This dissertation explores the origins and development of Northern Iroquoian village life in present-day southern Ontario, from the first appearance of durable domestic architecture in the 10th century A.D., to the formation of large villages and towns in the 15th century A.D. Twenty-five extensively excavated village sites are analyzed in terms of the configuration of exterior and interior space, with a view to placing the social construction of community at the centre of the problem of early village development.

Metric and space-syntax measures of the configuration of outdoor space reveal coordinated developments in the scale of houses and villages, their built-densities, and the structure of exterior accessibility networks, that involved the emergence of a “local-to-global” pattern of order with village growth. Such a pattern, I argue, was experientially consonant with a sequential hierarchy of daily social encounters and interactions that was related to the development of factional groups. Within the longhouse, a similarly “nested” pattern of spatial order and associated social identities emerged early in the history of village development, but was elaborated and ritualized during the later 13th century as the longhouse became the primary body through which political alliances involving village coalescence were negotiated.
I suggest that the progressive extensification of collective social groups associated with longhouse expansions and village coalescences involved the development of “conjoint” personhood and power in a context of predominantly mutualistic village economies and enduring egalitarian ideals. The ritualization of domestic space during this process reveals that the continual production and extension of social group identities – such as the matrilineage – was contingent upon “social work” accomplished through an ongoing generative engagement with the built environment.
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CHAPTER 1
TOWARD A HISTORY OF PLACE-MAKING

In the Carolinian and mixed deciduous-conifer forests of the lower Great Lakes-Saint Lawrence region of eastern North America, a series of dramatic cultural changes that in the Old World have been associated with the “Neolithic” – the advent of food production, sedentary village life, and durable architecture – began, at first slowly and discontinuously, by ca. A.D. 500, and continued up to the period of aboriginal contact with European traders and missionaries in the 17th century. The Europeans encountered a series of aboriginal nations and tribal confederacies whose populations were relatively settled as compared to their hunting-gathering neighbours to the north; who lived in densely populated villages of a few hundred to a few thousand; who constructed large, bark-covered multi-family longhouses often surrounded by several rows of palisade; and who grew maize, beans, squash, sunflower and tobacco in a regime of swidden cultivation. These nations shared a set of closely related languages (Northern Iroquoian), as well as versions of the same origin myth, powerful ancestor-spirits (e.g., the sky woman and her grandsons), matrilineal kinship and clan segmentation, a system of hereditary leadership, and a relatively egalitarian ethos.

It was in part the comparative sedentarism of these people that gave French missionaries of the Jesuit order a special hope of converting first the Wendat (Huron), Tionnantate (Petun), and Attiwandaron (Neutral) in southern Ontario, and after the dispersal of these groups by ca. A.D. 1650, members of the Five Nations Iroquois, or Haudenosaunee confederacy in today’s upper New York state. One result of these missions, as well as trade and military alliances with Europeans, is a remarkably rich ethnohistoric record for many Northern Iroquoian societies. This is especially true for the Wendat, for which exists the most extensive early contact record of any aboriginal society north of Mexico (Latta 1999).

However, it is only in the last century that archaeologists have come to understand something of the precontact history of the Northern Iroquoians, and the dynamic cultural changes that unfolded in the millennium prior to the colonial encounter. This dissertation is concerned with the development of Northern Iroquoian longhouse village communities (specifically, those ancestral to the Wendat-Tionnantate and Attiwandaron confederacies) in present-day southern Ontario, between their first appearance ca. A.D. 900, and their incorporation into early tribal polities during the late 15th century. Like many other “Neolithic” transitions in world prehistory, the emergence of nucleated Iroquoian villages was connected to the adoption and, particularly,
the intensification of horticulture, increased residential sedentism, and a pronounced demographic surge (during the 14th century [Warrick 2008]).

Archaeologists from a variety of theoretical standpoints have tended to assume that these sorts of economic and settlement transitions were normally associated with the rapid emergence of differential wealth accumulation, social inequality, and political complexity. For instance, adaptationists are wont to explain the initial development of socio-economic disparities as a functional response to an increased need for food storage to distribute risk in agricultural economies, and an associated need to regulate control over the products of delayed-return investments. By contrast, theorists such as Bender (1978, 1985) and Hayden (1995, 2001) have emphasized the role of economic competition and “aggrandizers” in creating a demand for increases in economic productivity and intensification. From either standpoint, 17th-century Northern Iroquoian societies, at least superficially, appear anomalous in their combination of relatively intensive maize horticulture, large and dense village populations, and nonetheless strong prohibitions against acquisitiveness, individual wealth accumulation, and coercive political authority (Trigger 1990).

Interestingly, recent reviews of the Neolithic transition in southwest Asia by Kuijt and Goring-Morris (2002), and Hodder (2007) point out that in spite of the early development of sedentary village life and intensive cereal cultivation, followed by domestication, across the Epi-Paleolithic – Pre-Pottery Neolithic (PPN) sequence, evidence for emergent social ranking is weak in the PPN. Kuijt and Goring-Morris report for the southern Levant that:

(1) there is no clear material evidence for extensive food storage until ca. 9500 B.P. […] ;
(2) there is no convincing material evidence for profound social differentiation, as would be expressed by widespread differentiation of individuals at death, or shown in life by differential access to residential housing, until 9500 B.P. […] ; (3) with one possible exception, there is no evidence for extensive interpersonal conflict in the PPN periods; and (4) consideration of the standardized nature of cultic and ritual practices within and among communities illustrates that social cohesion and collective identity were important aspects of PPN lifeways. [Kuijt and Goring-Morris 2002: 421]

As Ian Hodder has explored in a number of publications, it was these cultic and ritual practices and their connections to built domestic and village space that were in many ways the clearest hallmarks of the social and ideological changes that were involved in Neolithic developments in Europe (e.g., 1990, 2005) and the Near East (e.g., 2007). Hodder particularly emphasizes the new relationships to time and history that were reproduced in practices that focussed on the

The Northern Iroquoian case will serve to illustrate, as recent evidence from the Near East also suggests, that the changing economies and settlement systems in question were neither immediately nor universally associated with the development of systematic social inequality or hierarchy. As Trigger has put it, “small-scale societies are not merely egalitarian by default (1990: 144).” What, then, changed during the early emergence of Northern Iroquoian village societies? In this dissertation, I take the perspective that increasingly delayed-return material engagements (in subsistence economy, in material culture, in built environments) were pursued by ancestral Northern Iroquoians through practices that either expressly supported, or appeared not to threaten, longstanding mutualistic economies and collective social values. I focus particularly on the role of the materiality of place-making and architectural investment in the reflexive structuration of village communities over the long term. These new material engagements were the medium through which new experiences of group identity were negotiated, and concepts of power and personhood were articulated and altered. In much the sense given by Marshall McLuhan’s famous maxim (1964), the media of this process were the message – that is, the meaningful constitution of community emerged through the particular, inescapable material engagements initiated in village life.

In Chapter 2, I develop these theoretical ideas more fully, with an eye to placing the social construction of community and associated material engagements at the centre of the analysis of sedentarization and village formation. I argue for the generative role of built environments in mediating projects of social identity-construction that were closely related to the articulation of social and economic power in societies with enduring egalitarian structures. These projects focussed on the definition and scalar extension of co-residential social groups whose economic bases remained communal. Such social extensifications would, I suggest, inevitably have produced internal conflicts associated with the cultivation of common interests, and external conflicts associated with between-group political competition and community-level factionalism.

In Chapter 3, I consider the development of semi-permanent sedentism, nucleated villages, and horticultural dependence in southern Ontario in order to build an interpretive framework for the study of village spatial organization.
Chapter 4 reviews the geographic and temporal boundaries of the study and its organizing culture-historic scheme, and discusses the process of site selection and the details of how particular settlement occupational configurations were identified and modeled.

The developmental relationships between aspects of village and longhouse scale, density, and house orientation are explored in Chapter 5 in order to provide a context for the analyses of outdoor and indoor spatial organization undertaken in Chapters 6 and 7.

Chapter 6 pursues the hypothesis, introduced in Chapter 2, that the long-term development of village spatial order was consistent with a spatially embedded or consonant “sequential hierarchy” (spatially analogous to Johnson’s application of the term to social organization [1982]). This involved the development of a “local-to-global” structuring logic for ordering village growth that began with the physical extension of houses and was eventually extended to the arrangement of groups of houses in larger coalescent villages and towns. I also review evidence that large Late Iroquoian villages such as Draper had developed in the direction of “small world” spatial networks (after Watts and Strogatz 1998). Such an emergent small-world structure would have helped to promote village-wide communication and social integration while buffering the effects of major increases in scale on the everyday experience of individuals, as villages expanded to incorporate previously politically autonomous communities. In interpreting this pattern, I suggest that we should resist the urge to explain the development of this “local-to-global” order teleologically, in terms of its eventual effectiveness in reducing scale-dependent social stress, or as a simple reflection of a formal “sequential hierarchy” in socio-political terms. Instead, I argue that these developments make more sense from the perspective of built environments that were drawn into and acted back upon projects of group extensification, with unforeseen consequences in terms of endemic factional competition and de facto alliance building.

Chapter 7 moves indoors to investigate contemporaneous developments in longhouse interior organizational patterns. Methodologically, this chapter emphasizes evidence for both planned architectural boundaries and the foci of routine activities and domestic ritual practices that were multivalent and polysemous, simultaneously dividing and uniting interior domestic spaces according to a series of nested atom : whole dualisms. This analysis indicates that by the 12th century, and perhaps before, Early Iroquoian houses were frequently characterized by a consistent set of relative proxemics associated with the establishment of the paired bilateral

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1 Not to be confused with a different use of the same term to describe trends in agricultural production (see Morrison 2006 for a discussion of the latter concept). Although agricultural extensification may be linked to the developments discussed here, my use of the term refers specifically to the expansion of social groups.
nuclear family interior arrangement that persisted well into the contact period. This considerably weakens the case for a lack of “order” in Early Iroquoian houses (Kapches 1990), and indicates that longstanding organizational patterns were developing at a time when the average number of central hearths per house was about two; that is, largely before longhouses can be considered “long”. Indeed, it will be argued that it was only once this dual arrangement became pervasive that major longhouse expansions commenced in earnest.

By the late 13th to 15th centuries, houses were on average four times larger than they had been in Early Iroquoian times, and my analysis demonstrates that they displayed a heightened regularity in relative internal proxemics, particularly with respect to patterns of interior support post placement vis-à-vis the central hearth in both lateral and longitudinal dimensions. These regularities were associated with a characteristic triple zonation of floor space on either (lateral) side of the central hearth row, and a marked distinction in activities directly in “front of” and “behind” the hearth in the longitudinal dimension (with reference to the nearest longhouse end wall). At the same time, this was a period of intensified domestic ritual, evidenced by the proliferation of interior or appended semi-subterranean lodges with a variety of human mortuary and animal burial associations, post-cluster structures that may have been used as cyclically replaced sweat lodges, other primary or secondary human interments within the house, and, more rarely, “dedicatory” interments at the base of house foundation posts. Following Bradley (2003), I argue that the regularization of proxemic distances, structural zones of characteristic activity, and more overt ritual practices at this time evidence a ritualization of daily life, an increasingly performative quality of domestic experience that was related to the political expansion and consolidation of large longhouses through the processes of village fusion that were simultaneously underway. These domestic performances appear to have been involved in negotiating structural tensions between nested atom : whole identities, and even more fundamentally, structure and communitas (Turner 1969).

The final chapter synthesizes the conclusions of the foregoing chapters and considers their implications for understanding the general process of Iroquoian village development in southern Ontario. It becomes evident that the scalar extensions associated with the construction of co-residential and wider factional or sub-group identities were by no means simple to achieve. A balance had to be continually negotiated between individual and subgroup identities, alliances at a variety of levels, and the village community as a whole. The legacy of the establishment of a “local-to-global” spatial order in initial material engagements with place-making by Early
Iroquoians was, I suggest, a distinctive trajectory of community development shaped by the dialectical relationship between society and space over the long term.
CHAPTER 2
BUILDING VILLAGES, CONSTRUCTING COMMUNITY

The central issue of this dissertation is that of the social construction of community. I take as a starting point the notion that the initial formation and development of nucleated sedentary villages involved new ways of understanding the world, of defining selves, of interacting with family and neighbours, and new economies that were organically related to the changing temporalities of mobility and scales of nucleation. By placing the social construction of community at the centre of the problem of early village life, I shall shift the framing of this problem away from the teleological identification of trends in artificially externalized sub-systems such as “subsistence economy”, “settlement pattern”, and “demography” as causes of “internal” socio-political evolution. This re-framing recognizes that broad changes in productive activities, mobility, birth rates, and so on, occurred through practices undertaken by people in a world that was always already social. I will advance the thesis that cultural change in Northern Iroquoian villages was centered on competing projects of group formation and identity constitution connected in a variety of ways to community. Materiality, including architecture, artifacts, productive activities, and places, was drawn upon in (and acted back on) such projects that were, at root, based in the inevitable conflicts associated with the production and exercise of power in egalitarian contexts.

This perspective represents a substantial break with current ways of thinking about “sedentarization” by archaeologists working in the Northeast, and so requires greater examination. Although, in many respects, Northeast prehistory remains mired in debates over obdurate culture-historic schema (e.g., Williamson and Watts 1999), theorizations of culture change tend to fall into three categories: 1) natural state evolutionism, 2) speculative functionalism, and 3) neo-Darwinian evolutionary ecology. Natural state evolutionism assumes that cultures will advance or retreat along a predictable progression of societal “types” of increasing socio-political complexity, depending on the suitability of external conditions for cultural progress. When permitted, cultures will advance toward the natural state given by the inherent properties of the system in which they find themselves (cf. Hart 1999). This viewpoint is normally not explicitly avowed, but latent in explanations of culture change. For instance, for Fitzgerald (2001), the purported marginality of maize horticulture in southern Ontario made it inherently “culturally unsuitable”, leading to the “devolution” of tribal societies such as the Neutral during the Little Ice Age. Speculative functionalism assumes that cultures will adapt to
changing external conditions in ways that appear to us as functional, rational, or in their members’ best interests. This approach seeks explanations for inferred cultural developments (e.g., the emergence of “chiefs”), based largely on assumptions about the functional benefits of the development (e.g., chiefs were economic managers who buffered groups from the effects of resource fluctuations by pooling and redistributing products among community members).

Most recently, neo-Darwinian evolutionism and Darwinian evolutionary ecology have been put forward as a corrective for the normative thinking and progressivism associated with the former two approaches (e.g., Dunnell 1980; Hart 2001; Nolan and Cook 2010). While I am sympathetic with efforts to make theories of culture-change more explicit and consistent with Darwinian evolution, neo-Darwinian approaches to the history of social change are not, in my view, satisfactory. Two main problems are of particular importance when considering the emergence of nucleated villages and all that it entailed. These can be summarized as a failure to theorize social practice and historical contingency.

The recent application of evolutionary ecology models (based on those of Winterhalder and Goland [1997] and Kelly [1995]) by Nolan and Cook (2010) to the Fort Ancient period of the Middle Ohio Valley exemplifies these problems. They produce a complex series of predictions for social organization, political complexity, and ceramic stylistic patterning for 50-year periods from A.D. 800 to 1400. Their basic assumption is that generically described culture traits such as “political complexity” will be “selected for” by particular conditions of spatial and temporal variability in warm-season precipitation. While the effects of climatic fluctuations (particularly their amplitude) on the risks associated with particular subsistence economies is undeniable, the direct line drawn by Nolan and Cook between specific 50-year patterns of spatial and temporal moisture variability and the predicted cultural effects for the same period (on such variables as perimeter defense, exchange, and political complexity) strains credulity. These variables are treated as direct correlates (and consequences) of risk-management strategies, as though always and everywhere generic categories of social behaviour such as “exchange” amounted to the same kinds of functional outcomes (i.e., buffering risk) for which they were selected. The assumptions Nolan and Cook make about the predictive relationship between perimeter defense and the cost-benefit equation associated with food “theft” under different climatic conditions holds slight bearing on what is known about contact-period aboriginal warfare in eastern North America. Then, traditional raiding seems to have had little or nothing to do with food theft, and much more to do with the capture of enemies for ritual execution or adoption within a retaliatory dynamic known as the “mourning war” (e.g., Richter 1983;
Williamson 2007). This type of warfare was often associated with the construction of substantial palisades. Warfare and associated perimeter defense (as one example), turns out to have been a far more complex and deeply social phenomenon, the outcome of a dynamic interplay of political, ideological, and economic factors (see Richter [1992]), and not likely predictable by its potential for direct economic payoffs.

This example is not just about a failure to correctly associate a behaviour (perimeter defense) with a specific function (theft deterrent). After all, perimeter defences can function as theft deterrents. The more fundamental problem is the treatment of “the social” as a distinct internal sub-system of culture, one that responds predictably to external stimuli. This assumed predictability means that we need not interrogate social practice as such; selection will inevitably favour adaptive outcomes from a field of undirected behavioural noise. As Braun boldly asserts, “what motivates people to try out, retain, or avoid different practices in any given setting, in fact, ultimately does not matter (1990: 78).” Of course, even from a selectionist perspective, this can be questioned, since the processes that govern the generation of “variation” will influence what is available to be “selected”.

It would seem that, from the neo-Darwinian perspective, social practice is black boxed and history is reduced to the changing sequence of societal traits “selected for” over time. This failure to take historically conditioned social practice seriously is not a more, but less scientific position (cf. Pauketat 2008) since it ignores the transformative power of reflexively structured and structuring social practices situated in fields of relations. If we acknowledge that economic practices are historically conditioned and thoroughly social, we cannot get away from the fact that “political complexity” and “perimeter defence” will mean very different things in different contexts, with significant implications for long-term historical trajectories and “adaptive” outcomes (cf. Trigger 1990).

Historical causation, I believe, must be located within the densely interconnected relational fields of people and things. Numerous ethnographic studies demonstrate that the social dynamics of so-called middle-range societies are highly complex and unfold historically in unpredictable ways (e.g., Fowles 2002). Nor are such communities internally homogeneous. Varien and Potter have pointed out that, “a serious problem that plagues many studies of ancient communities is that they treat the community as if it were an entity that somehow acts in a uniform manner […] Archaeologists need to crack open the black box of the community concept and focus on the social action that produces a community (2008: 4).” In heeding Varien and Potter’s call, we must engage with specifics – how was social life changed during the
development of nucleated villages? What were the structuring schema that emerged? What do these tell us about the practical negotiation of tensions within society? How were new kinds of person with new kinds of agency produced through this process?

