EDITORIAL: RESEARCH ON INTRASITE AND REGIONAL SPATIAL DISTRIBUTIONS

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Forty years ago Grahame Clark observed that "archaeological distribution maps have been one of the main weapons in the armoury of the prehistorian" (Clark 1957:153). The three contributions published in this number of Ontario *Archaeology* suggest that spatial analyses, at both the intrasite and regional levels, continue to be important components of our research. The good news is that human behaviour is not entirely random but is constrained by a variety of physical and cultural factors which fall along a continuum ranging from idiosyncrasy to universality (von Gernet 1993). The bad news is that many archaeological spatial distributions are similar to those known to be produced by random processes; indeed, in archaeology, as in plant ecology and geography, the study of spatial patterns necessarily begins with the assumption of randomness (Hodder and Orton 1976:9, 30). From this baseline we then endeavour to recognise order or pattern through either subjective assessments or rigorous quantitative approaches. Examples of both are evident in the three papers.

Brian Deller and Chris Ellis rely on spatial analysis to distinguish Paleo-Indian from subsequent occupations at the Bolton Site, as well as to study the associations between scatters and concentrations of various lithic raw materials and tools. They employ the "floating template" originally developed by geographers. This ingenious method passed an accuracy check when Robert Whallon (1984) applied it to Louis Binford's Mask Site — a case where archaeological findings could be corroborated with ethnographic information. This has raised hopes that the technique has transfer value in other contexts, although, in their reply to comments made by one of the reviewers, Deller and Ellis concede that it has a number of inherent limitations. I might add that there are other standard tests and measures used to examine associations between distributions (e.g., Hodder and Orton 1976:198-223) which could have been employed in the Bolton Site research.

Deller and Ellis achieved moderate success because artifacts were piece-plotted even though the site had been ploughed. In our second paper, Peter Timmins examines the site structure and excavation methodology of an unploughed site. He employs models developed to account for the distribution of material remains on hunter-gatherer sites where drop, displacement and toss zones are often identified around hearths. He offers three compelling interpretations but wisely avoids the temptation to express a preference for one. The uncertainty is due, in part, to the fact that his pattern recognition procedure involves a subjective process in which (much like a Rorschach test) a previously observed and apparently structured organization is sought in a new distribution. Moreover, like Deller and Ellis, he must struggle with the additional problems posed by the multi-component nature of the Little Shaver Site.

Timmins' discussion of the relative merits of one-metre-square and piece plotting techniques should convince many Ontario archaeologists to spend the time and money applying the latter method to small, undisturbed sites. Indeed, an argument can even be made for adopting the method in disturbed contexts. I note that Timmins' passing observation that "piece plotting highly disturbed sites would probably be unproductive" appears to be contradicted by Deller and Ellis' recommendation that "such plotting be carried out in the future" on ploughed sites such as Bolton.

I have yet to see a detailed analysis of the relationships between the questions we have about the past, the appropriate spatial resolution required to answer such questions, and the arbitrary quadrats (or combinations of cells and coordinates) we routinely employ out of habit and convenience. One thing seems

clear: archaeologists replacing a non-renewable resource with a written database have a responsibility to maximize information potential through high resolution provenience, even when their own research interests, the objectives of cultural resource management, or fiscal constraints offer rationalization for lower resolutions. The only question is what provenience control is appropriate to permit the study of all variability in human behaviour at the intrasite level? Ultimately, the debate must bring in the conclusions of scholars in other parts of the world. I believe both papers could have benefitted from Hodder and Orton's (1976:30-52) comparison of quadrat and distance methods of point pattern analysis. Johnson (1984) also addresses this issue and suggests reducing quadrat cell size to increase resolution to the point where collection units can replace coordinate recording without an appreciable loss of archaeologically interpretable information. I also hope that, in the future, Ontario archaeologists will investigate the applicability of multi-response permutation procedures (MRPP) and similar methods which work for either point-plot or count-per-grid data in two or three-dimensional archaeological space (e.g., Berry et al. 1984).

Such rigorous analyses will go far in reducing the subjectivity involved in pattern recognition, and they may require collaboration between archaeologists and statisticians. This is successfully accomplished in our third paper — a contribution replete with mathematical notation that will seem arcane even to those archaeologists familiar with the difference between tree roots and square roots or subsquares and Chi-squares. Bellhouse et al. provide statistical models taken from actuarial science, medicine and reliability theory to show, among other things, that the distribution of the distances of Iroquoian sites in southern Ontario to the nearest source of water follows an exponentially decreasing pattern away from the water. The data were collected as part of an Ontario Hydro contract and the models were developed as planning tools to assist in selecting suitable locations for power transmission corridors.

