8 Conclusions

This work has tried to show two things: that there are a number of ways in which a computational approach can be brought to bear upon Roman cadastres, and that a multi-disciplinary strategy of investigation can inject some reality into the bare framework which the numbers reveal.

Emerging evidence seems to reveal a new landscape in Roman Britain, deserving further investigation. A computational approach, in its widest sense, must play a part in these investigations and, both locally and in the context of the Roman world as a whole, it can help to generate a deeper understanding of ancient cadastres.

8.1 A new map of Roman Britain

Research on ancient cadastres in the last 20 years has, with the exception of a few Greek or unclassified examples (Benoit 1985; Clavel-Lévêque 1983b: 208-218; Stancic and Katic 1990; Stancic and Slapsak 1988), been pushed forward by the study of Roman centuriations. In western and north western Europe we have moved from the position in which there were hardly any systems known, even in Gallia Narbonensis, to the recognition that centuriation was a commonplace and continuing process in that area, as elsewhere.

We have seen a progressive movement of acceptable cadastres northwards from the Mediterranean. The cadastres of Valence, in the Rhône valley, have been attested by excavation (Chouquer and Odiot 1984) and, much further north, the superimposed systems of the Finage have achieved recognition in the pages of *Gallia* (Chouquer and de Klijn 1989).

It has taken about 20 years for Roman centuriations to move, at least in imagination, from Béziers (Clavel-Lévêque 1970) to an area in eastern France, lying within the north western part of the Empire. A projection of this trend implies that the centuriations of

northern Gallia Belgica, such as the South Limburg system described above, will have achieved reality in another 20 years. If that happened it would be very much harder for us to dismiss the possibility that the same processes were in train on the other side of the channel, in Britain.

This is slow progress, but it may be possible to accelerate it for several reasons. One reason is that Britain's cadastres are highly visible, particularly in our island's fertile south and east. In general it can be said that British cadastral traces, such as those of Kent *(figure 6.3)* or Lincolnshire/Leicestershire *(figure 6.7)*, compare well with many undoubted centuriations. If they were removed to a different context, such as the Mediterranean, they would be perfectly acceptable.

It is not just a question of appearance. Trigonometrical relationships with Roman roads are also an important indicator of a cadastre's existence, and here again Britain is well served. Many Roman roads are known and their routes are well defined. This makes it possible to make repeated tests of the theory of oblique planning.

Here it can be concluded that the theory, so far, stands up. When a new section of Roman road is postulated after the publication of the South Norfolk 'A' hypothesis, in an area where an apparently planned segment already exists, it too appears to have been planned *(figure 5.26)*. When a very long section of a very early road *(figure 6.7, C)* is precisely at 1:2 to a later cadastre - a fact which threatens to destroy the theory - we find that earlier research has revealed that this section of road was reconstructed, for no apparent reason. Thus the theory is vindicated, and may also provide a range of explanations for observed relationships which were previously inexplicable.[185]

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185 The existence of the cadastre may also explain anomalous settlement location, as we have seen.

These are general conclusions, but there is also a most telling particular feature which says a lot about the likely reality of the two major systems whose investigation has only just begun. It has been shown that the Kent 'A' system includes, in Romney Marsh, a watercourse which some authors take to have been a major river in the early middle ages, and which, as argued above, may have been a canal. This watercourse is very close to a postulated *quintarius*, 45 centuries from a major Roman road leaving Canterbury *(figure 6.4)*. This is to be expected, given the hierarchy of *limites* so plainly prescribed by the *agrimensores*.

What the reader can have hardly failed to notice is that this pattern is repeated in the Lincoln 'A' cadastre. Again it is assumed that a main road leading from the town is a major axis. Again a canalised river - and this time it is virtually certain Roman - lies near a *quintarius*. The only difference is that the distance, 90 centuries, is doubled.

A principle seems to be in operation here which makes *quintarii* important, both conceptually and physically. This seems to fit so well with the spirit of the *agrimensores* that, without further investigation, it becomes difficult to reject the the idea that these cadastres exist.

At first sight these hypothetical British cadastral systems may seem exotic, unreal and incredible. Yet it becomes increasingly clear, given precedents set in Africa, that if any formal cadastres existed in the province then they would have been set up on a grand scale. They would have approached, and in some cases exceeded, the size of the present English counties and would thus be extremely prominent on some future map of Roman Britain.