**Why Community; Which Community?**

Community is a notoriously ambiguous and multivalent concept (Canuto and Yaeger 2000), and archaeologists have often tended either to conflate it with the residential population of a site, or to avoid it entirely. My justification for a focus on community in this study is based in part on evidence that nucleated Iroquoian villages formed communities defined not only by propinquity, but by histories of local territorial movement and relocation, family genealogies, political consolidations and schisms, defensive and symbolic boundaries, and public ritual performances. This does not mean that other kinds of communities did not exist in Iroquoian societies, such as those associated with curing associations, tribal councils, co-residential longhouse groups, or agricultural work parties. In fact, it is the very nested and internally heterogeneous nature of community in Northern Iroquoian societies that is our goal to understand. Nonetheless, the nucleated semi-sedentary village can be said to have emerged in consort with a first-order community of the sort defined by Lipe (1992). These communities are defined by locales of regular face-to-face interactions, bodily co-presence, and intensive quotidian encounters (Varien and Potter 2008). They constitute communities of practice, and are subject to reproduction, disruption, and transformation by the habitual activities of their members.

I also focus on first-order community in this study because, due to its dependence on architectural media for co-presence, interaction, communication, and representation, it may be central to the problem of sedentarization itself. Sedentarization, after all, represents a changing temporality and intensity of material engagement in social reproduction (Renfrew 2001). As such, sedentarization in the form of nucleated village formation must have been recursively involved in the constitution of first-order community. Or, put another way, sedentarization involving village formation and growth can be understood as inseparable from the process of community production. The very materiality of early village life, of the changing engagement with place, architecture, and time, had an important influence on how community could be experienced and reproduced. In an analogous argument, Barrett and Ko (2010) have recently suggested that megalithic monuments of the British Neolithic were not erected with an intent to project conceptual schema onto the landscape. They argue instead that through the material
engagement of builders with the process of building, new fields for conceptualization and objectification were opened up: “Central to our whole argument is the claim that megalithic (and non-megalithic) monuments were not initiated to inscribe a cultural order on the landscape, but by their construction they were the medium that revealed how an order of categories might have operated (2010: 289).” The potential for village space to articulate a particular conceptual order was likewise disclosed in the material practices associated with creating an enduring built environment. I will discuss this relationship between materiality and social reproduction at greater length below.

The Social Conditions of Community (Re)Production

There are a number of reasons to believe that decreasing residential mobility and increasing population aggregation often involve changes in conditions that are basic to community formation. One of these conditions is the level of social interaction stress experienced by community members. Social-psychological studies (Cummings, et al. 1974) ethnographic case studies (Kent 1989, 1995) and cross-cultural comparisons (Fletcher 1995; Forge 1972; Johnson 1982) indicate that interaction and communication stress within communities present significant constraints on their ability to maintain order and cohesion beyond specific size and density thresholds, when socio-political organization is held constant. Hunter-gatherer mobility patterns have been recognized in part as strategies for the reduction or avoidance of this type of interaction stress (Kent 1995, Lee and DeVore 1968). It follows that increasing sedentism and/or settlement size often entails rising social interaction stress (Fletcher 1995), as the frequency of dispersal and ability to “vote with one’s feet” is progressively reduced. Importantly, several studies have shown that social stress within nucleated communities can represent a more significant limit on settlement size, density and durability than the carrying capacity of their environments (contre Rosenberg 1998 [Fletcher 1995; Chagnon 1992; Hassan 1975]). The finite ability of individuals to process information, combined with the exponential growth of potential information exchange as group size increases, has been argued to produce scale-dependent stress independently of environmental factors, placing lower limits on the size, density, and duration of social nucleations than might otherwise be expected (Johnson 1982). If concomitant subsistence change is also a source of economic risk or competition, interaction stress will most likely be amplified (Sahlins 1972; Testart 1982, 1988).

This generalizing view of social interaction stress is problematic, however, since it is devoid of context. We run the risk of isolating stress from the rest of socially constituted
practice and reifying it as a scale/density-dependent prime mover akin to climatic variability. How stress is manifested, in what forms and with respect to which social and material “fault lines”, will depend on how a particular community is socially constituted. The implications of social stress for community cohesion may be profound, but understanding what these were requires a thorough linking of stress with the tensions present and reproduced by existing social structures, the way that stress could and could not be manifested by agents through competitive practices or contested significations, and the role of materiality (including architecture) in exacerbating or mitigating stress under certain circumstances (e.g., Fletcher 1995). Because of the potential for social stress to induce violence (or the threat of violence) that can rupture community completely, the negotiation of stress may be critical to the reproduction or failure of community. However, this does not mean that stress should be invoked as an independent social condition with primary causal significance. Stress is primarily symptomatic of systemic conflicts or tensions that emerge and obtain between individuals whose positions in society, and therefore whose agency, is structurally at odds. The link Johnson (1982) and others have made between communication stress and decision-making is significant, not only because decision-making involves the finite information-processing capacities of human brains, but because decision-making represents the negotiation and deployment of power. It is the desire to articulate such power that drives decision-making in the first place. This suggests that understanding how power was produced and reproduced in society is fundamental to how, when, and where stress emerges, and what its repercussions will be for community cohesion.

**Power and Economic Practice**

In seeking the foundations of power, we are forced to look equally to material practices and ideational schema. Power, in the sense of “power to”, and not necessarily (but sometimes) “power over”, is inherent in social relations (Foucault 1990; Gramsci 1971), and is generated differentially in unique historical circumstances. Central to the production of power is economy. However, perhaps because of the predominance of the calculative rational-actor model in classical economic theory and formalist economic anthropology (Gudeman 2008), the economic basis for the construction of social power, and all that attends it, has been neglected (if not studiously avoided) by archaeologists of a post-processual or practice-theoretical bent. Commenting on the waning engagement with Marxist philosophies by post-processual archaeology, Barrett and Ko write that: “what should have been the development of a strongly materialist philosophy began to slide unhappily towards idealism (2010: 290).” This trend is
certainly a reaction to the fear that economic theory leads inevitably to the sort of stimulus-response reductionism of social life that I have critiqued above. While this has often been true in practice, it need not be so. Economy, even basic subsistence economy, is no less a part of social practice than participation in secret societies, feasts, or village councils. Emerging from workaday social practices, economy is continually reproduced and altered by productive and consumptive activities undertaken by people whose knowledge and motivations are simultaneously personal and conditioned by the prevailing structures and ideologies of their times. Therefore, as with all social phenomena, we cannot rightly place historical causation entirely on the material or the ideal side of the economic equation, but in the dialectical interaction of the two over time.

What does an economic perspective lend to the search for the foundations of power in early village societies? Since Sahlins' “Original Affluent Society” (1968), anthropologists have recognized that the economic practices of many foraging societies display values associated with production, consumption, property, and wealth that seem “irrational” from, or contradictory to, the modern western model of calculative reason and methodological individualism (e.g., Ingold 1999). These differences go beyond the commonplace distinctions between “optimizing” and “satisficing” economic goals, and “complete” and “situational” knowledge of relevant conditions. Instead, they cut to the heart of what constitutes social value in a given cultural context. Recently, Gudeman (2008) has helped to clarify this problem by arguing that all economies are characterized by a tension between competition and “mutuality”, antagonism and communalism (see Coupland, et al. 2009 for a similar concept). He argues that the development of market economies promotes the competitive and comparative practices from which a sense of individual choice and calculative reason emerge as self-evident values. By contrast, many traditional economies, not only those of foragers, emphasize a “mutual” mode, or what Marxists have called the “communal mode of production” (Lee 1990). Within the mutual mode, value is heterogeneous and incommensurate (whereas the market mode is characterized by what Gudeman calls the “Fetishism of Prices”, that is “the abstraction of prices from things, services, and relationships [2008: 23]”). The mutual mode is also characterized by unmeasured (generalized) reciprocity (Sahlins 1972), the use of multiple types of reason (including figurative, moral, calculative), and “conjoint” personhood, or identity that is realized through interpersonal relationships, rather than possessive individuality (Gudeman 2008: 22).

Following Lee (1990), and Gudeman (2008), this mutuality-competition dynamic can be understood to structure early village economies and to penetrate everything from the
organization of labour to the sense of self. There are a variety of ways in which mutuality can be manifested in an economy. However, a common expression in middle-range societies is egalitarianism. Indeed, egalitarianism (in principle if not in practice) seems to be one of the few values that anthropologists can agree characterize the otherwise dizzyingly diverse array of so-called tribal societies (Fowles 2002; Lee 1990). Egalitarianism, like mutuality more generally, straddles the practical and ideal; it can emerge from taken-for-granted practices, and it can be discursively promoted as a rule or norm of right behaviour. Importantly, egalitarianism in a predominantly mutualistic economy limits how both economic and political power can be established and promoted. When egalitarianism becomes doxa (sensu Bourdieu 1977) it may be used to resist competitive economic behaviours, or, conversely, to legitimate them through overt displays of communal interests (cf. Coupland et al. 2009). In short, egalitarianism may become a supporting narrative, a moral rationality (comparable to the narrative of calculative rationality and individual choice stressed in competitive market economies) within an economy dominated by mutuality, a mutuality that is threatened by acquisitive practices. Within such a milieu, not only is personhood likely to be conjoint, but so, too, is power (see Chapter 7). Conjoint power flows from the ability to extensify the interpersonal network that defines the mutualistic economic group. This involves the extensification of the economic base through cooperative labour projects, shared consumption, feasting, and ritual events. What is socially valued, and the power to produce it, is thereby lodged firmly in collective experience.

Two features of such a system contribute to a propensity for particular kinds of social tension. The production of conjoint power requires maintaining and extending the social network that defines a collective or mutual economic base, while egalitarianism requires consensual decision-making. The articulation and expansion of social power in this context, requiring the increased social scale of the associated group, will potentially push the scalar limits associated with egalitarian decision-making, producing stress. This brings us to the other side of the mutuality-competition coin. If there is no pressure to “build” power, then presumably the scale of mutualistic economic groups will, through decision-making failures, fissions, and so on, tend to equalize below the scalar threshold associated with the limits of egalitarian decision-making. On the other hand, if competition should emerge between such groups, there may be a desire to build conjoint power through the kind of expansion that brings collective economic groups up against the scalar limits of consensus decision-making, and, more generally, common interest. The results of this dynamic are unpredictable, but it is reasonable to hypothesize that they will include the endemic factionalism commonly found in “middle-range” societies.
Village Formation and Material Engagement

From an historical perspective, these characteristic structural modes and associated tensions provide something of an entrée into the complexity of social dynamics in middle-range societies, but tell us little about how they might have influenced long-term processes such as sedentarization, settlement nucleation, and horticultural intensification. All three of the latter processes were involved in the emergence and growth of Northern Iroquoian villages. My central contention is that these processes opened up new possibilities for agents to seek old values, and that they therefore drew upon and promoted them in attempts primarily to maintain the status quo, yet irrevocably changing it.

The core of this perspective is the concept of material engagement (DeMarrais 2004). Sedentarization, nucleation, and subsistence change all represent developments in which, in ways that would have been impossible to foresee, new kinds of engagement with landscapes, plants, animals, buildings, artifacts, and people were made possible. Archaeologists have commonly assumed that the characteristic material engagements associated with these shifts were highly disruptive to well-established forager social relations and associated ideals (e.g., egalitarianism, generalized reciprocity). For instance, Woodburn’s (1980) influential comparison of “immediate” and “delayed-return” economies and their social and ideological correlates implies that a shift from the first economic form to the second would have involved a categorical change in culture brought about by a new way of engaging with materiality (summarized in the concept of delayed return). Such a “phase shift” view of cultural change provides little purchase on the issue of how such a transition could actually take place. Implicit is the notion that, given delayed-return economic engagement, commensurate social and ideological adaptations will follow. Thus, concepts of ownership, rights, inheritance, status, etc. will emerge as required to regulate the products of long-term investments (see also Testart 1982). In an alternative take, Hayden has argued that “aggrandizers” were able to draw upon the opportunities afforded by increasing sedentism and agricultural production in order to compete for wealth and status (Hayden 1995). In spite of their differences, both these “externalist” and “internalist” theories of the new kinds of material engagement afforded by settlement-subsistence change assume that they induced a rapid and radical departure from what we might call “classical forager values”.

But can we really assume that forager mutuality gives way to competition and acquisitiveness as soon as opportunity presents itself? In fact, the large body of ethnographic and ethnohistorical data on middle-range societies indicates that many small-scale sedentary
agricultural communities had both institutional and informal practices that worked against the development of disparities in wealth, ownership, status, and political power (including Northern Iroquoian societies [Trigger 1990; Murdock 1967]). Why were these levelling mechanisms important in certain contexts? What does this mean about how increasingly delayed-return settlement and subsistence practices were incorporated into the mutuality-competition dynamic within those societies?

In order to answer these questions we will need to move from a stimulus-response model of culture change, to one of historically conditioned practice. It seems likely from such a perspective that, given the deeply embedded mutualistic economic and social structures in many hunting and gathering societies, mutuality and egalitarianism will often continue to condition social relations even as new material engagements come into play. Agents may be constrained by the enduring structures of mutuality to draw upon new material resources in ways that appear to present little threat to the status quo. Indeed, “traditional” values may be actively sought through these new engagements. Of course, this does not mean that disruptive possibilities for wealth accumulation, ownership, and inheritance are not opened up by increasingly delayed-return engagements; rather, agents operating within enduring mutualistic structures will be forced to negotiate the resulting tensions brought forth in practice. Inevitably, these new engagements, even within the context of attempting to maintain the fundamentals of the status quo, will provoke change. As Lee puts it, “the germs of inequality arise, not from a breakdown of the sharing ethic, but from an effort to make it work under altered circumstances (1990: 238, emphasis in original).”

One possible outcome, which I argue was the case for pre-contact Northern Iroquoians, is that economic competition is continually “exported” to the social boundaries of collective socio-economic groups at a series of progressively expanding scales, permitting the continuity of predominantly mutualistic economic and social practices within, but with resulting between-group competition driving broader processes of scalar extensification of groups (involving longhouse expansions and village nucleations). This kind of social group extensification for the purposes of articulating power in an egalitarian context would have had unforeseen consequences associated with within-group scalar stress and factionalism. The persistence of egalitarianism during the development of Northern Iroquoian villages should be seen, not as blind adherence to a traditional norm, but as critical to agents’ ability to fulfill inculcated social values associated with collective welfare and spiritual strength (Trigger 1990; Engelbrecht 2003). In seeking these, agents drew upon the material possibilities afforded by reduced
mobility, durable architecture, and maize horticulture, in projects of group identity-construction that ultimately drove the formation of large nucleated communities.

**Social Practice and the Built Environment**

So far I have stressed the potentially disruptive role of changing material engagement in terms of mobility and subsistence economy, but neglected the more direct role of built environments in mediating social life. However, village formation, as a new kind of physical and spatial engagement, must have been fundamentally involved in the development of first-order community. In the following section I consider more fully the relationship between spatial order and social experience, and discuss why this provides a suitable foundation for the present study.

Pellow has observed that:

…with a few exceptions, architecture and spatial organization have been particularly neglected by academic anthropology as subjects in their own right, although both are cultural constructions. [Pellow 1996: 216]

One might have expected that anthropological archaeology, with its characteristic disciplinary struggle with materiality, would have already filled the lacuna identified by Pellow, but it has only just begun to do so. Part of the reason for this slow advance is that space has typically been seen by archaeologists as a passive backdrop for cultural action; an inert screen upon which patterns of social and economic dynamics are imprinted (a perspective Lefebvre has warned against [1991]). Of course, we readily admit that space is a fabric that is not entirely homogenous. Particular locales are known to provide unique opportunities and affordances for human action (as in site catchment analysis). Moreover, humans are understood to structure space through architecture so as to create or take greater advantage of such affordances (McGuire and Schiffer 1983). Nonetheless, archaeological expectations about spatial organization are most often incidental to explanations of social change. We commonly assume social meanings, taxonomies, and structures will be expressed to some greater or lesser extent in spatial patterning (e.g., Pellow 1996). The relationship between space and society is therefore seen as valuable to archaeology primarily because of its interpretive potential, rather than its explanatory force (cf. Smith 2003). In recent decades, static models of the mapping of social structure onto domestic and community space (for instance, as presented in early articulations of structuralism [Levi-Strauss 1955]) have given way to more sensitive analyses that recognize the recursive influences of space on human behavior, the function of the built environment in social
communication (Blanton 1994; Hall 1969; Parker Pearson and Richards 1994; Rapoport 1990), and the ability of the physical boundary to act both as, “...a principle of categorization and also a symbol of it (Pellow 1996: 215).”

But here, too, space continues to be viewed as an additive rather than inescapable property of social action and meaning-making. Space can be used strategically – for instance, by elites to legitimate positions of power with the symbolic placement of monuments, or the manipulation of plant life in formal gardens so as to make hierarchies of class and race appear natural (e.g., Leone 1984; Rotenberg 1996). Emphasis remains on the construction of space as an accommodation of preexisting behavioural and social functions (McGuire and Schiffer 1983; Morgan 1965) and as mirror and metaphor of social categories and structural templates (Rotenberg 1996; Ingersoll Jr and Bronitsky 1987). In parallel to what John Robb has referred to as the “symbols as tokens” notion of material culture (1998), which posits an arbitrary and normative relationship between symbol and referent (following the Saussurean semiotic [cf. Preucel 2006]), this instrumental view of space holds that its manipulation to effect social, technological, military, or ideological outcomes is a matter of choice and circumstance, of “value added” to existing cultural systems, just as the meaningfulness of built form is seen as an emic veneer over its objective empirical properties (Ingold 1993). But in this we fail to consider that most social entities would cease to operate as they do apart from their spatial inherencies; that actions in space do not merely “reflect” social realities, but constitute the daily interactions and boundary-forming practices through which social life is made possible (Bourdieu 1977; Latour 2005).

