 bits, showing the reduced randomness of a letter if we know the preceding two letters. Again, it is not

specific. It does not tell us that some three-letter combinations are very common (AND, THE), some are less common (PIC, TIS), and some never occur (PZQ, CCC).

Rules governing the pairing of symbols.

Now it so happens that among Class I stones with exactly two symbols, an *elephant* is never accompanied by another *elephant,* a *crescent+V* is never accompanied by another *crescent+V,* and more generally the two symbols are never the same And this pattern holds for Class II also, subject to an important proviso that we explain later. And something similar holds for the *mirror*: no stone has two *mirrors.* This looks like a general pattern, which we interpret as a grammatical or spelling rule. This particular rule seems to operate in both Classes, so it is natural to ask whether all the rules of grammar or spelling were the same for the two classes, even if the relative popularity of symbols differed. In general terms, by 'rules of grammar' we would understand the set of all the rules which govern which symbol, word or letter follows another (including the rule that no symbol appears twice in the same pair). Such a question could be answered, in principle, by looking at the mutual information of the two classes of stone.

Superficially at least, the most interesting fact to emerge from Table 1 of Lee et al's paper is the *near equality of their measure of 'digram entropy' in Classes I and II:* 1.28 in Class I and 1.36 in Class II (using Mack's definition of the symbols). The fact that these measures of information are nearly the same would suggest that the rules for the alternation of symbols/words/syllables are (nearly) the same for Classes I and II. If the reader is prepared to accept, at least as an analogy, that Pictish symbols represent elements of a written language, and that the rules for the pairing of symbols are analogous to a grammar in that language, then the equality of these entropy measures in Classes I and II is consistent with the grammar of the symbols being the same in both classes. Now the standard entropy measure for a single symbol in Class I is 4.14, and for a pair of symbols it is 6.21. The increase in entropy due to the second symbol is therefore $6.21 - 4.14 = 2.07$ bits for Class I stones. In Class II it is $4.71 - 3.56 = 1.15$ bits. This seems to arrive at a different conclusion: the entropy of the second symbol in a pair is less in Class II than in Class I. However, I do not trust these measures, either the standard or those of Lee et al, because the number of symbol stones is woefully small, especially in Class II.

The problem will be understood better if we look at those properties of Pictish symbols most relevant to information theory. There are about 249 stones with Pictish symbols (180 Class I and 69 Class II), but many are fragments, and only about 190 are complete enough to be reasonably certain that no more symbols were on the stone in its original condition. Of these,

perhaps 146 have exactly two symbols, discounting the *mirror* (115 in Class I and 31 in Class II). Yet there are potentially 30 x 30 possible pairs of symbols, so the bulk of possible pairs have not been observed. If we add to our list of Pictish symbols the *bear* inscribed on a recently discovered stone from Scatness, that would increase the number of possible pairs from 30 x 30 to 31 x 31. In theory the *bear* could be paired with itself, or any of the other 30 symbols in either first or second place, giving us an extra 61 possible Pictish inscriptions to consider, none of which have been observed so far. There are two ways to avoid this problem of empty cells: (i) reduce the number of allowed symbols by any fair means; and (ii) lump together whole classes of symbols. An example of the latter procedure is the division of Pictish symbols into two groups, animal and geometric. In the analysis of language, Markov looked at the alternation of vowels and consonants in the poem Eugen Onegin.

ECMS's or Mack's choice of symbols.

Lee et al suggest that symbols represent words or syllables, depending on whether the symbol set is that proposed in ECMS or Mack. This is very surprising, in itself, as ECMS and Mack will agree in the bulk of cases. There will be a small number of stones where the two differ, like Strathmartine 2, where ECMS can see two *serpent* symbols, and Mack can see none. Or Strathmartine 5, where Mack can see two 2-*disc+Z* symbols, as can ECMS iii, but ECMS ii can only see one. There are too many faint carvings, and too many potential symbol stones (is it Pictish or not?), to expect unanimity. But it should be noted that my five language-like properties of the symbols are only minimally affected by which authority is adopted (ECMS or Mack). Both authorities say there is only one stone with two *mirrors* (Rosemarkie). Both authorities agree that among stones with only two symbols there are only two cases where the symbols are the same. ECMS says the two are Strathmartine 2 with twin *serpents,* 'and Moniack (=Torgorm) with twin 2-*disc+Z*s. But according to Mack, they are Strathmartine 5 with twin 2-*disc+Z*s, and Torgorm with twin 2-*disc+Z*s[7]. Though I agree with the assessment of Strathmartine 5 in ECMS ii, I side with Mack for Strathmartine 2.

