

Virtual Constructs: Traveling the Tenth Century

Leigh Symonds

Department of Archaeology, University of York
King's Manor, York YO1 2EP, United Kingdom
E-mail: las102@york.ac.uk

Theoretical constructs

'The world has gotten smaller', is a phrase often heard today, at the turn of the twenty-first century. The electronic and information ages have compressed distance, forcing us to reconfigure our spatial understandings. Information is faxed and e-mailed across the world, from thousands of metres above the Atlantic ocean, while people rub their temples, asking the steward for more coffee, please, and contemplating the jet lag upon arrival. They ironically reflect that jet-lag, at least, was one thing the passengers of the Titanic (being shown on the screen) did not have to worry about! Traveling has been revolutionized during the twentieth century. Electronic and visual media have allowed us to travel to galaxies far, far away, to the bottom of the ocean, across time, and into virtual 'Otherlands', all with the flick of a switch, click of a mouse, or turn of a page.

This unprecedented freedom of movement has influenced how we think about space. Space is no longer inert, but interactive. It is both individual and collective. Space is culturally determined, as well as being a determiner of culture. Indeed, space is no longer seen as a backdrop for human action, but as an active participant in the production of material culture. Much scholarship within social geography and archaeology has been devoted to exploring this approach to space, to addressing the nature and structuration of situated geographies (Gregory 1994; Gregory and Urry 1985; Haraway 1997; Bender 1992). Perhaps the most important development in these studies has been the recognition that the meanings of space are multiple, fluid and dynamic - culturally contingent upon the presence, or absence, of human beings and the activities, in which they are engaged. This has offered archaeologists an exciting and challenging way of re-thinking our approach to landscapes, space, and place.

Landscapes are embedded in the elaborate and dynamic social relations, which structure settlement development and diversity. Landscape features (settlements, boundary structures and communication routes) are important, in how we define the society in which we live. They are bound up in our understandings of identity and social relations, as well as our perceptions of ethnicity and nationality. Movement across, along, and between landscape, features is contingent upon these socio-cultural understandings. Indeed, the perceptions of landscape held by the people navigating it, affects ease, direction, and distance of travel. For instance, movement within borders, defining a national identity, is often less difficult than traveling the same distance across a national border, which involves interaction with, and intrusion into, another nation's space. Travel is both culturally and temporally dependent, influencing the ways in

which people traverse their landscape. These decisions and acts of travel generate patterns of material culture. Through analyzing these patterns, archaeologists can seek to understand socio-economic structures, settlement dynamics, and cultural identity.

Anglo-Saxon geographical landscapes

My interest in travel stems from research into socio-economic landscapes in tenth century England. This falls within the late Anglo-Saxon period in England, a period from c. 850, AD to 1066, AD. There are a number of important developments during this period, which have been called, by some, 'The First English Industrial Revolution' (Hodges, 1989). These include developments, such as the re-emergence of towns, of large-scale industry, ecclesiastical reform, the formation of the manorial landscape, recorded in the Domesday Book of 1086, and the establishment of a national identity. In accordance with the interest in the excavation of towns during the 1960's and '70's, archaeology has stressed the importance of town plans and town development, the creation and interaction of central places. Thus, the Anglo-Saxon towns, of the tenth and early eleventh century, are seen as 'islands of royal power, through which the king and his agents, ealdormen, bishops, and reeves, were able to dominate the countryside' (Abels, 1988, 80).

Coinciding with the emergence of towns, was the development of a market economy, with production occurring inside the towns, and middlemen, carrying goods from one town, or market, to another. Archaeologists have suggested, from artefact distributions, that each town or production centre had a specific hinterland (Vince, 1985, 34). These discussions have tended to reinforce the perception of towns as islands, in a blank sea, connected by the river and road networks. Furthermore, they tend to imply that towns were the only places, where royal power and economic controls were exercised. This pre-occupation with the development of towns denies the existence of the intricate associations, between lords (royal, secular and ecclesiastical), and their tenantry, that were so clearly being articulated in the charters and wills of the Anglo-Saxon period.

My research into the socio-economic landscape of tenth century England uses pottery distributions and assemblages as a way to examine the patterns of movement, specifically in the county of Lincolnshire. By considering both the production and distribution of pottery from the emerging towns, the relations between the settlements - the towns, manors, berwicks and sokeland - can be further understood. Transportation and trade of pottery (and other artefacts), during the tenth century, respected and reinforced

perceptions of politico-cultural boundaries, social associations, and differentiation between settlements, as well as articulating concepts of travel and mobility.