In this dissertation, I take the position that the role of spatial pattern in social life is generative (Fletcher 2004; Ingold 1993; Smith 2003). In the same way that Latour has recognized in material culture the “missing masses” of social theory (1992), I suggest we must locate in space the “quantum forces” of social production. The familiar concepts of household and community continue to hover uneasily between spatial and social definition in archaeological parlance precisely because of our ambivalence about space. While it is true that household and community do not have direct spatial correlates in house and village (Allison 1999; Lawrence and Low 1990), it is equally true that these social entities would not exist as they do outside the operation of relations of spatial openness and division, integration and segregation, and proximity and distance on the quotidian practices of their members. The implication of this alternative ontology of space is that spatial organization – of social encounters and their perceptual contexts – holds inherent significance for everyday life and long-term culture change,
not as the dim reflection of unobservable emic classifications, nor as the fossilized instantiation of these, but as foundationally constitutive of the social realities that produced them. I advocate, then, that the agency of the spatial and material (Pauketat and Alts’ physicality [2005]) be drawn up into the “practice” of agency theory. Practice is conducted through these media, and must endure the consequences, intended and otherwise.

**Spatial Order and Village Formation**

Returning to the question of village formation, this perspective on the generative role of space in social life indicates that the physicality of architectural arrangements will profoundly influence long-term trajectories of community development. As suggested earlier, the historically particular sedimentation of spatial arrangements within increasingly sedentary settlements will be integral to the formation of first-order community. Critically, I anticipate that the diachronic archaeological record of village spatial configuration in Ontario Iroquoian settlements will evidence the ways that agents drew upon new spatial and temporal associations with architecture in projects of group formation and extensification and how resulting configurations had unintended consequences for social life in the long run. In analyzing these patterns, I will emphasize, a) the development of long-term structural regularities in spatial order at a variety of scales, b) the social tensions revealed in these structural poses, c) how variations in these patterns illustrate the dynamic negotiation, reproduction, and transformation of social categories and persons via material engagement over time.
CHAPTER 3
NORTHERN IROquoIAN SETTLEMENT-SUBSISTENCE CHANGE, A.D. 900-1500

Contact-Period Settlement-Subsistence Patterns

At the time of initial contact with Europeans in the 16th and 17th centuries, an estimated 100,000 Northern Iroquoians inhabited a series of tribal settlement clusters located discontinuously along the Saint Lawrence River valley, the upper Susquehanna River valley, the southern end of Georgian Bay on Lake Huron, and lands to the north and south of Lakes Ontario and Erie in what are today upper New York state and southern Ontario (Bamann, et al. 1992; Warrick 2000; Figure 3.0). These groups practiced shifting slash-and-burn agriculture in the temperate woodland environments of the lower Great Lakes-St. Lawrence and Carolinian forest zones. Maize was the staple crop, and normally accounted for more than 50% (up to an estimated 80%) of dietary calories (e.g., Heidenreich 1971; Katzenberg, et al. 1995; van der Merwe, et al. 2003). Other cultigens included the common bean, sunflower, squash, and tobacco (Crawford and Smith 2003; Fecteau 1985; Monckton 1990). Hunted and gathered foods varied in importance for different groups. Fish were a particularly important source of protein for the historic Wendat (Huron confederacy) (Warrick 2008), while white-tailed deer appear to have been more important to the Attiwandaron (Neutral confederacy) (Lennox and Fitzgerald 1990). Domestic dogs, (and occasionally black bears) were raised for pets, food, and ritual purposes. Bramble, strawberry, sumac and Chenopodium sp. could be found in disturbed habitats such as field edges and middens, and were commonly gathered but are not known to have been cultivated (Crawford and Smith 2003; Moncton 1992; Fecteau 1985).

Among the 17th-century Iroquoians, densely-built villages of several hundred to several thousand people were normally occupied by some portion of their resident population throughout the year, meeting Rafferty’s definition of sedentism (1985: 115). Villages were relocated every 10-20 years as local resources became depleted. Accordingly, this pattern has been termed “semi-permanent sedentism” (Chapdelaine 1993), or “semi-sedentism” (Trigger 1976). Like mixed forager-farmers elsewhere, seasonal and short-term forays for hunting, fishing, trade, diplomacy and warfare meant that for much of the warm season, villages were not occupied to capacity. Agricultural field cabins were also maintained when field systems were relatively distant from the main village (Warrick 2000).
Village architecture, while entirely composed of organic materials, was substantial, and longhouses were normally maintained as permanent structures for the duration of village tenure in a particular site (Warrick 2008). A longhouse consisted of a frame of poles deeply set into the sub-soil, sometimes with the aid of wall-trenches, and clad in eastern white cedar, American elm, or ash bark. According to Jesuit observers, they had arbour-shaped roofs, and “no different stories…no cellar, no chamber, no garret […] neither window, nor chimney (Thwaites 1896-1901 8: 154).” Historic period houses were normally between 6.5 and 7.5m in width, and approximately as high as they were wide. They ranged greatly in length, averaging about 20m in the 17th century, but sometimes reaching 30m or more (Dodd 1984). As we shall see, the precontact range in house width and especially, length, was considerably greater (see Chapter 7), with some houses reaching over 100m in length. Many, but not all, villages exhibited defensive features such as substantial wooden palisades (often arranged in multiple rows), earthworks, and hilltop or bluff-edge locations (Bamann, et al. 1992; Engelbrecht 2009).

Soil nutrient exhaustion has been cited as the main cause for village abandonment. However, there is evidence that precontact villages were sometimes inhabited for longer periods...
of time, up to about a generation in duration, suggesting that soil exhaustion was not the only factor behind the periodicity of contact-era village relocation. Analogies with tropical slash-and-burn regimes may be misleading in this respect since temperate soils are often more nutrient rich and less prone to short-term degradation than tropical ones (Engelbrecht 2003: 30). It seems likely that the local availability of firewood and suitable bark and bast fibre for house maintenance were equally important factors affecting village mobility, particularly for large 17th century towns (Warrick 2000; Wrong 1939).

In Huronia, the result of three centuries of in-migration by ancestral Wendat swidden horticulturalists and endogenous population growth was the development of an anthropogenic landscape. Wood charcoal from the earliest Iroquoian settlements in the region indicates the colonization of a climax maple-beech forest (e.g., Sutton 1996). By the early 17th century, this was, locally, sufficiently altered that the Recollet lay-brother Gabriel Sagard could describe the region as:

A well-cleared country, pretty and pleasant [...] full of fine hills, open fields, very beautiful broad meadows bearing much excellent hay, which is of no use except to set fire to as an amusement when it is dry; and in many places there is much uncultivated wheat, which has an ear like rye and grains like oats. I was deceived by it, supposing when I first saw it that these were fields that had been sown with good grain. [Wrong 1939:90]

**Iroquoian Sedentarization and Village Development**

When and how this shifting village pattern emerged is a problem scholars have grappled with for over a century (Smith 1990). Throughout the 19th and 20th centuries, this question was posed primarily in terms of ethno-linguistic origins, and addressed through traditional methods of culture-history (focused on pottery typologies), and models of in situ development, diffusion, and migration (Smith 1990; Latta 1999; Snow 1995, 1996; Crawford and Smith 1996). In many ways, however, the most interesting questions of cultural change and ethnogenesis have been “lost in the shuffle” of the ensuing in situ vs. migration debates. In my view, established features of the macro-regional archaeological record indicate that Northern Iroquoian sedentarization, adoption and intensification of agriculture, nucleated village formation, and political change, can be studied as in situ developments within the study region, since evidence suggests that a migration of proto-Northern Iroquoians, if one occurred, would have predated these developments and therefore cannot be used to explain them (contra Snow 1995, 1996).
In particular, there appears to be agreement between the proponents of migration and *in situ* hypotheses, that any in-migration of proto-Northern Iroquoian speakers could not have post-dated the Princess Point Complex in southern Ontario, as originally proposed by Snow (2005). Given the convincing arguments for cultural continuity from Princess Point to Early Iroquoian in southern Ontario presented by Crawford and Smith (1996), Snow has conceded that his proposed migration event would have to have pre-dated the establishment of “Transitional Woodland” or “Late Woodland 1” culture-historic taxa such as the Princess Point “complex” in south-western Ontario (Smith and Crawford 1997). The same conclusion would seem to apply to Sandbanks in south-eastern Ontario, (Curtis 2004), Melocheville in the upper Saint Lawrence valley, and early Owasco and Clemson Island manifestations in New York and Pennsylvania (Rieth 2002; Ritchie 1969; Snow 1995). All these taxa share ceramic stylistic traditions having evident continuity into indisputably Iroquoian regional traditions, such as the Early Iroquoian stage in southern Ontario (Crawford and Smith 1996; Curtis 2004; Fox 1990). For southern Ontario, this pushes any putative migration back prior to A.D. 500 (Snow 1996).

This temporal adjustment to the hypothesized migration, however, has more significant ramifications for his migration theory than Snow (1996) allows. This is because the paleoethnobotanical evidence for Late Woodland 1 contexts does not support a model of intensive maize horticulture analogous to that of contact period Northern Iroquoians (e.g., Saunders 2008, Crawford and Smith 2003), a subsistence pattern which does not appear in southern Ontario until the Early Iroquoian period at the earliest (Ounjian 1998). Likewise, settlement pattern data from Princess Point contexts in southern Ontario, and early Owasco in New York State, do not support the notion that these populations lived in compact, nucleated, semi-sedentary villages (e.g., Crawford and Smith 2002; Smith 2010; Chapdelaine 1993; Hart 2000). This undermines Snow’s position that agriculture and sedentism were imported to the region by Iroquoian-speaking migrants whose spread was associated with the predatory expansion and demographic growth that has sometimes been associated with horticultural societies.

However and whenever Northern Iroquoian-speaking populations arrived in the region, it is apparent that prior to the 5th century A.D. they were most certainly present in parts of western New York state and southern Ontario. There are several generalizations that can be made about these populations. They probably knew maize, (Hart 1999; Hart, et al. 2003; Crawford and Smith 2003) but it was then a relatively minor addition to a hunting-and-gathering economy; bands of less than 100 people seasonally re-inhabited large, diffuse, warm-season settlement
locales over several centuries, but were not fully annually sedentary; residential architecture was not designed to last from year to year, and was therefore replaced seasonally if not more frequently; swidden horticulture and associated nucleated upland village settlement was a pattern that was not well established in many areas for at least another 600 (in southern Ontario) to 800 years (in New York state) (Chapdelaine 1993; Hart 2000).

In sum, given the evidence that Northern Iroquoians did not migrate into the region with a developed pattern of swidden horticulture, semi-permanent sedentism, and village life, the question of when or how northern Iroquoian speakers entered southern Ontario can be set aside for present purposes (cf. Engelbrecht 1999).

Northern Iroquoian Culture History in Southern Ontario

Before discussing in greater detail what is currently known about the history of village formation in the study area, it will be helpful to review the culture-historic paradigm in use throughout this dissertation. The study area encompasses that part of present-day south-central and south-western Ontario in which the Attiwandaron (Neutral) and Wendat-Tionontate (Huron-Petun) confederacies are known to have developed. The member nations of these two groups were close in language (Steckley 2007) and shared an interconnected history of sedentarization and village development that was distinct in character and chronology from that of neighbouring Iroquoian groups in New York State and the St. Lawrence valley (Chapdelaine 1993; Warrick 2000). Ancestral Attiwandaron and Wendat populations participated in common ceramic stylistic horizons during the 14th century, and it is likely that the formal political consolidation of local settlement clusters into two distinct tribal confederacies began after the turn of the 15th century and was still ongoing on the eve of European contact. These historical, linguistic, and geographic connections are the basis for defining the study area as I have, and likewise led to the incorporation of the region’s Late Woodland archaeological record within a unified culture-historic system named the Ontario Iroquois Tradition (OIT) by J.V. Wright (1966).

Wright’s Ontario Iroquois Tradition was the culmination of several trends in Iroquoian archaeology during the early to mid 20th century. The introduction of the in situ hypothesis by Griffin (1944), and Kraus (1944), and supported by the work of Lee (1951), Emerson (1954), MacNeish (1952), and others, led scholars to more carefully consider the long-term development of Iroquoian culture in the region. In 1954, Emerson adapted the Midwestern Taxonomic System (MTS) to systematize Iroquoian prehistory in Ontario. He identified western (Middleport) and eastern (Roebuck) “Foci” of the “Iroquois Aspect”, of the “Woodland Pattern”,

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and argued that the Middleport focus was a “tradition”, while the Roebuck focus was more consistent with the “horizon” concept (Smith 1990). Meanwhile, working outside the framework of the MTS, MacNeish established the first comprehensive stage periodization for Iroquoian prehistory that provided estimated calendar dates, based on his extensive frequency seriation of ceramic types from 76 Iroquoian site assemblages (1952).

While rejecting the Midwestern Taxonomic System and MacNeish’s typological approach, J.V. Wright drew on Emerson and MacNeish’s work in developing the Ontario Iroquois Tradition, which, in spite of a variety of recent critiques, remains the lingua franca of archaeological practice in the region. The Ontario Iroquois Tradition was based on the tradition-horizon approach (Willey and Phillips 1958), and involved the division of the Iroquois “Tradition” into a series of diachronic “stages” and “sub-stages”, and synchronic or geographic “branches”. Controversy over the OIT has focused on 1) the empirical legitimacy of the sub-stage and branch distinctions (e.g., Spence 1994; Wright 1986), 2) Wright’s treatment of sub-stage and branch designations such as “Glen Meyer” and “Middleport”, as actual socio-political or tribal entities, or “peoples”, 3) the implicit assumption of within-stage cultural uniformity across large areas, and, likewise, synchronic transitions between stages across the entire region, and 4) the inadequacy of ceramic attribute similarity coefficients and artifact trait lists for characterizing culture change (Ferris 2003). These critiques are quite valid, especially given J.V. Wright’s and others’ use of the OIT as an explanatory tool for Iroquoian history (e.g., Finlayson 1998). By such logic, for instance, the appearance of the common Uren sub-stage, following the regionally bifurcate Pickering and Glen Meyer branches, was argued to indicate the conquest of the second “people” by the first (J.V. Wright 1966), in spite of the fact that Pickering and Glen Meyer were archaeological constructs that have not been convincingly shown to relate to past “tribal” groups in either socio-political or ethnic senses (Williamson and Robertson 1994).

Given these problems, in this study I employ an adapted minimal version of the OIT, set within the broader framework of the Early, Middle, and Late Woodland series commonly used in the Northeast (Figure 3.1). My intent is not to use the OIT as evidence for the political history of Iroquoian groups, nor to reify questionable sub-stage and branch distinctions that were originally founded on a much smaller body of data than now exist (Ferris 2003). Therefore, I make no formal distinction between Wright’s branches and sub-stages in my analytical approach, using only the broader Early, Middle, and Late Iroquoian stage designations. In Chapter 4 I discuss a refined chronology for these stages based on an up-to-date calibration of documented radiocarbon dates. Most important, however, for the present study, is the observation that
the rapidly growing body of archaeological data for the region continue to support the idea that broadly-based cultural changes that go well beyond ceramic styles were associated with transitions between Wright’s Early, Middle and (to a lesser extent) Late stages (e.g., Trigger 1990; Warrick 2000; 2008). Even those calling for the complete abandonment of the OIT propose a three-stage systematization involving essentially the same three chronological periods (Ferris 2003). Thus, for those who object to the use of the term “Iroquoian Tradition”, they can here read “Inter-lakes Tradition” (Ferris 2003) without any significant distortion in meaning. Nevertheless, I follow Trigger (1999) in maintaining that an association between the Northern Iroquoian linguistic and cultural tradition that exists up to the present day (lest we forget), can be reasonably “traced from historical times back through specific communities which clearly exhibit cultural continuity…” and that in Ontario, “this can be done successfully as far back as the Early Iroquoian period or perhaps the Princess Point Culture (1999: 318).” A final note is that, in keeping with recent practice (e.g., Ellis and Ferris 1990), I will refer to the Ontario Iroquoian Tradition, since Wright’s use of the term Iroquois has caused confusion over its relationship to the New York League Iroquois, or Haudenosaunee confederacy, and its descendent communities in present-day Ontario.

<table>
<thead>
<tr>
<th>Period</th>
<th>Tradition</th>
<th>Stage</th>
<th>Dates (AD)</th>
</tr>
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<tbody>
<tr>
<td>Late Woodland 2</td>
<td>Ontario Iroquoian</td>
<td>Middle Iroquoian</td>
<td>ca. 1280-1420</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Early Iroquoian</td>
<td>ca. 900-1280</td>
</tr>
<tr>
<td>Late Woodland 1</td>
<td>Princess Point/Sandbanks</td>
<td></td>
<td>ca. 500-1000</td>
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**Figure 3.1.** Late Woodland culture-historic sequence for the study region.
Sedentarization, Village Formation, and Horticulture

Middle Woodland Antecedents

Sedentarization in southern Ontario was a long-term process that may have had roots in the development of large, seasonally-reoccupied spring macroband campsites during the Middle Woodland period (ca. 400 B.C. – A.D. 500) (Chapdelaine 1993; Spence, et al. 1990). The residents of these sites are thought to have dispersed into smaller extended family groups that over-wintered in upland camps (Spence, et al. 1990; Finlayson 1977; Johnston 1968). The long-term re-use of macroband campsites such as Donaldson, near the mouth of the Saugeen River at Lake Huron (Finlayson 1977), and those of the Rice Lake Phase of the Middle Woodland Point Peninsula Tradition in southeastern Ontario (Johnston 1968; Curtis 2004), indicates the establishment of relatively stable band territories and regular patterns of seasonal aggregation and dispersal (Smith 2000). Several of these spring/summer aggregation settlements also functioned as cemeteries (e.g., Finlayson 1977), and those of the Rice Lake Phase involved the construction of burial mounds during the period of Hopewellian interaction (Johnston 1968; Spence, et al. 1984). Although maize may have been known to these populations through their participation in long-distance trade networks (Hart 1999; Hart, et al. 2003), there is as yet no evidence that it was grown or consumed in significant quantities. Middle Woodland economies remained solidly based on fishing, hunting, and gathering.