Censoring twin symbols increases the inform-ation content, and so increases the entropy.

Suppose we know the first symbol is a *crescent+V,* which is the most popular symbol. Without censoring, the most likely choice for the second symbol would be the *crescent+V* also. But if there is a rule that duplicate symbols are not allowed, a symbol with lower popularity must be chosen. The effect is to decrease the observed number of *crescent+V* symbols, and increase the number of less popular symbols. This reduces inequalities in symbol

probabilities, so increasing the entropy. From the practical point of view, repeating a symbol does not increase our knowledge if each symbol represents a message, but sending two different symbols would generally be more informative, as two different messages would be transmitted.

Notes

The *comb:*
> The *mirror* symbol may be accompanied by a *comb*, but there is no certain case where the *comb* appears without the *mirror.* Thus the presence of a *comb* adds little to the information content of the symbols, apart from confirming the presence of the *mirror*. The text makes no distinction between *mirror* and *mirror+comb.*

1 It is a rather unsatisfactory state of affairs when conclusions depend critically on whether we use the symbols listed in ECMS, rather than Alastair Mack's list in *Symbols and Pictures*. Mack has the advantage of including many stones discovered after ECMS was published. There are as many as 44 symbols on Pictish stones, but for entropy purposes we exclude the *mirror, comb, hammer,* and *anvil,* as well as a few solitaires like the *bear, helmet, horse*. Only 30 symbols appear on standard stones (with exactly two symbols). I have followed Mack's descriptions of the symbols, but this is not critical for my purposes.

2 See Mack, *Symbols and Pictures*, chapter 5, for a discussion of the meaning of the *mirror*.

3 Unless, of course, the symbols are purely decorative.

4 The *mirror* is very occasionally the only symbol on a stone, as on the Newton (Pitmachie) stone which also has ogham.

5 The only other stone with more than two *crescent+V* symbols is Dingwall in Class I.

6 Logs are to base 2. If another base is used for log(p), convert via $\log_2(p) = \log(p)/\log(2)$.

7 The sketch of Strathmartine 5 in ECMS cannot be reconciled with two *2-disc+Z* symbols, since the lower of the two (as sketched) would lie partly outside the left hand edge of the stone, and would be very oddly aligned relative to the upper symbol.

Correspondence

Dear Editor,

I think it is very useful to have different disciplines applying their methods to the symbols in an effort to discern their real meaning.

Has anyone approached the Wycliffe Bible translators, to discuss their very up-to-date methods of linguistic analysis? This might be of considerable help, since they are working in a similar field, with previously unrecorded languages whose underlying patterns must be first discerned and understood before any 'translation' process can even begin.

There is also the Faculty of Modern and Mediaeval Languages, Sidgwick Site, Cambridge University, where research is ongoing into all aspects of language and communication; their interest and expertise might be fruitfully harnessed.

It occurs to me that the way the figures are facing on the symbol stones may also contain a meaning. Has this been adequately researched, especially in comparison with similar work from continental tribes at a similar social stage?

Another aspect of some of the symbols is reflected in what Piers Vitebsky discovered among the Siberian reindeer herders (*Reindeer People*, 2005, p.330).

> To visit a recent grave was to stand in an eerie silence of shattered objects, each symbolically 'killed' so that it could pass into the next world. Vodka bottles were smashed, cigarettes snapped in two, wooden sledge-runners cracked, tin bathtubs punctured. On a child's grave, toys were ripped and dolls mutilated. The grave was a portal from this world to the next which sucked in not only the dead but also everything that the living brought as offerings …

> It was here that death most clearly revealed the essence of the Eveny person as an external nomad. One might think that the grave was a place where a nomad came to rest and was no longer preparing to move on. But the violence done to these offerings showed that they were being sent on an onward migration, slipping through the portal after their owner. Transformed irrevocably by their destruction, the reindeer, cigarettes, and bottles would continue to follow the dead person around a succession of camp sites …

A further related aspect concerns metal (p.429, note to p.344):

> … throughout Siberia the iron reindeer antlers of a shaman's headdress and the models of spirits which are sewn onto the shaman's robe are made by a blacksmith, who has a hereditary magical power parallel to that of the shaman – the power to shape iron into aggressive or protective objects. The blacksmith is said to be the one person who is immune to the shaman's power.

Hope this is useful. Yours etc.

Althea Tyndale, Llanilar, Ceredigion

We have had to reduce the point size of the text of the contributions on pages four to eight in order to fit them into this 8-page issue. Apologies to Bob Henery and Althea Tyndale. *Ed.*