The most obvious routes of travel in Lincolnshire are the river systems and the Roman roads (figure 1: Road and River Systems of Lincolnshire). Discussion of riverine transportation is complicated, due to the diverse understanding of the word, 'navigability', and the vast changes in the riverine system in Lincolnshire, due to fenland drainage in the eighteenth and nineteenth centuries. Two people, who have helped tremendously to increase the understanding of navigability in the medieval period, are Hindle and Edwards (1991, 1993). Their documentary research into who and what was traveling where, has added a great deal to our understanding of medieval travel, especially in terms of the dynamics between road and river transport. Edwards and Hindle focus on the integration of these two mediums of transport, rather than envisioning them as two separate systems (Edwards and Hindle, 1991, 129-131).

Road transportation has primarily focused on Roman roads. However, the level of Roman road upkeep and of travel along them, during the Anglo-Saxon period, is difficult to discern. Furthermore, Roman roads have a sparse coverage in Lincolnshire, accounting for little of the potential, land-based travel. Indeed, it was the most problematic transportation routes, those pathways that existed between settlements and which may only exist as public right-of-ways today, which were probably the routes, that the average Anglo-Saxon used the most. Unfortunately, little research has been done on the subject of settlement-to-settlement pathways in medieval Lincolnshire. This is partially because of the paucity of written evidence, such as charter-boundary clauses, which may record these routes.

The mode of transport is also important to human movement. It has implications for the distance and season traveled, as well as the amount carried. However, there is little evidence indicating the ways in which people traveled, during the Anglo-Saxon period. Indeed, the only archaeological evidence of travel rests in excavations of boats (such as Graveney (Fenwick, 1978)), finds such as bridle mounts (Sutton Hoo (Carver, 1992, 362)) and indications of traction, found on cattle bone (Bourdillion, 1988, 181-2). Literary evidence does not have much to add. Heroic poems of battles tell us that the Anglo-Saxons rode horses to battle (*Battle of Maldon* in Mitchell and Robinson, 1986, 227) and that boats were used to cross the North Sea (*Ælfric's Colloquy*, in Mitchell and Robinson, 1986, 178-9) or to navigate the fens (Roberts 1979). However, glimpses into everyday travel are rare, and we must look to later historic periods and today's non-Western civilizations, to suggest ways in which the Anglo-Saxons moved.

GIS Networks

Having set the theoretical and archaeological background, for the discussion of travel in tenth century England, I will now turn to the ways in which GIS can model and investigate past routeways. Travel can be explored through GIS systems, either through an established network of roads and rivers, or through creating hypothetical routes. The first uses vector techniques, and the second is primarily raster-based (see van

Leusen, this volume). This paper focuses primarily on vector techniques of network analysis, using Roman roads, prehistoric pathways and river routes. However, it does suggest ways, in which raster-based analysis can further elaborate on this transportation network, and be integrated with vector analyses.

Vector-based analysis is primarily concerned with describing and querying a transportation network. Descriptors of this network can be either linear (written to sections of the route) or single point events (written at specific sites along a route). These classifications of the route are held within the supporting database of the GIS. Linear events deal with issues such as navigability, current, tidal flow, terrain elevation and road composition. These can be directional (such as current variations up- and down-stream) or constant (such as road surface). Point events can be stops along the network: places where there is off-loading and on-loading or other occurrences attached to a specific coordinate. For example, sites (point events) can be integrated into the network, allowing artefact assemblages to be incorporated. One of the most common usages of point events is to describe turns. This allows the description of whether a turn is possible and the time needed to make that turn. This is useful for demonstrating changes between riverine and terrestrial networks which are also associated with a period of off-loading boats and re-loading carts or horses. Furthermore, turns can be prohibited from one arc to another, for instance, restricting a turn from a road to an unnavigable river.

Both linear and point events can also have impedances associated with them. For today's transportation networks, impedances often define speed limits along highways. More useful archaeologically, is the ability to render speeds of travel along roads with varying elevations or rivers with current and tidal flows. Distances can be converted into time-units (such as days) rather than meters (which are bound up in twentieth century conceptions of car, train and air travel), thus facilitating an understanding of past perceptions of distance.