Late Woodland 1

The subsequent period in southern Ontario, known variously as the “Transitional Woodland”, “early Late Woodland”, or “Late Woodland 1” (ca. A.D. 500 – 1000) was marked by significant changes to the regional settlement system (Crawford and Smith 2002; Crawford, et al. 1998; Smith and Crawford 1997). These changes were not homogenous across southern Ontario, and did not occur simultaneously, and were particularly associated with the “Princess Point Complex” in central southwestern Ontario. Strong evidence for small-scale maize gardening, a relatively restricted territory, and initial contemporaneity with neighbouring groups that continued a Middle Woodland hunting-gathering lifeway (Smith 1997), have led some to argue that the Princess Point Complex represents an intrusive population that migrated into southern Ontario from outside the region (Bursey 1995; Stothers 1977). Others see it as an in situ cultural change associated with the limited incorporation of maize gardening into an otherwise traditional hunting-gathering economy (Ferris 2003, Crawford and Smith 1996).
Smith and Crawford (2002), and Dieterman (2001), have documented a pronounced transition in regional settlement systems for the Princess Point Complex. Princess Point settlement systems show a marked riverine-lacustrine focus, and known settlements form distinct clusters in a series of locales along the lower Grand River valley (LGRV) and at the Cootes’ Paradise wetland. Large, diffuse sites up to 10ha in area occur on alluvial river bars and floodplains of the LGRV, and on associated river terraces. Fluvial geomorphological studies at the Grand Banks site have shown that during the Princess Point occupations of the floodplain, unlike today, the flats were stable and could have been occupied for the entirety of the year. A few ephemeral upland Princess Point camps have been identified, and these appear to have been short-term resource-extraction sites. Seasonally reoccupied Princess Point fishing stations have been documented on the Long Point peninsula in Lake Erie (MacDonald 1986).

Smith has recently interpreted the Princess Point settlement system as indicative of a transition from the Middle Woodland focus on “territory” to a more limited focus on “locale” (Smith 2000). In support of this, Dieterman has shown that viewsheds from Princess Point settlements were significantly more restricted than those of Middle Woodland settlements (2001). Smith further argues that large Princess Point floodplain sites were occupied at least throughout the warm season, if not all year, and that they formed a focal base from which relatively brief special-purpose forays were made (Smith 2000). Radiocarbon dates from Princess Point sites such as Grand Banks indicate continual (re)occupation throughout the Late Woodland 1 period (ca. 500 years) (Smith 1997).

It remains unclear whether such sites evidence full annual sedentism. Many scholars appear to favour a long warm-season sojourn during which maize was cultivated in small quantities on the alluvium of the river flats, followed by winter dispersal or relocation to nearby terrace sites (Chapdelaine 1993). Explicit tests of this hypothesis using relevant seasonality indicators have not yet been made. However, evidence for architecture and settlement spatial organization provides an indication of site formation processes. Artifact distributions on alluvial sites typically form diffuse scatters over large areas (e.g., along 1000m of exposed river bank at Grand Banks [Smith and Crawford 2002]). Sites that have received extensive excavation reveal idiosyncratic patterns of posts occurring at different depths, scattered hearths, numerous small pits, and occasionally, large cylindrical storage pits (Smith and Crawford 2002; Pihl 1999). The general disorganization of these spatial patterns indicates that standing architecture was rather lightly-built, replaced frequently, and shifted substantially over time across a large area that may not have been densely occupied at one point in time. The observed spatial disorganization of
these sites certainly relates to their successive reoccupation over centuries, but cannot be attributed to palimpsest alone, since the relatively short-term occupation at the fully excavated Holmedale site also yielded ambiguous, poorly-defined post lines and feature patterns (Pihl 1999). In these respects, Princess Point site organization and architectural investment more closely resembles that of Middle Woodland macroband camps than it does later, demonstrably sedentary villages. With Chapdelaine (1993), I interpret these patterns to indicate that Princess Point settlements do not represent annually sedentary nucleated villages, but rather, long-term settlement foci for groups with fluid social membership and significant local mobility throughout an annual cycle.

_Late Woodland 2 - Early Iroquoian_

Between the end of the Late Woodland 1 period (A.D. 900-1000) and the beginning of the Middle Ontario Iroquoian stage (ca. A.D. 1280), major changes occurred in the nature of settlement architectural investment, the spatial organization of sites, the choice of site locations, and the periodicity of settlement relocation, signalling the development of nucleated, semi-permanent sedentary villages broadly analogous to those of the contact period. For this reason, the study sample of villages considered in the following chapters begins at ca. A.D. 900, with the advent of the Early Ontario Iroquoian stage (EOI). Between A.D. 900 and 1100, the first nucleated settlements with evidence for several contemporaneously occupied pole-frame houses, associated interior hearth and pit features, and often lightly-built fences or palisades, appear (Williamson 1990; Warrick 2000). These architectural and organizational developments were coincidental with a broad shift in the settlement system away from the riverine-lacustrine focus of the Late Woodland 1 period, to well-drained upland locations away from navigable waterways (Dieterman 2001). In south-western Ontario, there appears to have been local expansion westward from the core Princess Point area onto the Norfolk and Caradoc sand plains (Timmins 1997; Ferris 2003). In south-central Ontario, too, Early Iroquoian settlement shows a distinct bias toward upland locations on the sandy soils of the proglacial Lake Iroquois shoreline (MacDonald 2002).

These settlement patterns, combined with the frequent recovery of maize from Early Iroquoian sites, initially led researchers to interpret Early Iroquoian settlements of sufficient size (e.g., >0.5 acres, [Noble 1975]) as “formal” villages and evidence for the establishment of the same swidden horticultural system as was practiced historically (Noble 1975; Trigger 1990: 122). More recently, several detailed studies of Early Iroquoian settlement-subsistence patterns...
have emphasized the continued economic importance of wild collected foods (Williamson 1985), and indicate that not all settlements with longhouses and palisades were occupied continuously throughout the year (Williamson 1985; Kapches 1987), or that they may have shifted in use from seasonal hunting-gathering camps to year-round settlements and back again throughout their life-cycles (Timmins 1997). Moreover, it appears that nucleated villages with durable residential architecture did not take hold in the rest of Iroquoia until the turn of the 14th century (Chapdelaine 1993; Hart 2000; Niemczycki 1984). These trends have led Chapdelaine to argue for an intermediate “semi-sedentary” stage prior to the emergence of full annual or “semi-permanent sedentism” by around A.D. 1300. He suggests that before this time villages were abandoned during the cold season in favour of smaller family camps (1993). Williamson has also questioned the extent of maize dependence in Early Iroquoian diets (1985) and stressed the importance of long-distance forays for the collection of wild foods (1990) (but see Ounjian 1998).

However, it is important not to exaggerate Early Iroquoian continuity from Princess Point settlement-subsistence patterns, particularly after A.D. 1100. The relatively rapid settlement transition (from ca. A.D. 900 to 1100) from extensive, long-term reoccupation of floodplain, wetland margin, and river terrace locales, to nucleated upland settlements with shorter and more variable occupation histories, must have been associated with a significant change in village economies and the organization of labour required to support them. Ounjian’s extensive comparative study of Early Iroquoian (Glen Meyer) and later Neutral paleobotanical remains indicates that a very significant increase in the economic importance of maize horticulture was associated with the development of Early Iroquoian villages in southern Ontario, and that Early Iroquoian horticulture may have been as intensive as it was in Middle and Late Iroquoian contexts (Ounjian 1998). Furthermore, instead of taking advantage of the relatively open and disturbed habitats of river floodplains for maize gardening, shifting cultivation in upland locations would have required, even at a modest scale, considerably more labour in clearing old-growth deciduous forest. This, along with the construction of durable settlement architecture, suggests a commitment to the creation of a new kind of settlement space by a group of associated households. Seasonal or “logistic” mobility now involved movement from one durable built space to another, as indicated by evidence for a distinction between fall-winter hunting camps, warm season hamlets, and all-season “villages” in Williamson’s Caradoc survey (1985). Following Kent’s research on the determinants of settlement spatial organization and architectural investment (Kent 1992), the shift to settlements with orderly house layouts, multi-
stage patterns of refuse disposal, and architecture that was maintained over years or decades (e.g., Timmins 1997), appears to indicate a significant change in anticipated mobility (Kent 1990).

Considered at the site level, this raises a certain conundrum. If Early Iroquoians continued to practice considerable seasonal mobility, for instance between settlements with a focus, respectively, on hunting, fishing, and horticulture, why does settlement material and spatial investment indicate a rather momentous change in anticipated mobility? Measured on the same yardstick, the Princess Point settlement system seems to have involved far greater long-term stability in the use of particular sites within a predictable seasonal round. Why, precisely as settlement communities embarked on what could be called a system of neo-local colonization involving heterogeneous mobility patterns, does settlement spatial organization appear to have involved a new “sedimentation” of place?

One clue to understanding this development lies with the observation that Early Iroquoian settlements that have been considered “seasonal” or “special-purpose” nonetheless involved the regular or recurring presence of some individuals in all seasons. Also, significant architectural investment, especially by the 12th and 13th centuries, was normal for both “villages” and “special-purpose camps”. Most notably, houses with multiple aligned central hearths appear to cross-cut a variety of settlements with otherwise divergent evidence for the intensity of indoor use, seasonality, and economic emphasis. What seems most important to Early Iroquoian settlements, then, was not necessarily a reduction in mobility throughout an annual cycle, but the establishment of enduring built spaces associated with specific co-residential groups. A particularly early example is the warm-season 10th century Auda settlement, which consisted of at least nine regularly spaced ellipsoidal lodges with well-defined interior hearths but a near complete lack of storage pits, refuse-filled depressions, or shallow interior pits typical of year-round intensive habitations (Kapches 1987). The Lightfoot site, a probable early 12th century settlement situated in the Credit River drainage, was also likely a warm-season camp. Lightfoot was similar to Auda in lacking a palisade, storage facilities, or evidence for the cold-season occupation of houses, but it nevertheless included five well-constructed short longhouses (Poulton, et al. 1996).

To the west, in his survey of Early Iroquoian settlements on the Caradoc sand plain, Williamson (1985) identified five primary “villages” (>1ha) and twenty-five smaller sites (<0.5ha) that he interpreted as seasonally reoccupied hamlets or collecting camps for provisioning the villages, including the sites of Yaworski, Berkmortel, and Kelly. The Yaworski
site, interpreted as a fall-winter hunting and processing camp, included a single-row palisade surrounding at least four house structures. In strong contrast to Auda and Lightfoot, the Yaworski settlement included a number of clearly-defined feature clusters, some that occurred outdoors, and others that occurred within two of the houses. Like other inferred cold-season or year-round houses, House 1 included a central occupation corridor involving two feature clusters, each associated with a central hearth (1985: 198). Williamson’s description of the excavation also suggests that living floors had been present: “Portions of both structures were initially covered by large, thin cultural stains, and, when these were removed, the posts of the small house were quite evident (1985: 198).” Similar stains have been documented in central house floors at the EOI Elliott and Porteous villages (Stothers 1977). Another small Yaworski house included a dense cluster of shallow features surrounding a central hearth. These features “were extremely regular and indicated interior winter longhouse activity (1985: 194).” Peripheral, deep storage features also occurred in this house, one of which was stratified and contained a wide variety of household refuse deposited above a rich organic layer (1985:195). Large outdoor pits also appear to have functioned as storage for maize, and later for general refuse disposal. Quantities of uncalcined deer bones in these exterior pits indicated an important role for hunting at the site, while floral remains included maize, squash, bean and tobacco. Maize ubiquity at Yaworski was as high as at the nearby Roeland “village”, and a wide variety of collected plants were also present in flotation samples from storage pits, including raspberry, sumac, elderberry, strawberry, lamb’s quarters, knotweed, acorn, black walnut and butternut (1985: 204). Layers of dense fish scales in some features indicated spring fishing events. While the Yaworski data support a significant role for fall-winter deer hunting at the site, they also indicate warm season use and intensive occupation of two of the excavated house structures.

Likewise, limited excavations at the nearby Berkmortel site revealed a single-row palisade and portions of four houses, again with evidence for indoor feature clustering, and a broad spectrum of floral and faunal remains indicating exploitation of deer and raccoon in the fall and winter, fish and turtle in spring and summer, and a variety of summer-fall plant foods including knotweed, nuts, raspberry and sumac (Williamson 1985: 217). Maize was also ubiquitous at the site. Extensive excavations at the Kelly site revealed a palisade, two shallow midden areas, and a single longhouse. Low densities of indoor features and dense clusters of outdoor features indicated a warm-season and/or low-intensity use of the house. Feature contents were correlated with mammal hunting, nut collecting, seed-plant storage, and spring fishing (Williamson 1985).
Williamson’s Caradoc research reveals several things. Twelfth and thirteenth-century “hamlets” in that area, in spite of their small size, normally involved the construction of a palisade and one or more longhouses, regardless of their extractive purposes or seasonal emphases. Also, in spite of the special focus on hunting at Yaworski and Berkmortel, there is abundant evidence that sustained occupations of both sites occurred in all seasons. Furthermore, if Williamson is correct in suggesting that maize was brought to such hamlets rather than grown there, the high ubiquities and large quantities found in the numerous storage pits at these sites indicate that substantial maize provisions were required for extensive stays by large social groups (cf. Fox 1976). Williamson argues, somewhat circularly, that Yaworski was not likely a year-round village occupation because its catchment was not what was predicted for a village (1985). The evidence for some occupation in all seasons, however, is quite indisputable.

Similarly, the Late occupation phase at the Dorchester cluster Calvert site, interpreted by Timmins as a “hunting camp, occupied repeatedly on a short-term basis” (1997: 102) included three parallel short longhouses of typical width for the period, and was likely surrounded by a single-row palisade “for at least part of the occupation” (1997: 87). As with Williamson’s Caradoc hamlets, in spite of an economic focus on mammal hunting that certainly involved fall-winter occupations, the Calvert Late phase also featured the consumption of passenger pigeons, and the collection of wild plants and fleshy fruits available only in the warm season (Timmins 1997: 102-103). Regarding this, Timmins commented that, “the floral data leave little doubt that the Calvert site was occupied during the spring, summer, and fall during all phases” but that this “does not negate the hypothesis that the Calvert site functioned as a hunting camp in the Late phase (1997: 103).” Nonetheless, Timmins reports, “no notable changes in the diversity of floral species among the three main [occupation] phases (1997: 102),” the first two of which he considers year-round habitations. So, if we choose to call it a “hunting camp”, we are nevertheless confronted with a settlement that (like Yaworski and Berkmortel) involved occupations during all seasons and for a wide variety of subsistence pursuits. The construction (and maintenance over an estimated 20 years) of durable domestic architecture, a palisade, and considerable consumption of maize, all likewise indicate that the Calvert Late phase settlement was probably regularly occupied for lengthy, if periodic, stays by the members of three extended families that were associated with specific houses, including women, men, and children. An argument can be made that the successive reconstruction of three similarly oriented houses in each of the three occupation phases at Calvert (Timmins 1997, Chapter 4) indicates between-phase continuity in the extended families they housed. Thus, in spite of the possibly changing
extractive and seasonal emphasis of use across phases, a degree of stability in the social composition of the three resident family groups seems to have been maintained.

From this perspective, the development of built village space during the Early Iroquoian period begins to make sense. What had changed between Princess Point and Early Iroquoian settlement systems was neither a significant increase in the long-term stability and predictable occupation of settlement sites, nor the loss of mobility *per se*, but principally an increase in the anticipated stability of the constituent social groups forming a *community* and the ongoing periodic use of associated settlements by those groups. This signals an important watershed in the way people experienced housing. Whereas the fluid group membership of Middle Woodland territorial bands involved a built environment that was “fit” to the frequent movement of people within and between long-term seasonally reoccupied settlements, the increasing stability of Early Iroquoian household or co-residential group membership in a particular community (or perhaps *claims to membership*) meant fitting these households into an “anticipatory” built environment in one or more associated settlements. In this light, the construction of houses at Early Iroquoian hamlets might actually indicate an attempt to cement claims of use or site occupation by the families that built and regularly occupied them.

This change involved the intensification of a kind of material engagement that can be called place-making. Fields and village clearings were cut from the forest, houses were built to last decades, and palisades were commonly constructed around both semi-permanent villages and hamlets with periodic or seasonal uses. These palisades were not the large multi-row defensive structures of the historic period. They were normally constructed of a single row of relatively slender posts (5-10 cm in average diameter), and it has been suggested that they functioned primarily as snow fences or to keep out wild animals (Trigger 1990). However, like the longhouse, they “anticipate” a cleared, built area that had a defined social constitution; they were (also like the longhouse) frequently expanded or contracted in proportion to the addition or loss of houses. The physicality of the longhouse, too – its role in promoting regular patterns in the comportment of its residents, and in defining different co-residential groups within the settlement as a whole, was now brought into play, even as households, groups of households, or entire communities moved between settlements of variable seasonal or economic emphasis.

For this reason (in contrast to definitions of the village that emphasize scale and/or full “annual” sedentism) I consider the shift in the anticipated stability (or claims to stability made through house construction) of the co-residential groups that composed a community to be the crucial development that marked the advent of the Iroquoian village. This is also a practical
definition, since the extent to which apparently semi-permanent sedentary villages were seasonally depopulated is extremely difficult to gauge, even for the contact period. Seasonal occupation of hamlets and field houses is certainly known from the Middle Iroquoian to the 17th century (Pearce 1983; Poulton 1984; Williamson 1983), and, as in the Early Iroquoian period, these seasonal sites continued to involve significant architectural investment and spatial arrangements that mirrored year-round residence structures. Thus, seasonal depopulation of a core village in favour of summer field houses or fall hunting camps may have been, to varying extents, a common feature of Iroquoian settlement systems in southern Ontario from the Early Iroquoian period onwards. As noted by Eder (1984), residential sedentism, defined as settlement occupation by at least some people throughout the year, sets the bar low with respect to actual mobility, and the Caradoc “hamlets” and Calvert Late phase “camp” would perhaps qualify as “sedentary” on these grounds.

Early Iroquoian place-making was also a symbolic process linked to ideas about defining the village community as a social whole, and perhaps opposing “clearing” and “forest”, “domestic” and “wild” spaces. Beyond the fact that forest-clearance, house, and palisade construction served to define a bounded physical and social space, there is strong evidence from the 13th century Elliott III village that, at least there, the village boundary at the palisade was the focus of a series of ritual events involving large-scale feasting, and mortuary practices (Fox and Salzer 1999). The remains of these events were preserved in a deep flat-bottomed pit located just inside a gap in the palisade. Its position there is conspicuous, as it was one of just two such pits that occurred outside a house. An entire large ceramic vessel was deposited in a basal layer of the pit along with a dense deposit of fish bone (Fox and Salzer 1999). Subsequently, the body of a young child was placed in the pit and the long-bones removed, likely for curation and reburial at a later date. Directly associated with the burial were three Marginella sp. shells and an eagle wing digit (Fox and Salzer 1999: 249). Above the burial, an ashy, artifact-rich layer contained two red ochre paint palettes (Fox and Salzer 1999). The Early Iroquoian Miller (Kenyon 1968) and Praying Mantis (Howie-Langs 1998) sites also featured human burials at or just outside the village palisade, in addition to interments within houses. Primary and secondary burial in houses, frequently in pits located beneath the side platforms or “bunk-lines”, seems to have become increasingly common by the end of the 13th century (at sites such as Bennett, Uren and Myers Road) and this pattern continued through the 14th century (see Chapter 6).