This is not the first time that such an idea has been proposed. Similar ideas was put forward by Henry Charles Coote (1878). His work was badly received for several reasons. These include his odd and unacceptable ideas about supposed English-speaking inhabitants of Roman Britain, and his style. Nevertheless he made some interesting points and we can see that, as a lawyer and

author of a much reprinted legal textbook, he was an expert in his own field.

One of his ideas (1878: 113) was that "[several] English counties are … decussated [divided up by two lines crosswise] by the Roman roads of the greater magnitude", and that "In all these cases such roads are the *decumanus* and *cardo maximi* of Roman **territoria*, and towns of Roman foundation, at the point of intersection of these roads are the *civitates* [civitas capitals] to which these *territoria* belonged". This seems absurd since it is contradicted by the facts of geography, but in the case of Canterbury and Lincoln (although the latter is not a civitas capital but a *colonia*) he may have been at least half right. These towns do have major Roman roads issuing from them which, it has been suggested, may well have been *limites maximi*.

Now, the suggestions being made here are much less grandiose than Coote's, and hopefully less simplistic, but they go almost as far as him in picturing large parts of several *civitas* territories as being structured by centuriated cadastres. These cadastres would have had a profound influence on economic and social life, perhaps greater than that of any other element of the cultural environment. Thus they ought to be on the map of Roman Britain, even if there are large areas of uncertainty *(figure 8.1)*.

This uncertainty needs to be reduced, and clearly a single individual cannot successfully pursue all potential avenues of research.[186] Multidisciplinary teams would need support in order to approach these problems and to start to construct an atlas of Roman cadastres in Britain, just as CNRS research funding has supported the same activity in France. This might possibly and eventually overcome the inevitable opposition to the ideas presented here. If so it would give Britain a revised status within the Roman world, as the possessor of some of Rome's most impressive artifacts.

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186 Sattelite remote sensing, as used in areas of Roman cadastres in Italy (Barisano, Bartholomé and Marcolongo 1984; Marcolongo and Mascellani 1978), might give valuable results in Britain.