A Transportation Model for Lincolnshire

The model of the Lincolnshire transportation network, which I have constructed, consists of three routeways: Roman roads (and prehistoric pathways), rivers, and potential pathways, connecting sites to the Roman road and riverine systems. Rivers were further divided into navigable, potentially navigable, and unknown. These (figure 2: Navigable Rivers) unknown rivers are those, whose prominence on maps suggests navigability, but for which there is no documentary reference of their use. Their inclusion in the network is important for testing the validity of current understandings of navigability, such as those presented by Edwards and Hindle (1991, 1994).

The potential pathways, mentioned above, represent those pathways between settlements (figure 3: Lincoln Kiln Type Distribution), which link the rural settlements and which, today, may exist only as public right-of-ways. Presently, they form straight lines, from the river or road, to the settlement, in an attempt to realize their conjectural nature (figure 4: Pottery Sites and Hypothetical Linear Pathways).

Ongoing research into these pathways employs some of the raster-based approaches, explored by van Leusen (this volume). The results of these approaches will then be compared with maps of pre-Enclosure Lincolnshire (Russell and Russell, 1983, 1985) before being presented as a model. It is imperative to ground such hypothetical models in what historic data is available. Indeed, the use of these methods to suggest non-Roman routeways, compared against an historical control, should provide an interesting test of the use of GIS, to imply such roads.

Integration of these three different systems was preformed by directing the network turns. Turns between rivers and roads were loaded with an impedance value, to suggest the time needed to change from road-based transport to a boat, or vice versa. Turns from or onto potential pathways (except at their source) were not allowed, as it was important that these routes be representational of unknown routes and not a spatial model, in and of themselves. Further integration comprised impedance values on the rivers, suggesting current and tidal flows, as well as land elevation data.

Additional research will focus on further defining and implementing impedance values, to indicate travel time, as well as a cultural preference for river over road, suggested by Edwards and Hindle (1991, 129). These results will be compared with the metric values, associated with only natural impedance, to demonstrate the importance of cultural perceptions of landscape and their effect on concepts of travel.

The mapping of these natural and cultural descriptors is important for two reasons. First, since much archaeological scholarship of Anglo-Saxon England, in the tenth century, was focused on towns, rather than on the hinterland, an alternative approach is needed. The integration of cultural and natural phenomena, presented above, instead, represents the hinterland as a landscape filled with perceptions and understandings, rather than a blank space between 'islands of royal power' (Abels, 1988, 80). Second, and more generally, it has allowed consideration of the details involved in a transportation network. While I have only presented the process of establishing a network, the factors associated with building a terrain model, or assigning a turn impedance at a river, have led to further questions concerning perceptions of distance and effort, in the structuration of social geographies (Symonds, forthcoming). It is these basic considerations, which begin to flesh out the bones of the river and road systems, and contextualize them within tenth century society.

However, networks are not simply a cartography of descriptors. They also incorporate queries. While the above network development describes the route, in terms of geography and perceptions of distance, it does little to examine the social mobility along it. Indeed, one of the primary issues, in considering travel, is which routes are used more than others. This is significant in terms of road versus river transportation, and of the source and destination of travel. It has permutations for discussion of territorial identity where movement might turn away from socio-political boundaries and focus on interior travel, or alternatively be concentrated along those boundaries. An approach (or query), therefore, is needed to suggest directions and frequencies of movement.

One method incorporates archaeological sites into the network, in this case, tenth century pottery sites. This can be done by creating a file, containing the source and destination of the pottery, and by running a query through the network, to establish the easiest route between these two points. This has immediate implications, in terms of testing the impedance design on the network. For example, it was difficult to maintain a consistent mode of transport, when only time impedances were considered. River routes, which tended to be longer than roads, by nature, were selected against, in favour of road transport, with the result that the path the query took, jumped from one mode of transport to another. This flagged up issues concerning the cost of transport and the perception involved, in transferring goods from road to river transport, and vice versa. It aptly illustrated that transportation routes are governed by a host of social factors, which need to be considered, in addition to distance, time, and effort calculations.