Ethnohistoric evidence points to a pervasive ideological distinction between “forest” and “clearing” that was emphasized in Iroquoian gender roles and political and religious ceremonies
(Engelbrecht 2003; Hamell 1992; Ramsden 1990). For instance, the Iroquois rite of condolence, in which a newly appointed chief was installed or “requickened” under the name of a deceased chief of the same lineage, involved a narrative structure that reified these categories by ritually marking the meeting of two communities as hosts and guests, “at the wood’s edge” (Hamell 1992). The main stages of the rite moved along the metaphorical (recapitulating the literal) route of the guests to the host village, and involved “journeying on the trail”, “welcome at the wood’s edge”, the “requickening”, “songs of farewell”, and “over the great forest” (Woodbury 1992).

The wood’s edge ritual was described by Hale as follows:

At the appointed day the chiefs of the other nations approached the place of meeting. A multitude of their people, men and women, usually accompanied them, prepared to take part both in the exhibitions of grief and in the festivities which always followed the installation of the new councillor. The approaching chiefs halted when they reached the border of the “opening,” or cleared space surrounding the town. Here took place the “preliminary ceremony,” styled in the Book of Rites, “Deyughnyonkwarakda”, a word which means simply “at the edge of the woods.” At this point a fire was kindled, a pipe was lighted and passed around with much formality, and an address of welcome was made by the principal chief of the inviting nation. The topics of this address comprised a singular mixture of congratulation and condolence, and seem to have been prescribed forms, which had come down from immemorial antiquity, as appropriate to the occasion. [Hale 1962 (1882): 49]

The ritual events that took place at the edge of the Elliott site seem to indicate a similar concern over the village boundary as a threshold between host and guest communities, and domains of “woods” and “clearing”. It is tempting to suggest that the feasting that occurred there involved host and guest parties and associated rituals of condolence related to the child’s interment. As Fox has pointed out, the deposition of marine shell beads was part of the “requickening” stage of the condolence rite, so as to metaphorically “wash the bloody mat” of the deceased (Fox and Salzer 1999). It is also known that the 17th century Wendat practiced rituals for “resuscitating” the names of deceased family members (Trigger 1976). In any case, the ubiquitous use of palisades in the 12th and 13th centuries, even at seasonal, single-house settlements such as Kelly, takes on additional significance in light of the boundary-marking rituals at the Elliott site, and the wider ideological context of Northern Iroquoian cultures (see also Hamell 1992).

With respect to Early Iroquoian subsistence, recent paleoethnobotanical studies demonstrate that maize cultivation was significantly more important in the Early Iroquoian of southwestern Ontario than it had been during most of the Princess Point period (Saunders 2008;
Maize kernel fragment densities in flotated pit samples recovered from Early Iroquoian (Glen Meyer) and prehistoric Neutral sites were found to range from 1.3 to 33 per litre (Ounjian 1998), while those of Princess Point sites ranged from zero to a maximum of 0.23 per litre (Saunders 2008: 79). This does not mean that *per capita* maize consumption had reached historic levels in Early Iroquoian contexts, but it does indicate an important increase from Late Woodland 1 times, supporting the interpretation that the shift to easily tilled sandy soils was related to a new level of dependence on the crop. Unfortunately, relatively few Early Iroquoian osteological samples have been analyzed for stable carbon isotopes. The data that do exist indicate that maize made up between 25-35% of average dietary caloric intake between ca. A.D. 900 and 1200 (Schwartz, et al. 1985), gradually increasing until the 13th century, when it rose rapidly to historic levels (i.e., 50 to 70% of dietary calories) by the beginning of the Middle Iroquoian stage (Katzenberg 2006; van der Merwe, et al. 2003).

*Late Woodland 2 – Middle and Initial Late Iroquoian*

From A.D. 1280 to A.D. 1420 (the Middle Iroquoian stage) and A.D. 1420-1500 (the Initial Late Iroquoian stage), a series of rapid and dramatic changes occurred in the scale of houses and villages (Dodd 1984; Warrick 2000). Massive longhouse expansions (with some houses reaching over 100m in length), village coalescences, and high levels of maize dependence, were associated with a period of rapid demographic expansion (estimated by Warrick [2008] at 1% per annum), a shift to heavier soils, and the colonization of new regions, including Huronia, during the 14th century. House expansions appear to have been linked to community mergers, and to have paved the way for higher levels of maize dependency (van der Merwe, et al. 2003) and subsequent demographic growth (Trigger 1990; Warrick 2008). By the early 15th century, populations were stabilizing, but a second wave of village coalescence had begun (producing towns up to 4.5ha in area with an estimated 2-3000 residents) (Birch 2010). These developments, in turn, were associated with settlement fortification and evidence for endemic warfare (Birch 2010; Finlayson 1985; Snow 2007; Williamson 2007).

**Village Development and Social Change**

As noted recently by Robb in his analysis of the Neolithic-Early Copper Age transition in prehistoric Italy, causation in the study of long term cultural change cannot be adequately approached within the traditional paradigm of prime movers and unilineal consequences, be these “external” or “internal” (Robb 2007). Inevitably, as data have built up, our understanding
of the related transitions to sedentism, maize horticulture, and Iroquoian “tribal” evolution have become increasingly complex and subtle. Theories attributing culture change rather mechanically to migration or diffusion have given way to those seeking functional or systemic understandings of cultural evolution. Within these systemic perspectives, migration (e.g., Snow 1995, 1996) and diffusion (Dincauze and Hasenstab 1989; Hart 2001; Jamieson 1992) have sometimes continued to play important roles, but with an increased recognition of the complex chains of cause and effect typically at play over centuries (e.g., Chapdelaine 1993; Ferris 2003; Williamson and Robertson 1994).

Nevertheless, “tribalization” in the wake of the adoption of agriculture has often continued to be seen, at least implicitly, as the predictable outcome of a Service-style evolutionary progression set in motion by the introduction of maize. Cultural evolution, it would seem, could hardly be resisted in view of the manifest economic attractions of cultivation over foraging and associated consequences of sedentism and population growth. In one of the earliest explicit treatments of the problem of Iroquoian village formation, Noble remarked that, “it is something of a truism to say that if the horticultural subsistence base is sufficiently intensive and reliable, then it has incentives towards population growth and increased stability in residence, and will permit semi or permanent sedentary, nucleated settlements (Noble 1975:25).” With the rejection of traditional migration theories for Iroquoian origins by MacNeish and Ritchie’s generation, the introduction and intensification of maize horticulture came to be seen as the prime mover in the in situ emergence of “formal village life”. Associated social changes, from Steward’s patrilineal band structure to a matrilineal/matrilocal village organization, were linked to the increasing contributions of women’s work to subsistence (Ritchie 1969; Noble 1975; Ferris 2003) or to their cooperation for social harmony and mutual security at sedentary settlements while men roamed further afield (Trigger 1976). Longhouse formation and growth were therefore seen as a natural outgrowth of this socio-economic development, representing the unproblematic economic development and demographic expansion of matrilineages (e.g., Warrick 2000; Ferris 2003). Resulting population growth and increasing settlement size led to the formation of “formal village government” led by the heads of matrilineal households, and the extension of segmentary organization in larger MOI and LOI villages via the formation of “clan barrios” (Warrick 2000).

Debates have tended to focus on the timing of the probable emergence of matrilineal/matrilocal organization (EOI vs. MOI [Timmins 1997; Kapches 1990; Snow 1995; Hart 2001; Ferris 2003]), and on the rapidity or gradualness of the transitions to sedentism,
intensified swidden horticulture, and matrilocality (e.g., Chapdelaine 1993; Hart 1999, Niemczycki 1984). Within this milieu, escalating endemic warfare has been seen as a consequence of the adoption of maize horticulture, as opportunities for male prestige in hunting waned and were traded for those of the warpath (Kapches 1994; Trigger 1976), and as part of the predatory expansion typical of farmers (Snow 1995, 1996). Warfare itself has often been posited as the proximate cause of village coalescence for defense, and in a more sophisticated iteration, the release valve for competition between unrelated males in newly matrilocal/matrilateral communities (Kapches 1994). Snow has argued, contrarily, that matrilocality emerged as the consequence, rather than the cause of warfare (1995, 1996), following cross-cultural studies of matrilocal segments that link it to external warfare among migrating agriculturalists and not to female labour (Divale 1984). Meanwhile, taking an explicitly Darwininan approach, Hart has rejected Snow’s argument for the relationship between matrilocality and predatory expansion, as well as the traditional female labour hypothesis, in favour of the gradual co-evolution of productive maize populations and matrilocal exogamous communities based on a shifting balance theory for maize adaptation to heterogeneous fitness landscapes (2001). This theory posits selection for stable matrilocal households capable of maintaining continuity in local agricultural knowledge, technologies, techniques, and environments to which maize population demes were specifically adapted.

In all of these theories maize agriculture, semi/sedentism, population growth, warfare, and matrilocal/matrilateral segmentation evolve together as an interconnected causal set. The culmination of this process is the so-called “crystallization” of the Northern Iroquoian tribal pattern (as ultimately documented by Europeans in the 17th century). Yet, as the review above indicates, the timing of changes in various elements of this complex demonstrates that they did not all appear rapidly around A.D. 1000 (or A.D. 500, or 1300, for that matter), as a neatly correlated “Neolithic package”, as implied by Snow’s incursion hypothesis, or Noble’s “formal village” model (Hart 2001; Ferris 2003; Chapdelaine 1993; Crawford and Smith 1996). On the other hand, Chapdelaine’s (1993), Ferris’ (2003), and Hart’s (2001) gradualist evolutionary approaches do not, in my view, adequately address the reality of punctuated change (especially at the end of the 13th century).

We are now in a position, I believe, to move away from a model of causation that presumes the rather natural emergence and extension of matrilineal/matrilocal organization in response to the ecology of maize horticulture. I am not rejecting the significance of horticulture and kinship in the history of Iroquoian social and political development; the point, rather, is that
in order to avoid the just-so narratives that so easily co-opt and control thinking (including my own) about “causes”, we will need to resist their apparent natural logic, and identify the specific material patterns that tell us, perhaps, something very different about the past than we were expecting.

For instance, in spite of the prominent position of matrilocal culture change in all of the foregoing models of Iroquoian culture change, to my knowledge only two significant attempts have been made to associate specific material patterns of the archaeological record to matrilocal culture. Whallon (1968) made early strides in this direction by identifying relatively greater ceramic decorative homogeneity within vs. between Owasco sites. To him, this suggested that, at least at the village level, Owasco communities were exogamous and matrilocal. It has since been shown that Whallon’s samples were not likely derived from single components, as he had assumed, casting some doubt on his conclusions (Hart 2001). More significantly, the idea that daughters passively adopt and replicate ceramic decorative attributes or styles directly from their mothers has been questioned based on ethnographic and ethnoarchaeological grounds. Indeed, a similar pattern of village or village-cluster related ceramic “micro-styles” in the Early Iroquoian appears to have given way to a regionally more homogenous and extensive set of simpler and widely recognizable ceramic designs at the onset of the Middle Iroquoian (Dodd et al. 1990; Timmins 1997; Ferris 2003). If Whallon’s interpretation were correct, it would seem to indicate that matrilocal culture ceased to operate at the onset of the 14th century, precisely the time when longhouses grew significantly in southern Ontario, and became common throughout Iroquoia generally (Hart 2000; Chapdelaine 1993).

Another attempt was made by Kapches (1990) who used an assessment of longhouse interior spatial organization as a proxy for the strength of social control by “matrilocal residence groups” to argue for a relatively late emergence of matrilocal culture in the 13th century. This assessment of “organized” space in longhouses is critiqued in Chapter 7. Kapches may, indeed, be correct about the relationship between longhouse organization and matrilocal culture, or at least matrifocality (Latta, personal communication), but her assessment of “organization” is problematic (see Chapter 7).

Significantly, some of the most relevant data to the question of post-marital residence, osteological genetic traits, indicate that the female populations of village ossuaries were not necessarily more genetically homogenous than those of males. At the late 13th century Moatfield ossuary, the female population was more genetically heterogeneous than the male (DeLaurier and Spence 2003). This does not preclude the possibility of matrilocal practice, since the female
population might be more diverse for a variety of contingent historical reasons, such as the capture of women from non-local groups in warfare. On the other hand, it provides no particular empirical support for matrilocality. My point, here, is not to argue against the possible development of matrilocality as a guiding norm for residence practices associated with a matrifocal longhouse, but to demonstrate that the actual archaeological data invoked in causal explanations of culture change in the region has been weakly constituted. More fundamentally, following Birch (2008), I question the premise of treating matrilocality and clan formation as an adequate description of the dynamic social changes that occurred in southern Ontario prior to A.D. 1500.

**Ontario Iroquoian Village Development: An Exploratory Framework**

In the previous chapter I suggested that the social construction of community lay at the core of Northern Iroquoian village development. It is evident from the foregoing review that Northern Iroquoian sedentarization, population nucleation, and horticulture were closely interrelated developments over the long term. However, it is also apparent that these developments were not gradual and continuous over time; there were periods of slow change followed by rapid transitions in regional settlement systems, architectural investment, the scale of houses and settlements, agricultural dependence, and birth rates. The first of these transitions was associated with the onset of the Early Iroquoian period in southern Ontario, and principally involved a new material engagement in place-making. I have argued that this emerged in part from a growing expectation of, or desire to establish, the social stability of the member co-residential groups that composed a village community. Physical boundaries and mortuary rituals were both involved in marking *house* and *village* as significant and enduring social entities. The second major transition began in the second half of the 13th century, when houses rapidly extended, and small Early Iroquoian villages merged to form Middle Iroquoian village communities that were on average about four times larger in terms of total built area (see Chapter 5). Like the initial emergence of Early Iroquoian villages, this transition involved a new level of dependence on maize horticulture. It also likely instigated a major demographic growth period during the following century (Warrick 2008), and a continuing trend toward village coalescence.

In both of these periods of punctuated change, what is most striking is that they do not appear to have been the result of significant regional population growth and demographic pressure (*contra* Cohen 1977); nor were they the result of the intensification of agriculture; nor were they (initially) the consequence of a dramatic reduction in mobility. Instead, these
transitions each occurred in such a way that demographic growth, agricultural intensification, and increasing sedentism were their short-term consequences. The case is particularly clear for the Early-Middle Iroquoian transition, when the fusion of small longhouses to form the large, sometimes monumental longhouses of the 14th and 15th centuries was part and parcel of a process of village amalgamation (Pearce 1984). This nucleation process, which must have been inescapably political in character, initiated, and I would even say made possible, a new dietary dependence on maize that further ushered in rapid population growth and a final commitment to semi-permanent sedentism (Chapdelaine 1993).

Likewise, the Late Woodland 1 — Early Iroquoian transition involved a series of decisions by social groups to move away from long-established locales and predictable territorial rounds in order to colonize the virgin deciduous forests of the upland sand plains. The commitment to place-making that the associated land clearance and architectural investment implies was not initially linked to an abandonment of seasonal mobility patterns; rather, it involved a new experience of built space that served to materially fix a set of co-residential group identities vis-à-vis a defined settlement community. To paraphrase Barrett and Ko, the new material engagement that such place-making entailed was not likely undertaken to inscribe a new cultural order on settlement space, but in the process, built environments became “the medium that revealed how an order of categories might have operated (2010:289).” The consequence, again, seems to have been increased levels of maize consumption, a gradual relaxation of the limits on fecundity, and positive feedback with the scale, durability, and organizational complexity of built environments (see Chapter 7).

In short, it begins to look as though new material engagements (with maize, with landscapes, with built environments) were drawn upon and, perhaps quite intentionally, intensified and extended during periods of rapid change that principally involved the social definition, reorganization, and coalescence of first-order communities. To some degree these social upheavals may themselves have been instigated by the destabilizing qualities of gradual increases in maize productivity over the preceding half millennium, but this observation cannot pass for an adequate account of how and why those changes occurred. This dissertation aims to provide such an account by looking at the way new experiences of built space were drawn upon and transformed during the long-term development of Iroquoian villages in southern Ontario. I have argued earlier that the social changes involved in the development of village communities likely involved emerging tensions associated with the maintenance of “mutuality” in the context of competitive possibilities opened up by increasingly delayed-return material engagements.
Furthermore, I have suggested that scale-dependent social stress may have been related to egalitarian decision-making in social groups that were extended in order to articulate power in increasingly competitive between-group relationships at a number of scales (e.g., between houses, between village factions, and between whole villages).

The key to understanding how this dynamic was involved in structuring Iroquoian village life may lie, yet again, with people’s ongoing generative engagement with built environments. Fletcher has emphasized that this engagement is characterized both by correspondence and non-correspondence between spatial and social orders (2004). He argues that the social and ideological can never be fully “spatially realized”, and spatial configuration will tend to have social effects and the potential for meaningful interpretation beyond that which is expected or understood by builders or inhabitants at one point in time. The disjunction between agency and outcome may appear small on the short term, but its significance over the long term is likely to be considerable (Fletcher 2004). The result of this disjunction is that unanticipated aspects of an architectural configuration will, through time, create increasing friction between agents’ interests, goals and motivations occurring in real spaces, and the propensity of the configuration to support them. Likewise, as architecture cannot fully accommodate or determine social function and meaning (nor are the interests and intentions of agents within communities ever united or stable), and as changes in other domains such as economy, the family developmental cycle, or demography emerge to some degree independently, resulting attempts to reconfigure built environments will always represent contingent and partial “solutions” to these conflicting concerns. The outcome of this process will be a distinct cultural trajectory that is shaped by the nature of the fit between space and society mediated through practice over the long term.