Although the authors suggest that their models are useful for both prediction and explanation, I believe it would be a mistake to use this study uncritically for either purpose. The paper is a contribution to knowledge because it offers a unique interdisciplinary approach to spatial analysis and brings a scientifically-justifiable rigour to what is often an intuitive effort to describe distributions. Nevertheless, I fail to see how such a contribution can circumvent the inherent circularity that plagues much archaeological site potential modelling (particularly the type of correlative modelling that relies on extant inventories). It stands to reason that, if statistical models are used to predict the location of undiscovered sites or to organize a survey area into zones of archaeological potential, such models must be developed using data that was not collected through recourse to an intuitive equivalent of the statistical model. Yet, it has been noted that survey biases involving research focused on drainages constitute a flaw in the provincial site database (MacDonald and Pihl 1994:39) and I see no indication that the data used in this study is exempt from this deficiency.

It is well known that, since different processes may produce similar spatial distributions, there need not be a link between demonstrably associated distributions. Hence, the temptation to use the study as evidence should be avoided. MacDonald and Pihl note that the Ontario Hydro Distance to Water Model has a focus on

> a criterion that is arguably the most fundamental human resource: water. Regardless of a group's subsistence economy, whether based on hunting herds of caribou or growing corn, it will require access to potable water. In addition, access to navigable water can be a significant land-use constraint in areas such as the Canadian Shield where land travel can be very difficult [MacDonald and Pihl 1994:30].

On the face of it, this seems logical and axiomatic. Yet, although no one would argue that access to potable water is a universal human need, most will concede that the effort people are willing to expend in accessing this resource is subject to significant variability within the broad limits of human physiology

and technology and that it would be a mistake to apply Zipf's (1949) ethnocentric "principle of least effort." While there is some evidence that the Hurons located their principal communities near good supplies of springwater (Trigger 1990:21), Bellhouse et al.'s work suggests that at least some Ontario Iroquoian sites were as much as 850 m from the nearest source of any water.

Then there is the question, apparently ignored by many researchers, whether "potable" water (a biological variable) is synonymous with "good" water (a cultural variable). I recall that, in 1603, the Algonquins told Champlain that they considered the waters of Lake Ontario and Lake Erie to be "brackish" (Biggar 1922-1936:1:155), which points to the existence of an aboriginal taxonomy of preference. When I did fieldwork in an Egyptian oasis community there was little choice, since everyone was dependent on a single artesian well that spewed a malodorous and barely palatable liquid. In prehistoric Ontario, where this resource was ubiquitous and options were numerous, it is much more difficult to cite access to water as a significant constraint on settlement patterns or to suggest that the mere presence of water (including swamps and ponds) increases the probability of finding archaeological sites in the immediate environs.

That access to navigable water can be a land-use constraint also seems logical. Here it is important to recall, however, that the importance of such a constraint depends on site function and other criteria. The villages built by the Senecas, Cayugas and Oneidas along the north shore of Lake Ontario after 1665, for example, were strategically located near the mouths of rivers or near portages, so that the inhabitants could effectively reach northern hunting territories and control the flow of furs to the Iroquois homelands (Konrad 1981:135-136). On the other hand, the people who occupied a remote headwater lake site (BiGh-l) in the Madawaska Highlands during the Protohistoric were there to exploit local resources, were not interested in long-range travel and had to walk 15 km over difficult Shield terrain before they reached a navigable drainage (von Gernet 1992:6, 104).

All of this suggests we adopt a cautious approach. No matter how sophisticated and rigorous they may appear, predictive models developed as tools for land-use planners and cultural resource managers cannot stand as research results, but must be tested "on the ground" using the type of exhaustive field surveys which some models are intended to circumvent in the first place. Furthermore, the argument of "diminishing returns," is scientifically flawed since it emphasizes normative patterns at the expense of those exceptional cases which define the all-important limits of variability.

Nor should Bellhouse et al.'s paper be read in isolation; the reader will profit from a perusal of other contributions (e.g., Peters 1994) generated by the Hydro Model project. In addition to developing statistical approaches, researchers involved in this project have been leaders in the application of computerized geographic information system (GIS) approaches to spatial analysis at the regional level. This type of research holds great promise and will undoubtedly lead to more interdisciplinary efforts.

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