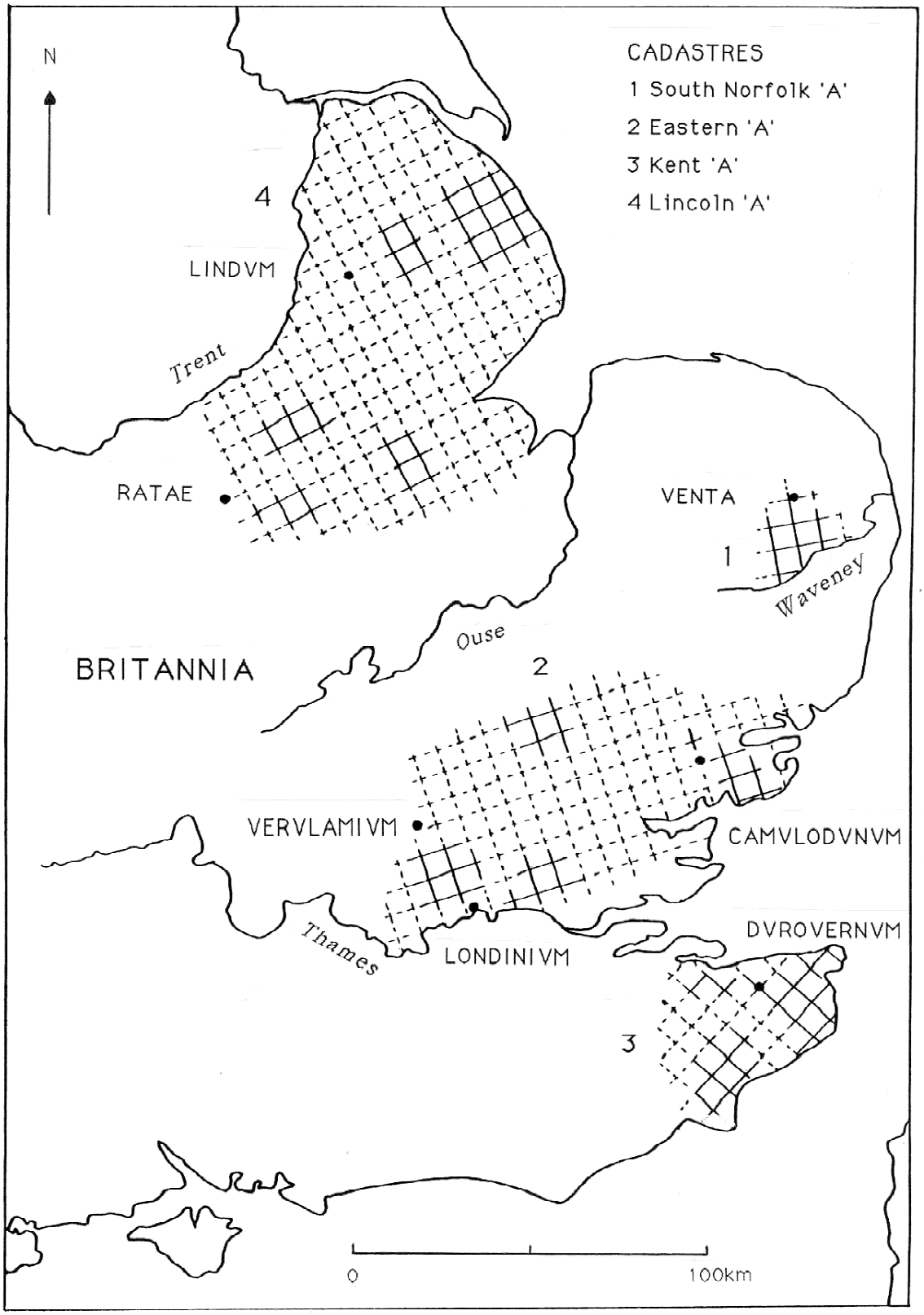

Figure 8.1 Roman cadastres in Britain.

8.2 A quantitative basis for cadastral research

We may also conclude, possibly with less fear of contradiction, that computation can be used as a sound basis for the study of ancient cadastral systems. This is at two levels: one is straightforward and relates to the techniques of investigation; the other is deeper since it involves an understanding of the statistical nature of these systems and of the complex mathematical ideas that seem to have been in the minds of their creators.

At the technical level, only computation gives precise modules and angles for cadastres. Specifying the orientation of a cadastre in vague terms is not satisfactory. We have seen from the Saône plain system that misleading results can arise if geographic north is used as a reference and that in that case there is no detectable variation from a constant angle, so long as the Lambert grid of kilometre squares is used as a basis for the location of grid intersections. On this basis other Roman surveys could be equally accurate. If this is so, then only computation will allow us to detect significant minor anomalies such the discrepancy in Orange B *(3.1.2)*. The slight misfit may not due to error, but may hint at the possibility of separate development of the southern portion, with different parameters. Confirmation of this would be important historically.

Only computation allows us to project theoretical grids over areas which may be inadequately covered by computer-ruled transparent overlays because of the unavoidable margin of error of plotters and instability of paper maps. With computational aids it becomes possible to study cadastres, and supposed cadastres, on a much larger scale.

At the deeper level, the study of ancient cadastres demands the use of statistics. Their properties are properties of the system as a whole and they only appear statistically. The potential outcomes are so rich and varied that there is no deterministic rule which says that any particular phenomenon will be observed at any particular place.

Gérard Chouquer (1989) gets close to this idea, but he prefers to use the metaphor of modern music. As he says (1989: 102), ""devant la complexité de l'écriture musicale, et l'abondance des événements musicaux, l'interprète doit effectuer un choix car il ne peut - à certains moments - tout jouer".

This analogy is a most striking, but it seems unnecessarily remote from the subject matter. A more prosaic view, taken here, is that these cadastral systems, despite their superficial appearance of obviousness and rigid determinism, are primarily conceptual and probabilistic. They include many connections which, if they ever existed in a physical form, we can no longer see. They were lived in by human beings who could and did[187] distort the order which the authorities had tried to impose. They were in several cases taken over by people of the Middle Ages who did not appreciate the concepts behind their formation, and who used only some of their physical elements to make a *bricolage* of the countryside. These factors produce a pattern which can only be appreciated statistically.

This is a perceptual problem for the pure empiricist[188], but it should not be so for most scientists. Who, for example, has ever seen an atom? Nevertheless everyone proceeds on the basis that they exist, with significant outcomes for the human race. Statistical

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187 " ... les vétérans avaient d'eux-mêmes modifié mutuellement la taille de leurs lots par échange ou par vente, et les avaient adaptés aux limites naturelles." (Hinrichs 1988: 206).