This leads to the following question: what kinds of conjunction or disjunction might have emerged between Iroquoian village spatial organization and the social practices involved in community reproduction? A partial answer arises from the distinction drawn by Johnson (1982) between sequential and simultaneous hierarchical organizational systems. Johnson argues that as communities face scalar stress, they may respond in terms of these two organizational patterns. He suggests that since scalar communication stress is most properly a function, not of absolute population size, but of the number of autonomous decision-making units within a system, an egalitarian “solution” is to expand the absolute size of decision-making units such that they remain few in number. Once consensus is reached within these units, decision-making at the aggregate level is relatively straightforward (1982: 403). This is what Johnson terms sequential hierarchy. Alternatively, simultaneous hierarchy is a non-egalitarian organizational form in
which a relatively few dominant individuals or groups exercise decision-making powers over the community at large.

While Johnson presents these organizational patterns in socio-political rather than spatial terms, an intriguing possibility emerges when we consider the potential of built environments to influence the everyday social practices upon which higher-order political networks are ultimately based. As Hillier and Hanson (1984) have pointed out, there are two elementary syntactic vectors along which a settlement spatial system may expand. The first is by subdividing or adding cells within domestic structures, and the second is by adding new free-standing domestic structures. If domestic groups form significant “organizational units” within a community, then the first pathway of growth may be spatially consonant with sequential hierarchy to the extent that domestic structures promote internal local integration of constituent family members. The second pathway of growth, on the other hand, may increase village organizational scale, and concomitantly, community-level interaction stress that would require resolution transpatially. At a secondary level, the arrangement of free-standing structures within the exterior space of a settlement will have an impact on how community-level interactions are situated and controlled with respect to interior domestic space and the surrounding landscape. Exterior space might be arranged so as to encourage the interaction and solidarity of spatially delimited social subgroups, supporting a kind of spatially inherent sequential hierarchy beyond the co-residential group (i.e., where village outdoor spatial configuration promotes social interactions leading to cohesion at local scales, so as to reduce the impacts of scale at the village level). On the other hand, exterior space might be arranged so that individuals regularly encounter all kinds of village occupants and visitors beyond the domestic threshold.

These different configurations would, in turn, variously iterate with the nature, scale, and setting of ritual and political practices of social identity formation within communities, particularly as these were related to ongoing social tensions associated with mutuality and competition. For instance, by expanding the size of the co-residential longhouse group, communities may have been able to mitigate scalar stress at the community level, but only through the paradoxical problem of expanding the house itself. In contrast to Johnson, I do not see the expansion of “organizational units” as in any way straightforward: actual and fictive kinship may have been the discursive “logic” for house expansion, but producing longhouse cohesion would have demanded the continual practical negotiation of social tensions. This suggests that the process of social identity production and extensification that was underway during Iroquoian village development was fraught with difficulty, and required a great deal of
“social work” (*sensu* Latour 2005) in which the physicality of the longhouse came to play a central role. The following chapters of this dissertation pursue these ideas in a series of empirical studies of village and longhouse spatial organization using data from 25 Ontario Iroquoian villages spanning the period between A.D. 900 and 1500.
CHAPTER 4
STUDY FRAMEWORK, CHRONOLOGY AND SITE SAMPLING

This dissertation is composed of three main analytical projects, presented in Chapters 5 through 7. Chapters 5 and 6 deal with aspects of spatial organization at the village level (village-level analyses), while Chapter 7 explores the arrangement and use of interior domestic space (house-level analyses). All three studies pertain to the same geographic area and temporal period; however, due to the unique data requirements of the different research methods that are used, site sampling varies somewhat among the chapters (Table 4.0).

Study Design and Sampling Strategy

One option in designing this research program was to identify a set of related villages within several geographically distinct local settlement clusters, and to track the historical developments of village organization within the same communities as they relocated over time. This approach would theoretically provide a much finer-grained analysis of local historical trajectories of village growth, coalescence, and reorganization than has so far been available. Unfortunately, several features of the Late Woodland archaeological record for southern Ontario rendered such a plan unfeasible. While local village occupation sequences have frequently been hypothesized (e.g., Pearce 1984; Williamson 2004), these remain largely speculative constructs based on general assessments of ceramic type or attribute frequencies and geographic distances between neighbouring sites. Attempting to rigorously establish one such sequence based on a more fine-grained analysis of material culture would alone constitute the work of a dissertation. More limiting still is the fact that a study of village organization of this kind depends on data from fully or near-fully excavated settlements. Such large-scale excavations are most often conducted in salvage contexts, and so relatively few sites within any given hypothetical village relocation sequence have seen extensive excavation. Moreover, village fusions and fissions, and the colonization of new territories, mean that few site clusters show continuity from the earliest period of village formation into the 15th century.

Instead, a regional and long-term approach was taken. This research design had the benefit of permitting identification of regional diachronic trends of considerable scope by making use of large and statistically significant sample sizes. Given the high level of variation in Iroquoian village size and layout, casting a wider net allowed recognition of general patterns that
might not have been evident at the local level. It also serves to establish a foundation for future “high resolution” local comparative studies.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Site</th>
<th>Stage Level Studies (Chapters 5&amp;6)</th>
<th>Occupation Phases Analyzed (Chapters 5&amp;6)</th>
<th>House-Level Study (Chapter 7)</th>
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<td><strong>43</strong></td>
<td><strong>25</strong></td>
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Table 4.0: Study site and longhouse sampling.

**Study Area**

Figure 4.0 illustrates the study area in south-central and south-western Ontario. The region is naturally bounded on the south by Lakes Erie and Ontario and the Niagara River, on the east and northeast by the Frontenac Axis dividing the precambrian shield and the Ordovician bedrocks of southern Ontario, and on the northwest by Lake Huron (see also Figure 3.0). The southwestern boundary occurs just west of the present-day city of London, and perpendicular to
the Thames River Valley. This boundary represents the approximate frontier between the Ontario Iroquoian Tradition to the northeast, and the Western Basin Tradition to the southwest (Murphy and Ferris 1990). The study region incorporates the area in which the contact-period Neutral and Huron confederacies developed, and in which there is evidence of population continuity reaching back to at least the 10th century (see Chapter 3). The approximate boundary between the ancestral Neutral and Huron populations has been given variously as the Niagara Escarpment (Smith 1997a), or the Credit River Valley (Warrick 2008). However, given the small scale and wide distribution of Early Iroquoians across the region, the significance of these 17th-century political divisions for this early period is uncertain. The withdrawal of widely dispersed Middle Iroquoian populations into more densely populated regional clusters separated by large buffer zones between the 15th and 17th centuries suggests that this was a period of tribal consolidation and confederacy formation in southern Ontario (MacDonald 2002). Prior to the 15th century, much less certainty can be attached to the terms Neutral and Huron. In the present study, all of these populations are considered to have been participating in a wider Iroquoian interaction sphere (Chapdelaine 1989; Engelbrecht 2003) from which distinct “tribal” identities were emerging by late pre-contact times.

The study area is characterized by a wide variety of soil types that have developed in the wake of the last glacial episode on flat, gently undulating, or rolling terrain marked by strand lines of the ancient lakes Algonquin and Iroquois, and glacial features such as moraine systems, drumlin fields, eskers, till plains and clay plains (Chapman and Putnam 1966). The northern and north-eastern portion of the region falls within the Canadian biotic province, while the south-western portion, including a narrow strip along the northern edge of Lake Ontario, falls within the Carolinian province. These provinces are characterized by temperate climates, mixed deciduous-conifer forests, and a wide variety of plant and animal foods. In addition to the Great Lakes system itself, significant waterways include the Saugeen to the northwest, the Nottawasaga in the north-central area, the Trent-Severn system in the northeast and east, the Grand River in the central south-west, and the Thames River in the south-west.
Figure 4.0. The study area in southern Ontario showing the locations of sampled archaeological sites.

Site Sampling

The selection of sites for inclusion in the analysis of exterior village organization involved several stages. Because many excavations of Iroquoian settlements in the study area have occurred recently in salvage contexts, published reports and settlement plan data are often not readily available. Moreover, comprehensive published summaries of archaeological resources in Ontario were more than a decade old when this project commenced. In order to identify sites that had received extensive “mitigation” and fell within the period of study, I made several large site record form requests to the Ontario Ministry of Culture’s archaeological site database. Along with existing published material, this database search allowed me to create a short-list of unpublished “grey literature” reports on extensively excavated sites of interest. Because of existing privacy laws, I was required to obtain permission from certain excavation directors to access site reports held at the Ministry of Culture. In some cases, these individuals did not respond to requests. Also, not all documents that were said to be held at the Ministry
could be located by staff. Poor print quality rendered some settlement plan maps inadequate for my purposes. Many of the most useful materials, including original field notes, plan drawings, and CAD files, were generously provided by staff at the London Museum of Archaeology, the Royal Ontario Museum world cultures department, Archaeological Services, Inc., Archaeologix Inc., and Poulton & Associates, Inc. Once these materials were in hand, site selection was based on the relative completeness and fidelity of documented intrasite settlement pattern data and the existence of supporting data on excavation methods, site topography and dating. Even as this list was finalized, additional sites of relevance were being excavated and reported on, including the remarkable early Middle Iroquoian Dorchester villages.

Because of the contingencies of this selection process (as well as those governing salvage archaeology itself), the resulting sample cannot be assumed to represent the “population” of Iroquoian villages across the region for each period of interest. Nevertheless, the collection of 20 complete site plans with a total of 43 modeled occupation phases dating between A.D. 900 and 1500 represents the largest sample of its kind yet studied with respect to village spatial organization in the region.

**Chronology**

The study period, ca. A.D. 900 to 1500, was determined so as to include three major transitions in the development of Northern Iroquoian villages. Widespread establishment of settlements composed of nucleated clusters of pole-frame houses that were maintained over several years seems to have occurred between approximately A.D. 900 and 1100 throughout the study area. This increasing investment in residential architecture and community stability was initially associated with settlements of variable seasonal and economic orientations (see Chapter 3). Many of these were apparently residential bases for at least part of a core village community throughout the year; others may have been established for seasonal occupation by special-purpose foraging expeditions, but the relatively high architectural investment at these “camps” suggests an expectation of repeated use by particular social groups over many years. The second transition occurred between A.D. 1250 and 1350, when village fusions and house expansions appear to have been associated with a new level of commitment to maize as a subsistence staple, and the longhouse as an enduring focus for sedentary life. The third transition, beginning around A.D. 1400 and continuing into the 16th century, involved a “second round” of village coalescences that resulted in the formation of large fortified towns such as Draper and Parsons.
The three basic stages identified by J.V. Wright in his Ontario Iroquois Tradition (OIT, Early, Middle, and Late Ontario Iroquois) were adapted to organize the diachronic analysis of settlements within the study area. As discussed in Chapter 3, the empirical validity and historical significance of regional branches (e.g., Pickering and Glen Meyer), and sub-stages (Uren and Middleport) has been debated, but the general cultural shifts associated with Wright’s Early, Middle, and Late stages have been borne out in subsequent studies (e.g., Williamson 1990; Dodd et al. 1990; Warrick 2008; Ferris 2003). Also, the vast majority of site reporting in Ontario has made use of the OIT stages for initial chronological classification of components based primarily on relative frequencies of ceramic types. Because of a large sample size and the widely distributed storage of collections included in the study, attribute-based ceramic seriation of all settlements was not a practical solution to provide more detailed chronological estimates for each site. Funding from the University of Toronto Department of Anthropology, and an internship at the University of Arizona Tucson AMS facility, permitted the acquisition of 12 new AMS dates on cultigens, nut shell, and carbonized textile from four previously undated sites: Holly, Alexandra, Berkholder II, and Dykstra (Table 4.5). These were combined with existing reported conventional or AMS dates for the sampled sites and calibrated using Oxcal 4.1 and the 2009 calibration standard (IntCal09 [Reimer et al. 2009]) (Table 4.1). Modes were used as central point estimates of the calibrated dates, rather than the more popular but flawed intercept method, since the mode represents the calendar date with the highest associated probability. Intercepts are problematic because they can occur at lower probability zones and are highly susceptible to minor changes in the calibration curve (Telford et al. 2003). In the cases where two modes were equally probable, both modes were listed (Table 4.1). Unfortunately, radiocarbon dates were still not available for all sites. Because of this, classification within the Early, Middle or Initial Late Ontario Iroquoian periods was the most broadly applicable organizational scheme given the nature of archaeological reporting encountered in the existing literature.

Sites lacking radiocarbon dates were assigned estimated occupation dates based on ceramic attributes or type frequencies. These estimates were most often based on the subjective observations of individual field archaeologists and cannot be assumed to be perfectly consistent across sites (cf. Lennox, et al. 1986). However, the basic agreement between the calibrated radiocarbon dates and assessments based on ceramic attribute or type frequencies indicates that these are adequate for the dating of settlements to the Early, Middle, or Initial Late stages.

The final chronological definition of the EOI, MOI, and ILOI used throughout this study was determined by creating a radiocarbon database for the study region and period of interest.
Ontario Iroquoian site dates listed in recent syntheses (Dodd, et al. 1990; Smith 1997b; Timmins 1985; Williamson 1990) and the Canadian Archaeological Radiocarbon Database (www.canadianarchaeology.ca/radiocarbon/card/card.htm) were combined with the new dates processed by the author at the University of Arizona AMS facility. Table 4.1 provides data for a sample of 131 calibrated dates on sites from the study area. These dates were newly calibrated using OxCal 4.01 and the 2009 calibration standard (Reimer et al. 2009). Early Ontario Iroquoian (EOI) components range maximally between 855 and 1335 cal AD.

<table>
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<tr>
<th>Lab Number</th>
<th>Site</th>
<th>Square</th>
<th>Feature</th>
<th>Material</th>
<th>Species</th>
<th>Collected by</th>
<th>δ13C value</th>
<th>14C age BP ± 14C age (2-σ)</th>
<th>2-σ age (2-σ)</th>
<th>Calibrated Age AD (mode)</th>
<th>Calibrated Age AD (68% CI)</th>
<th>Calibrated Age AD (95% CI)</th>
<th>Radiocarbon Age (BP)</th>
<th>Δ/± °C age (2-σ)</th>
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<tr>
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<td>F.168, Section 3, East Half</td>
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Table 4.5. AMS radiocarbon dates obtained by the author for four Middle and initial Late Iroquoian village sites.
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<td>1262</td>
<td>1027-1278</td>
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Table 4.1. Sample of 130 calibrated $^{14}$C dates from site components identified as Early (EOI), Middle (MOI), or Late Ontario Iroquoian (LOI) within the study region. Note that the first MOI dates begin after A.D. 1250, but become common in the sample only after A.D. 1280. Components dating between A.D. 1335 and 1405 were exclusively identified as MOI. From A.D. 1405-1425, sites identified as MOI and LOI are both common. Sites dating after A.D. 1425 are exclusively identified as LOI. (Original uncalibrated dates compiled from Smith 1997b, Dodd et al. 1990, Timmins 1985, Williamson 1990, and the Canadian Archaeological Radiocarbon Database).

A small number of Middle Iroquoian (MOI) components appear to date prior to A.D. 1280 (Moatfield Ossuary, Middleport Ossuary, Nodwell, Wellington) (Table 4.1). The earliest of these that have been accepted, from the recently excavated Moatfield Ossuary, were AMS dates conducted on human tooth enamel, and so the early values may result from dating the enamel of elderly individuals (van der Merwe, et al. 2003). Alternatively, they may represent human remains that were curated for some time prior to ossuary interment. The Middleport Ossuary dates are also similarly early (i.e., ca. A.D. 1250). MOI components become common after A.D. 1280, and all dates in the sample between A.D. 1335 and 1405 pertain to MOI components. MOI and LOI components both commonly date to between A.D. 1405 and 1425, while components dating after 1425 are exclusively identified as LOI (contra Kapches 1981).

This suggests that the Early Ontario Iroquoian stage ranges principally between A.D. 900 and 1280. A transition period appears between 1280 and 1335. Middle Ontario Iroquoian sites alone occur between 1335 and 1405, followed by another transition period from 1405-1425 in which both MOI and LOI components are attested. There could be several reasons for the apparent transition periods. They might reflect inherent measurement error, variability in the relationship between the dated material and the target occupation (e.g., due to dating intrusive material, old wood, or elderly tooth enamel) or differences between how different researchers
define the characteristics of EOI, MOI, and LOI artifact assemblages. They might also indicate that different communities made the transition between characteristic ceramic styles at somewhat different times (i.e., were more or less conservative), or that these transitions spread through time and space as a wave of influence from early points of innovation (Timmins 1985, but see Dodd 1990). Given the relatively large number of MOI components calibrated to ages before A.D. 1300 and immediately after A.D. 1400, I believe these data support the revision of J.V. Wright’s (1966) MOI to begin ca. 1280 and end by ca. 1420. While some MOI components may legitimately date prior to A.D. 1280, the large number of EOI components that definitely post-date A.D. 1250 do not support Timmins’ suggested date of A.D. 1250 for the close of the EOI (1985). Similarly, a number of securely dated MOI components post-date A.D. 1400, but do not extend beyond A.D. 1425. Therefore, mindful of the likelihood that the transitions between culture-historical stages were not instantaneous across the region, I have defined them as follows:

EOI: A.D. 900-1280
MOI: A.D. 1280-1420
LOI: A.D. 1420-1650

Modelling Village Occupation Phases

The decision to model village “occupation phases” stems from the recognition that not all structures in a settlement were necessarily constructed and inhabited simultaneously over the same period of time. It is a common occurrence to find that one or more structures in a settlement plan have overlapping footprints, demonstrating that they were constructed sequentially. Before discussing the histories of specific sites, it will be helpful to consider the nature of Iroquoian village formation processes, the likely duration of settlements, and the principles by which occupation phases were modeled in this study.