After the query has run through the stops in the network, it is possible to add up the number of times it used a particular path. This frequency can then be displayed on the network, to demonstrate those pathways which are used most often. It is through this calculation that one is able to discuss direction and concentration of travel. This can be further related to the importance of a place or destination, and the patterns of movement throughout the territory. An example of this can be seen in this demonstration model, developed to test the usefulness of this technique, before incorporating it into the Lincolnshire transportation network. The first diagram (figure 5: Demonstration Model: Roads and Rivers) depicts a hypothetical road and river system, where sites are located at the end of each line, and a production centre is positioned at a junction between a road and river. The second diagram (figure 6: Demonstration Model: Frequency of Movement) demonstrates the frequency of travel from the production centre to each of the sites. It illustrates that riverine travel is preferred to terrestrial transportation, when traveling towards the north-east. Furthermore, it suggests a greater amount of movement towards the north-east.

An additional query, using the same sites, or stops, as above, can be performed, to further examine movement patterns. By loading the routes with the number of pots, traveling along them, or more specifically, the pots found at the sites, which provide the destination of the query statement, one can discuss orientations of trade and its implications for social interaction. This can be compared to the previous query, to comment on the quantitative direction of goods. The third diagram (figure 7: Demonstration Model: Frequency of Movement (Loaded Network)) indicates that, although there is a significant amount of movement towards the north-east (as suggested in the second diagram), particular sites have a great deal of pottery moving towards them. This is especially seen along the route, leading directly west of the production site.

These two measures of frequency, each comment on different aspects of directed travel. The first provides a general model, suggesting the importance of routeways connecting clusters of sites. It illustrates the spatial linkage between the sites. The second, with its loaded routes, adds socio-economic depth to the route systems. It articulates the amount of pottery traveling between sites, highlighting those

sites which may not be attached to a clustered route-system but which have important economic connections with the production centre. Both of these frequency maps demonstrate socially embedded, economic movement. Through employing this technique on the larger model of Lincolnshire pottery production and distribution, it is anticipated that socio-economic movement patterns will be further elucidated.

These frequency queries are adaptations to the twentieth century configurations of GIS systems. Geographic information systems are powerful tools, built to manage large amounts of known data. Archaeologists have the challenge of modifying these tools, to deal with indeterminate quantities of data, and ascertaining relationships between variables (such as settlement definition, routeways, boundary lines and trade volumes), without the set equations available to modern day problems. By representing the quantity of pottery at a site, as a load along a route, archaeologists can avoid presenting equivocal data as absolute, in order to perform resource allocation routines. Instead, direction and flow of goods is illustrated in terms of general tendencies, rather than specific instances. This has the added advantage of focusing on landscapes between settlements, rather than simply on the settlements themselves. Indeed, multivariate statistical methods are more useful for questions pertaining to fixed coordinates and should be used in conjunction with the information gained through network analysis, to further understand site dynamics.

GIS networks are a useful tool for research, concerning travel. Through the use of events and the querying of routes, archaeologists can approach movement along roads and rivers, and begin to address the perceptions of distance, held by travelers in the past. Indication of the importance of boundaries or certain places, such as manors for the transportation of pottery, can further be elucidated. By approaching the landscape, through issues of travel, archaeologists avoid subscribing to a false dichotomy between town and hinterland, or road and river, and instead, focus on the interaction between these places and mediums of travel. The landscape, thus, becomes filled with social understandings of territories and boundaries, roads and rivers, as well as markets and manors.

Further querying of the GIS networks suggest concentration of travel along these routes. This impacts on our understandings of navigability, road-use, as well as the establishment of new routeways. Furthermore, the frequency of movement across territorial boundaries can indicate the prominence of that boundary. How boundaries were constructed, by political manipulation and social understanding, can be significant to the distribution of artefacts. Through the combination of network interrogation and multivariate analysis, direction and character of trade and social movement can be discussed.

The usefulness of the GIS system is to suggest patterns in data and reasons why it is patterned, in the way it is. However, it is our interpretation of these patterns, which remains the most important. As the world becomes smaller, our interests become increasingly focused on topics, such as contextuality, ethnicity, and liminality. In order to deal with

both the quantity of information available, on the sites we dig, and the complexity of the questions we are asking, about the societies we are studying, techniques, such as GIS, and others presented in this volume need continued exploration. We can only speak about the past from the present. It is, therefore, through virtual travel, that we are able to approach travel, through past landscapes.

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