188 According to Christopher Tilley (1991: 14) the pure empiricist has " ... an attitude of mind ... both pervasive in much research on Scandinavian rock carvings, and indeed in contemporary archaeology as a whole", which subscribes to "a rigid doctrine of atomistic particularism in which it is assumed that nothing is related unless it can be proved otherwise so the occurrence of the same or different figures on the same or different rock surfaces has no necessary significance. The only possible proof of any relationship is ascribed to the realm of sense perception: individual rock carvings are not related unless they are joined in some way, unless there is a visible connection."(1991: 12)

treatment is needed because it is an essential instrument for the comprehension of a system which can only be studied scientifically as a whole.

Also at this deeper level, computational ideas can be used more speculatively to attempt to get inside the minds of the *agrimensores*. This is clearly not a field reserved for members of one discipline. Tom Williamson may reportedly criticise those who play with ley lines[189], but such people, who may have relevant skills that archaeologists do not normally acquire, could be in a good position to understand and appreciate the technical abilities of the Roman land surveyors. There are also other professionals, including mathematicians, who may be interested in this game. Francis Haverfield (1921: 125) saw this, with his suggestions to those antiquaries with "a taste for playing with instruments".

It is thus extremely interesting that, according to Monique Clavel-Lévêque's (1991) description of the "jeux de construction" around Béziers, the *agrimensores* also were playing construction games. which were satisfying in several ways.

These could have had practical ends; the use of symmetries is an example. Translational symmetry can be seen in parallel offset segments of road, for example in Béziers B (Clavel-Lévêque 1992: fig. 2) and South Norfolk 'A' *(5.1.5.1)* where in both cases the

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189 Ley lines are hypothetical lines connecting prehistoric (or supposed prehistoric) sites. The case has been put for (Devereux and Thomson 1979) as well as against (Williamson and Bellamy 1983), but, in the author's eyes, there is no real evidence for their existence.
According to Alison Utley (1992), Williamson's view is that "It is quite incredible and difficult to explain why these kind of myths are still so popular and not just among hippy cranks. They seem to give people a kind of popular repossession of the past." She also reports him as saying that Ley lines are particularly attractive because all you need to become harmonised with the earth's currents is a thick pencil to trace lines,and that "Typical followers were retired surveyors and engineers who liked working out statistics."

repeated angle is 3:5. This would simplify specification. Mirror symmetry, as at Cremona *(figure 8.2)* where the quadrant to the north west of the settlement is divided into three nearly equal segments, provides equal opportunities for access.

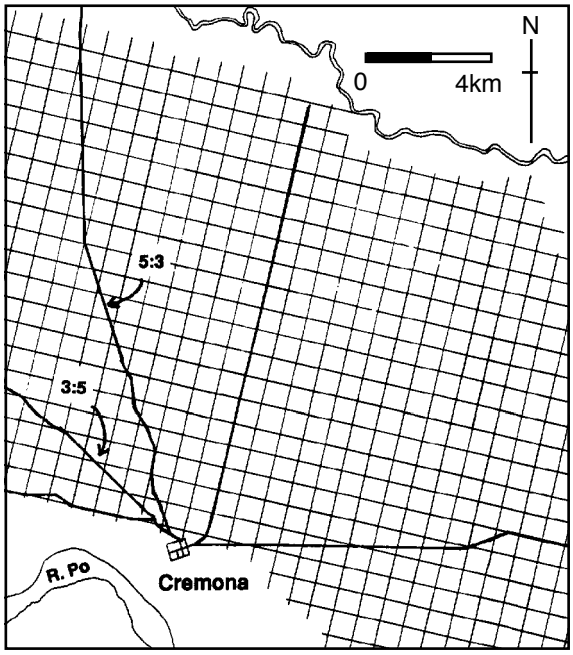

Figure 8.2 Symmetrical roads at Cremona, after Tozzi (1972: fig. 5).

As another example, there is some practical value in linking new features to pre-existing features of the landscape, when new superimposed layouts are to be constructed.

But we may also suspect that such geometrical figures could have been made for their aesthetic appeal. Even in an obscure corner of the empire, at Hempnall *(figure 5.28)*, we can be impressed by a geometrically economical rearrangement of the landscape.

This game thus gives practical and intellectual satisfaction and it may indeed have been intended to promote the harmony of the societies involved[190]. As Lewis Carroll (1939 [1872]: 150) said through the mouth of his heroine "Its a great huge game of chess that's being played - all over the world - if this *is* the world at all, you know. Oh, what fun it is!"

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190 On this point, see Clavel-Lévêque (1992: 176).