Generally speaking, Iroquoian village sites do not exhibit stratigraphic layering of sediments or masonry that could be used to identify discrete occupation phases. Most settlements appear to have been inhabited for a relatively brief period (in archaeological terms). European reports of early 17th-century Huron village occupation durations range from approximately 10 to 40 years (Wrong 1939: 92-93; Biggar 1922-1936, 3:124, Thwaites 1896-1901, 10:275; 15:153; 19:133; see also Warrick 2008), and documented village durations after A.D. 1630 range from 8 to 12 years (Warrick 2008). Archaeological estimates of house longevity based on wall-post densities suggest a 15-20 year life-span, which is commensurate
with reported average village durations (Warrick 1988; 2008). Thus, depending on the length of village occupation, longhouses constructed when the settlement was first established might last for the entire duration of occupancy, or require total replacement or major in situ reconstruction. The maximal span of known village occupations involved two episodes of wholesale longhouse reconstruction or replacement. Only one of the villages in the present study (Calvert, see below) exhibited superpositional evidence for such a pattern (i.e., three successive superimposed houses), an observation that corroborates Warrick’s suggestion that Iroquoian villages with multiple occupation phases had maximum cumulative spans of about 40 years (2008: 134). It seems probable that sites lacking house reconstructions or overlaps were occupied for a maximum of 20 years. At the extensively dated Middle Iroquoian Holly site (see below), which exhibited four large, evenly-spaced longhouses and no evidence for superpositions, seven AMS radiocarbon dates from a variety of contexts all calibrated within a 15-year period (AD 1290-1305). Sites with evidence for one episode of house reconstruction/replacement may therefore have been occupied up to an estimated 30 years, assuming no occupational hiatus between building events.

The brief occupation spans of these settlements is a particular asset in studies of spatial configuration such as this, since the potential for confounding diachronic changes in intrasite settlement patterns is more limited than at sites with greater house longevity. In many ways, Iroquoian village sites can be viewed as exceptional temporal “snapshots” in the life of a community that began before and persisted beyond the particular settlement in question. This lack of long-term palimpsest provides unparalleled interpretive opportunities that have yet to be fully appreciated.

The firm identification of distinct occupation phases within Iroquoian villages remains a challenge, however. While the superposition of particular structures can be used to deduce their construction sequence (e.g., Timmins 1997), there is little positive deductive evidence for identifying which structures were occupied simultaneously. The strongest such evidence may come from robust samples of ceramic and lithic refits linking secure pit contexts between houses. In a limited number of cases, ceramic cross-mend data was available to help infer occupational contemporaneity (e.g., at the Calvert, Elliott, and Praying Mantis sites, see below). In most cases such evidence was not available, and deductive certainty regarding structure contemporaneity was not possible. Of particular concern is the potential for villages to have expanded or contracted over time. For instance, additional longhouses may have been added to an existing village at a later date. This situation is most evident in cases where an original palisade was torn
down and extended to encompass the additional houses. On unpalisaded sites, it may be much more difficult to identify expansion events. Sometimes, later additions may be inferred from differences in the ceramic vessel assemblages associated with houses (e.g., Williamson 1998), and disparities in evidence for house maintenance activities and long-term use between an early “core” of houses, and peripheral additions. Such a pattern was evident at Draper, where the sequential addition pattern was inferred independently from the history of palisade expansion (Finlayson 1985).

In attempting to identify occupation phases for the site sample, it soon became evident that, except in cases where superpositional or palisade extension or contraction data were determinate, the process would have to be guided by a number of assumptions that fit with the goals of analysis. For instance, it is possible that non-overlapping structures represented in a settlement plan accumulated through stages of accretion and were subsequently abandoned over an unknown but relatively rapid period of time. It would not be possible or realistic to attempt to infer each possible configurational “moment” that might have occurred during the occupation span of a village. Instead, therefore, a principle of maximum contemporaneity was used to model occupation configurations. This procedure assumes that, in the absence of evidence to the contrary, a settlement configuration can best be described by the pattern given by all houses that can reasonably be considered contemporaneous (i.e., that cannot be excluded due to superpositional data or strong inferences, for instance linking houses with an area of palisade expansion). Given the brief occupation duration of most settlements, it is highly probable that the pattern of maximum contemporaneity also represents a real-world configuration that existed at least at the end of village occupation. The analytical process for identifying phases based on the maximum contemporaneity principle was as follows:

1. Identify all structures and palisades that could not have been contemporaneous due to superposition, and identify where possible the relative chronology of construction.
2. Identify all structures that almost certainly experienced some period of contemporaneity using cross-mend data, physical, and inferential links between structures (e.g., fences linking houses to houses, or houses to palisade, or parallel layouts indicative of coordinated planning).
3. Identify structures that were most likely not contemporaneous on the basis of inferences from house form and material culture.
Thus, where no superpositions of any kind were found, and where inferences based on 2 and 3 did not refute an hypothesis of contemporaneity, the settlement plan (i.e., the layout of houses, middens, palisade, and exterior activity areas) was modeled as a single occupation phase. This was found to occur at 8 of the 20 sites analyzed (Table 4.0). Where one or more cases of superposition or palisade extension to include additional structures occurred, structures that could be attributed (based on 1, 2 and 3, above) to a set of contemporaneous structures were so grouped, resulting in a series of maximally inclusive sequential phases.

In two cases, equally plausible but mutually exclusive alternative models presented themselves. At the Auda site, 9 definite and 4 probable houses were identified. I therefore produced alternative exclusive (9 houses) and inclusive (13 houses) models (see below). At the Alexandra site, the diachronic sequence of overlap between Houses 14, 16 and 17 could not be determined by superpositional evidence (see below). In this case it was necessary to model two options vis-à-vis the sequence inferred for the rest of the settlement. It is important to emphasize the distinction between these alternative models, and the other sequential phase models; the former represent synchronic options that could not both be true, while the latter represent the sequential occupation phases of a village. A final issue relates to the temporal relationships between house extension and contraction events. It was generally impossible to say when a given house may have been expanded or contracted vis-à-vis the others. It would be entirely arbitrary, then, to attempt to assign particular expansion or contraction events to specific phases (except in the few cases where superpositional evidence is determinate). An alternative, in keeping with the maximum contemporaneity principle, was to model each identified phase at maximum house lengths, unless superposition evidence demonstrated otherwise.

The principles of maximum contemporaneity and maximum length applied here are consistent with Warrick’s (2008) approach to estimating village populations. He points out that:

…wall post densities for single component village sites, such as Nodwell (Wright 1974), Raymond Reid (Fitzgerald 1984), Auger (Latta 1985), Ball (Knight 1987), and Warminster (Sykes 1983), are remarkably constant house to house (Warrick 1988). Thus, the archaeological data imply that the number of contemporaneous houses in an Iroquoian village can actually be considered the sum of nonoverlapped houses plus one house for each pair of overlapped houses. Furthermore, the maximum momentary population of an Iroquoian village occurred at abandonment. No archaeological examples have come to light of any large Iroquoian village that declined in size during its life span; we have only cases of relatively stable or growing village populations for the Wendat-Tionantate.
Given these observations, it is likely that modeling maximum contemporaneity and maximum house length for each identifiable phase frequently reflects the actual configuration pattern that occurred immediately prior to phase change or abandonment.

The Sites

The following section is not intended to provide a comprehensive discussion or comparison of each of the sites included in this study. Please see the reports cited throughout for further detail. The present object is to highlight some of the key issues associated with the selected sites that influenced which aspects of the study they were included in, how occupation phases, where present, were identified, and how they were dated.

*Early Ontario Iroquoian Settlements*

Porteous (AgHb-1), ca. A.D. 850-1060

This approximately 0.1 ha palisaded settlement was located on a well-drained sandy hill about 1200m inland from the Grand River in present-day Brantford, Ontario (Stothers 1977). Excavations were conducted in 1969 under the direction of Noble (Noble and Kenyon 1972), and later by Stothers (1977). The excavations were not total, but three structures, including two small longhouses and a small circular lodge, were entirely exposed, along with portions of two others and several sections of a double-row palisade. Five discrete midden deposits arranged in a broad ring just outside the palisade were also located (Stothers 1977). While Stothers (1977) considered the site to be late Princess Point, it is now generally considered to be one of the earliest Early Iroquoian villages (Williamson 1990). Three acceptable radiocarbon dates from the site calibrate to A.D. 855 (658-1014, 95% C.I.), 668 (668-1148, 95% C.I.), and 1060 (1020-1259, 95% C.I.) (Table 4.1). Given mounting evidence that some Early Iroquoian villages were occupied for more than a century, I consider the date range of the calibrated modes plausible. Houses 3 and 4 are recognizably typical early longhouses, complete with short rounded ends, parallel side walls, interior feature clusters, and 1-2 central hearths. House 4 also appears to have had side benches, or a similar structural division between a central corridor and side areas. Houses 1, 2 and 5 are all more atypical in shape and interior arrangement. House 5 appears to overlap or be overlapped by at least two other structures that were not otherwise exposed, complicating an assessment of original form and interior organization. House 5 also featured a
rare, intact house floor composed of a 2-7cm thick ashy sand layer containing chert and ceramic micro-refuse. The obvious complexity of the site’s occupation history along with the limited extent of excavations prevented inclusion of this site in the syntactic analysis of settlement form (Chapter 6), but measurements of the fully excavated houses were included in the house-level analysis in Chapter 7.

**Auda (AlGo-29), ca. A.D. 985**

The Auda site was a small, unpalisaded Early Iroquoian settlement located 15km west of Port Hope, Ontario, and completely excavated in 1979 under the direction of Kapches (Kapches 1987). The 0.15 ha settlement was composed of a cluster of at least 9 small house structures located on a sandy plateau bordered on the east by a ravine and seasonal creek. The structures were variable in size and shape but generally ellipsoidal, averaging 4x7m, with poorly defined walls composed of slender posts (ca. 7-9cm in diameter). They frequently contained one or more central hearths but few other interior or exterior features. There is little evidence for overlap between the structures, but one structure (House 4) was possibly extended in length to incorporate an additional hearth. A single radiocarbon date from the site calibrates to A.D. 985 (690-1182, 95% C.I.) (Table 4.1). Kapches has argued for an occupation date of A.D. 775 for Auda, but this does not seem warranted given the 68% confidence interval of A.D. 782-1147, and the dearth of other Early Iroquoian sites dating prior to the 9th century.

The lack of overlapping features and of refuse pits or middens at Auda strongly suggests that it was occupied for a relatively brief period of time (Kapches 1987). Houses were generally evenly spaced, and contained 1-3 closely spaced, centrally aligned hearths. In addition to 9 definite structures, I identified four other probable structures based on the presence of hearths that were evenly spaced between the known structures, and associated with poorly defined post clusters suggestive of disturbed walls. Alternatively, these might have been outdoor activity areas. I therefore created two models of the Auda plan for spatial analysis, one with, and one without, these additional structures (Figure 4.1). It is important to note that the interpretation of structures at Auda was the most subjective for all sites analyzed (not surprisingly so, given its early date and short-term use). The two models therefore represent interpretive options based on different thresholds of certainty, rather than successive occupation phases. Accordingly, each model was analyzed individually, but the results were averaged in the Chapter 5 and 6 analyses so as to provide a “best-estimate” of values for the settlement without creating a pseudo-replication problem by including (essentially) the same plan in the sample twice.

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Figure 4.1. Plan map of the Auda site showing definite (solid line) and probable (dashed line) house structures (redrawn from Kapches 1987).

Lightfoot (AjGw-5), ca. A.D. 1100

The 0.3 ha Lightfoot site was located on level tableland immediately above and overlooking a large bend in the Credit River Valley in present-day Mississauga, Ontario. The northern edge of the site was defined by the Credit River Valley break-in-slope that drops steeply to the valley floor. The site was excavated in a salvage context by D.R. Poulton and Associates, Inc. in fall 1988 and spring 1989 (Poulton, et al. 1996). In addition to traces of late Paleo-Indian,
Archaic, and Middle Woodland activities, the Lightfoot site consisted of a substantial Early Iroquoian component that included five houses and three associated middens (Figure 4.2). Like Auda, the village was unpalisaded, but the house walls were much more clearly defined, and the development of middens indicated a longer-term, regular occupation of the site. A core area

![Figure 4.2. Plan map of the Lightfoot site (redrawn from Poulton et al. 1996).](image)

(Lightfoot West) contained four evenly-spaced, aligned houses and two middens, with no evidence of structure overlaps, wall reconstructions, or house extensions, and few interior features. These houses averaged approximately 7x10m in dimension. A fifth house was located 95m east of the main cluster and was associated with a separate hillside midden and exterior artifact scatter (Poulton et al. 1996). As such, its temporal relationship to Lightfoot West is uncertain. However, the virtual absence of cultural remains in the intervening area suggest that this structure may have been occupied independently of Lightfoot West. Meanwhile, evidence indicates that the houses of Lightfoot West were occupied at the same time. Poulton et al. report that:

Several factors argue that the Lightfoot West structures were
contemporary with each other and were the result of community planning. These include the relative consistency of the orientation of the houses and the absence of overlapping structures. The absence of firm evidence for rebuilding, combined with the limited number of subsurface features, also suggest that the occupation of Lightfoot West was somewhat limited in duration, at least compared to certain other Early Iroquoian sites where village and house extensions or contractions have been documented, and/or where the density and overlapping nature of interior house features attests to an intensive and long-term occupation [1996: 28]

Accordingly, the four houses of Lightfoot West were analyzed as a single occupation phase in Chapters 5-6. The Lightfoot village has not been radiocarbon dated but, on the basis of ceramic stylistic attributes, Poulton et al. estimate a date of ca. A.D. 1100 for the settlement (1996).

**Elliott (AfHc-2), ca. A.D. 1050-1250**

The Elliott site was excavated in a large-scale salvage operation undertaken by W. Fox in 1982 (Fox 1986a, 1986b, 1988; Fox and Salzer 1999; Spence 1988). The site was situated on a plateau on the Norfolk sand plain, bounded on the northwest by a ravine associated with a tributary of Big Creek, in the present-day municipality of Haldimand-Norfolk, Ontario. Close to 0.26 ha of an approximately 1 ha site was excavated, revealing two complete, largely superimposed Early Iroquoian villages (Elliott II and III), and the northern edge of a third unexcavated village located to the south (Elliott I) (Fox 1986). Thanks to extremely careful mapping, documentation of feature superpositioning, and an extensive ceramic refitting program (Fox 1986), it was possible to identify structures and palisades associated with each village (Figure 4.3). N. Ferris of the Southwestern Ontario Regional Archaeological Office, Ontario Ministry of Culture, was particularly helpful in providing the author with original settlement plan data and maps for Elliott (and DeWaele, see below). Each of the two excavated Elliott villages had experienced at least one palisade expansion to incorporate one or more additional houses. Elliott II was the earlier of the two, and was generally composed of north-south trending structures, while the later Elliott III was composed of east-west trending structures. The extreme northwest edge of the site was disturbed due to erosion associated with the ravine bank, truncating one house and the palisade lines in that area. A total of 25 structures were associated with Elliott II and III. This includes two additional structures not identified by Fox (1986). Using Fox’s numeration, this includes Houses 2-24, plus the additional two, identified here as Houses 25 and 26.
Occupation History of the Elliott Site

A substantive report of the occupation history of the Elliott villages has not been made to date. Therefore, I undertook a detailed analysis of this history using the settlement data provided by the Ministry of Culture, and the ceramic cross-mend data published by Fox (1986). Following the approach Timmins used at the multi-phase Calvert site (see below), this analysis consisted of:

1. Enumerating all non-contemporaneous structures and palisades due to overlap (Table 4.2).
2. Identifying cases of feature and/or post superpositions that could be associated with specific houses or palisades in order to determine their stratigraphic relationships (Table 4.3).
3. Analysis of ceramic cross-mends linking features associated with specific structures that could be interpreted as likely to have been in use at the same time (Table 4.4)

<table>
<thead>
<tr>
<th>Non-contemporaneous Elliott Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Houses 9a&amp;b and 17</td>
</tr>
<tr>
<td>Houses 18 and 17</td>
</tr>
<tr>
<td>Houses 18 and 19</td>
</tr>
<tr>
<td>Houses 19 and 23a&amp;b</td>
</tr>
<tr>
<td>Houses 22 and 23b</td>
</tr>
<tr>
<td>Houses 13 and 14</td>
</tr>
<tr>
<td>Houses 2a&amp;2b and 4</td>
</tr>
<tr>
<td>Houses 3a and 11</td>
</tr>
<tr>
<td>Houses 11 and 10</td>
</tr>
<tr>
<td>Palisade 2a and Houses 2a&amp;b, 5, 15, 21, 22, Palisades 3a&amp;3b</td>
</tr>
<tr>
<td>Palisade 1a and Houses 15, 7b, 4, 2b</td>
</tr>
<tr>
<td>Palisade VI and House 16, Palisades 2a, 3a and 3b</td>
</tr>
</tbody>
</table>

Table 4.2. List of non-contemporaneous structures at the Elliott site due to structure overlap.
<table>
<thead>
<tr>
<th>Observation</th>
<th>Source</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>F. 93 postdates H. 9 wall PMs</td>
<td>Plan</td>
<td>F. 93 assoc. with H.17, therefore H.17 postdates H. 9a&amp;b</td>
</tr>
<tr>
<td>F. 91-92 postdates H. 18 wall PMs</td>
<td>Plan</td>
<td>F. 91-92 assoc. with H.17, therefore H.17 postdates H. 18</td>
</tr>
<tr>
<td>H. 19 wall PMs postdate F. 49</td>
<td>Plan</td>
<td>F. 49 assoc. with H. 18, therefore H. 19 postdates H. 18</td>
</tr>
<tr>
<td>F. 75 postdates H. 18 wall PMs</td>
<td>Plan</td>
<td>F. 75 assoc. with H. 19, therefore H. 19 postdates H. 18</td>
</tr>
<tr>
<td>H. 19 wall PMs postdate F. 82</td>
<td>Plan</td>
<td>H. 19 construction truncated wall of H. 19 overlap</td>
</tr>
<tr>
<td>H. 23 wall PMs missing/disturbed in H. 19 overlap</td>
<td>Plan</td>
<td>F. 57 assoc. with H.23, therefore H. 19 postdates H. 23</td>
</tr>
<tr>
<td>F. 49 postdates H.23 wall PMs</td>
<td>Plan</td>
<td>F. 19 assoc. with H. 22, therefore H. 22 postdates H. 23</td>
</tr>
<tr>
<td>H. 14 refuse-filled depression overlaps inferred wall of H. 13</td>
<td>Plan</td>
<td>F. 405 is H. 5 hearth, therefore Palisade 2a postdates H.5</td>
</tr>
<tr>
<td>H. 13 walls extremely disturbed</td>
<td>Plan</td>
<td>H. 401 is assoc. with H. 2b, therefore Palisade 2a postdates H2b</td>
</tr>
<tr>
<td>F. 34 postdates Pal. 2a PMs postdate H. 15 wall PMs</td>
<td>Notes</td>
<td>Palisade 2a postdates H. 15</td>
</tr>
<tr>
<td>Pal. 2a PMs postdate F. 405</td>
<td>Plan</td>
<td>F. 34 assoc. with H. 22, therefore H. 22 postdates Palisade 2a</td>
</tr>
<tr>
<td>Pal. 1a highly disturbed throughout northeast section</td>
<td>Plan</td>
<td>Palisade 1a predates Hs. 7b, 15, 4, and 2b, explaining its disturbance</td>
</tr>
<tr>
<td>Pal. 2b encloses Hs. 2a&amp;b, 5, 15</td>
<td>Plan</td>
<td>Palisade 2b contemporaneous with Hs. 2a&amp;b, 5, 15</td>
</tr>
<tr>
<td>Pal. 3a PM postdates F. 339</td>
<td>Plan</td>
<td>F. 339 assoc. with H. 16, therefore Palisade 3 postdates H.16</td>
</tr>
<tr>
<td>Pal. 3a PMs postdate F. 185</td>
<td>Plan</td>
<td>F. 185 assoc. with H.8b, therefore Palisade 3 postdates H. 8b</td>
</tr>
<tr>
<td>Pal. 3b appended to extend Pal. 3b, to enclose H. 25</td>
<td>Plan</td>
<td>Pal. 3b postdates Pal. 3a, H. 25 postdates Pal. 3a</td>
</tr>
</tbody>
</table>

Table 4.3: Superpositional evidence for the relative chronology of structures at the Elliott site.
<table>
<thead>
<tr>
<th>Features Linked</th>
<th>Structures/Outdoor Activity Areas Linked</th>
<th>Village Phase</th>
<th>Phase Conflict?</th>
</tr>
</thead>
<tbody>
<tr>
<td>F. 238 and F. 423</td>
<td>H. 4 and H. 6</td>
<td>VII</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>H. 7a and exterior pit between</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F. 304 and F. 404</td>
<td>Pal. 1a and 2</td>
<td>VII</td>
<td>N</td>
</tr>
<tr>
<td>F. 184 and F. 239</td>
<td>H. 8b and immediate exterior of</td>
<td>VII</td>
<td>Y</td>
</tr>
<tr>
<td>F. 239 and F. 225</td>
<td>H. 8b</td>
<td>VII</td>
<td>N</td>
</tr>
<tr>
<td>F. 179 and F. 159</td>
<td>Exterior within Pal. 3 and H. 17</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 179 and F. 91-92</td>
<td>Exterior within Pal. 3 and H. 17</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 179 and F. 283</td>
<td>Exterior within Pal. 3a</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 166 and Midden 1</td>
<td>H. 9a and Midden 1</td>
<td>VII</td>
<td>N</td>
</tr>
<tr>
<td>F. 166 and F. 319</td>
<td>H. 9a and Midden 1</td>
<td>VII</td>
<td>N</td>
</tr>
<tr>
<td>F. (unknown) and Midden 1</td>
<td>H. 9b and Midden 1</td>
<td>VII</td>
<td>N</td>
</tr>
<tr>
<td>F. 144 and F. 83</td>
<td>H. 14 and H. 19</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 132 and F. 161</td>
<td>H. 14 and H. 9*</td>
<td>VII-VIII</td>
<td>Y</td>
</tr>
<tr>
<td>F. 124 and F. 106</td>
<td>H. 14 and H. 17</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 154 and F. 106</td>
<td>H. 14 and H. 17</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 154 and F. 68</td>
<td>H. 14 and H. 19</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 154 and F. 83</td>
<td>H. 14 and H. 19</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 69 and F. 9</td>
<td>H. 14 and H. 21</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 60 and F. 283</td>
<td>H. 14 and F. 283</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 60 and F. 83</td>
<td>H. 14 and H. 19</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 60 and F. 309</td>
<td>H. 14 and H. 17</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 63 and F. 69</td>
<td>H. 14 and exterior within Pal. 3</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 63 and F. 60</td>
<td>H. 14 and exterior within Pal. 3</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 63 and F. 106</td>
<td>H. 17 and exterior within Pal. 3</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 9 and F. 83</td>
<td>H. 21 and H. 19</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 9 and F. 309</td>
<td>H. 21 and H. 17</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 9 and F. 283</td>
<td>H. 21 and F. 283</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 1 and F. 159</td>
<td>H. 21 and H. 17</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 83 and F. 283</td>
<td>H. 19 and F. 283</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 83 and F. 309</td>
<td>H. 19 and H. 17</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 68 and F. 106</td>
<td>H. 19 and H. 17</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 68 and F. 159</td>
<td>H. 19 and H. 17</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 68 and F. 283</td>
<td>H. 19 and F. 283</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 106 and F. 283</td>
<td>H. 17 and F. 283</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 390 and F. 280</td>
<td>H. 17 and exterior within Pal. 3</td>
<td>VIII</td>
<td>N</td>
</tr>
<tr>
<td>F. 212 and F. 283</td>
<td>H. 25 and F. 283</td>
<td>VIII</td>
<td>N</td>
</tr>
</tbody>
</table>

Table 4.4. Elliott between-structure ceramic cross-mends. Data tabulated from Fox (1986).

This process supported Fox’s identification of Elliott II and III (1986), and provided additional information about diachronic changes within the settlement histories of each village. This led to the identification of three modeled occupation phases within Elliott II, and two occupation phases within Elliott III. The identification of overlaps and stratigraphic relationships determined that (Tables 4.2 and 4.3):
House 19 postdated Houses 13 and 14
House 20 postdated Houses 14 and 15
House 23 postdated House 15 and Palisade 2a
House 18 postdated House 26
House 24 likely postdated the original Palisade 3 (3a)

Houses 18, 19, 20, 23, and 24, along with House 22, were southwest-northeast trending structures occurring within the limits of Palisade 3a (or 3b in the case of House 24), while Houses 13, 14, 15, and 26 were northwest-southeast trending structures occurring within the limits of Palisades 1a, 2a, and 2b. Moreover, numerous ceramic vessel cross-mends interlinked Houses 18, 19, 20, 22, and 14 with each other and with several exterior pits located within the confines of Palisade 3a. One of these exterior features was Feature 283, a large pit located just inside the western edge of Palisade 3a, and found to contain the remains of feasting events, the interment of a child, and likely ritual activities associated with red ochre paint palettes and an eagle wing tip (Fox 1999). Red ochre palette fragments were also found in House 18, further strengthening the association of Feature 283 with the Village III occupation. Moreover, Palisade 3 was found to post-date Houses 5 and 7 along its eastern course, overlap Houses 11 and 12, and exclude Houses 2-4, 6, 8-10, and 24 to the northeast, all of which were contained within Palisades 2b or 2a. On the western side of the site, House 23 was found to overlap and postdate Palisade 2a, while House 22 also overlapped Palisade 2a, and House 24 lay outside its limits. Combined with the circumstantial evidence of similar house orientation, this evidence strongly supported a separation of the two main Elliott villages as follows (Figure 4.3):

Village II: Houses 2-15, 17, 24 and 26
Village III: Houses 16, 18-24

It was also evident that settlement configuration changes had occurred within the tenure of each village. Turning to Village II, Houses 4 and 24 overlapped, as did Houses 11 and 10a. Also, two main palisades were present (2a and 2b), as well as a third heavily disturbed or weakly constructed probable palisade (1a). Palisade 2a was found to overlap and postdate the construction of Houses 2, 3 and 4. Palisade 2b consisted of an incomplete course of posts on the eastern periphery of the site and beyond Houses 2, 3, and 4. Assuming that it was constructed to
enclose these houses, Palisade 2b can be inferred to predate Palisade 2a. Palisade 1a occurred within the limits of Palisade 2a, and intersected with Houses 2, 6b, 4, and 24. Two interpretations are possible for Palisade 1a, since there was no conclusive stratigraphic evidence to show that it predated or postdated these houses. One is that Palisade 1a was contemporaneous with or later than Palisade 2a. Evidence in support of this is its apparent splitting off from Palisade 2a south of House 5, and its convergence with Palisade 2a north of House 9. However, this would require that the House 6 extension event predated Palisade 1a, or that House 6 was contracted rather than extended. The other interpretation for Palisade 1a is that it predated a House 6 expansion, and the general expansion of houses to the east. This interpretation is supported by the observation that the Palisade 1a line is particularly disturbed within House 6b, and throughout its eastern circuit, suggesting that it predated and was disturbed by the subsequent construction of structures in that area. The high density of features, wall posts, and interior posts within Houses 6 and 7, as well as evidence for major reconstruction events for both structures, strongly suggest that Houses 6 and 7 were intensively inhabited throughout the duration of Village II. This indicates that they were likely present before, during and after the eastern expansion to include Houses 2-4. Combined with the disturbance associated with Palisade 1a, this suggests that the second explanation for Palisade 1a is the correct one, and that it was therefore associated with the initial eastern limit of the village, prior to the Palisade 2b expansion and subsequent 2a contraction (which conspicuously left room for the House 6b expansion, indicating that it was already present or planned at the time of the Palisade 2a contraction event). Few between-context cross-mends were found within the Village II occupation. However, links occurred between House 8 and a feature probably associated with House 25, House 15 and a midden deposit adjacent to the inside southern edge of Palisade 2a,
Figure 4.3a. Plan map of the Elliott site (redrawn from original unpublished plan by W. Fox).
Figure 4.3b. Elliott Village II, Phases 1-3 (a-c); Village III, Phases 1-2 (d-e).
and House 6 and a nearby exterior pit located beyond Palisade 1a, but within Palisade 2a. Overall, these data led to the following modeled occupation sequence for Village II (Figure 4.3):

Village II, Phase 1: Houses 5, 6a, 7a, 9a, 10b, 11, 12, 26, 13a, 14, 15a, 17, and Palisade 1a.
Village II, Phase 2: Houses 2, 3, 4b, 5, 6b, 7b, 8, 9b, 10a, 12, 13b, 14, 15b, 17, and Palisade 2b.
Village II, Phase 3: Houses 5, 6b, 7b, 8, 9b, 10a, 12, 13b, 14, 15b, 17, 24 and Palisade 2b.

Village III can be divided into two occupation phases. Houses 16 and 18-23 all occur within Palisade 3a and were most certainly contemporaneous. At some point, Palisade 3 was expanded on the west (Palisade 3b) to enclose House 25. House 25 was linked by a cross-mend to Feature 283, which was also associated by cross-mends to most houses in Village III. Therefore, it would appear that House 25 was added to the existing village. Accordingly, the Village III occupation sequence was modeled as (Figure 4.3):

Village III, Phase 1: Houses 16 and 18-23 and Palisade 3a.
Village III, Phase 2: Houses 16, 18-23, 25 and Palisade 3b.

Elliott Site Dating

Four conventional radiocarbon dates were obtained from the Elliott site by Fox (1986; Williamson 1990). These dates range quite significantly, as would be expected of a site with multiple occupation phases (Table 4.1). The dates were calibrated to A.D. 970 (694-1150), A.D. 1160 (1015-1273), A.D. 1220 (1030-1290), and A.D. 1265 (1045-1394) (all ranges are 95% C.I.). It is difficult to ascertain how well these dates cohere with the record of material culture at Elliott since this has not been published. However, it is interesting to note that the latest date was run on material from the Village III Feature 283, supporting the inference that this represented the latest occupation phase of the site. The wide spread of the dates also indicates that there could have been a considerable occupational hiatus between Villages II and III.

DeWaele (AfHd-1), ca. A.D. 1000-1100

The DeWaele site was an approximately 0.33 ha palisaded Early Iroquoian village located on the Norfolk Sand Plan along the upper reaches of Big Otter Creek in today’s Oxford County southeast of the town of Norwich. It belonged to a cluster of villages in the locality that included the Van Besien (above) and later Uren sites (see below). The site was situated on a
triangular-shaped promontory bounded on the northwest and northeast sides by the break-in-slope associated with the Otter Creek Valley. W. Fox conducted test excavations at the site, followed by more extensive excavations in 1971, revealing portions of four longhouses and three smaller structures, a two-three row palisade, and three midden areas (Fox 1976, 1982b; Watts 2008). House 1 was superimposed over House 5, and another rectangular structure overlapped a section of the northern palisade. Only one house, House 3, was fully excavated. The structure was somewhat unusual, being sub-rectangular in form, with an entrance along the side wall, and having a single, tripartite hearth zone surrounded by a series of large storage pits located along the perimeter of the interior. Access to original settlement plan maps of the DeWaele site was provided by N. Ferris of the Ontario Ministry of Culture. Because the site was not fully excavated, it was not included in the village-level analysis. A number of structural attributes were recorded for the house-level analysis. Two conventional radiocarbon assays from pit features at the DeWaele site calibrate to the 12th century (A.D. 1075, 1155 [986-1276, 95% C.I.], and A.D. 1195 [1014-1290, 95% C.I.]) (see Table 4.1). This result is consistent with the ceramic vessel assemblage as analyzed by Watts (2008).

Calvert (AfHg-1), ca. A.D. 1190-1275

The Calvert site was a 0.28 ha palisaded village situated on a sandy plateau overlooking a large wetland to the southeast and the floodplain of the Thames River to the north. Located approximately 10km east of present-day London, Ontario (Timmins 1997; Fox 1982a), it was extensively excavated in a salvage context under the direction of Fox in 1981-82. An estimated 70% of the site area (0.2 ha) was excavated, revealing a series of three superimposed occupation phases and a 1-2 row palisade that had been contracted at one point. Timmins’ detailed monograph (1997) documents the occupation history of Calvert and provides a robust argument for three main occupation phases based on his analysis of structure and feature superposition, ceramic cross-mend patterning, radiocarbon dates, and structure post-mould densities (Timmins 1997). These phases each included three principal longhouses oriented in broadly the same direction (Figure 4.4). Smaller ancillary structures were present in the Early and Middle phases. Also, House 4 is known to have post-dated the Early phase, but it could not be placed definitively in either the Middle or Late phase by Timmins. It may have spanned the Middle and Late phase occupations, or have been particular either to the first or the second. Clues to its affiliation include its relatively short-term use (given low wall-post densities), its small size (similar to the Late phase houses), and an interior pit containing 699 pieces of unburned faunal
material. Given the emphasis on mammal hunting in the Late phase (Timmins 1997: 197), this feature, along with the house’s dimensions and lack of intensive use, points to an affiliation with the Late phase hunting camp. Fox (1982a) placed House 4 and the truncated House 9 in this Late phase. Based on this evidence, House 4 was included in the modeled Late phase for the village-level spatial analysis. It should also be noted that the Middle phase House 10 was not completely exposed due to the presence of a road allowance that cross-cut the southern edge of the site. It was therefore necessary to infer its overall dimensions from the exposed north wall and east end (Figure 4.4). Four radiocarbon dates attributed by Timmins to Early phase contexts were calibrated to A.D. 1195 (1025-1275, 95% C.I.), 1220 (1030-1290, 95% C.I.), 1255 (1034-1381, 95% C.I.), and 1275 (1057-1400, 95% C.I.) (my calibration, see Table 4.1).

Figure 4.4a. Plan map of the Calvert site (redrawn from Timmins 1997).
Ireland (AiGx-39), ca. A.D. 1215-1255

The Ireland site was a small (0.21 ha) palisaded Early Iroquoian village in the present-day Burlington area, located on a low ridge on the south side of a tributary of Shoreacres Creek, which flows into Lake Ontario 7.7 km downstream from the site (Finlayson 1998). Ireland was completely excavated for the Ontario Ministry of Transportation in a salvage operation led by Warrick in 1990 (Finlayson 1998: 178). These excavations revealed five closely-spaced longhouses surrounded by a 1-2 row palisade with evidence of episodic reconstruction and
maintenance activities. Houses 3 and 4 were superimposed and therefore could not have been contemporaneous. The low density of wall posts and disturbed nature of the House 3 footprint in comparison to the other structures strongly suggests that House 3 was replaced by House 4 at some point during the occupation of the site. The high density of wall posts in Houses 1, 2, and 5 suggests that they were occupied and maintained throughout the duration of the settlement. Accordingly, two occupation phases were inferred for Ireland, consisting of A) Houses 1, 2, 3, and 5, and B) Houses 1, 2, 4, and 5 (Figure 4.5). These houses ranged from approximately 17-23m in length, 6.3-7.9m in width, had parallel or slightly curved side walls and the short, rounded ends typical of Early Iroquoian houses. The houses also exhibited relatively few interior features in spite of structural evidence for significant wall maintenance and reconstruction. Two reported radiocarbon dates calibrate to A.D. 1215 (1017-1296, 95% C.I.), and A.D. 1255 (1030-1388, 95% C.I.) (Table 4.1). It should be noted that the nearby (400m south) Early Iroquoian Tara site was also fully salvaged by Warrick in the same year. Although this revealed two overlapping palisaded villages, the settlement patterns were very badly disturbed such that few structures could be confidently identified. For these reasons, the Tara villages were not included in this study (Finlayson 1998).

**Praying Mantis (AfHi-178), ca. A.D. 1250-1275 (?)**

The Praying Mantis site was a small (0.21 ha) Early Iroquoian village located in the present-day Byron area of London, Ontario. The site was completely excavated in a salvage operation undertaken by the London Museum of Archaeology in 1993 and 1994 under the direction of Pearce and Matilla (Howie-Langs 1998; Pearce 1994). Original field notes and settlement pattern data were kindly provided to me for the present study by R. Pearce, Senior Archaeologist at the London Museum of Archaeology. Three longhouses at Praying Mantis were identified, one of which showed evidence for significant *in situ* reconstruction. The houses ranged from approximately 20-30m in length and 6.3-8.1m in width, contained 2-3 centrally aligned hearths, and numerous interior pits. These were surrounded by a mostly single-row palisade with evidence for a possible expansion/contraction event on the northeast side, and reconstruction on the east and southeast sides (Figure 4.6). The settlement is noteworthy for having a rare early semi-subterranean lodge (SSL). This lodge was spatially associated with human and animal interments and evidence for ritual events that took place at the east end of the central longhouse (House 2; Howie-Langs 1998). A second burial was located near the north-eastern periphery of the site immediately beyond the palisade. No radiocarbon dates are
Figure 4.5. Plan map of the Ireland site (redrawn from original CAD data provided by the London Museum of Archaeology, London, Ontario).

Figure 4.6. Plan map of the Praying Mantis site (redrawn from original data and maps provided by the London Museum of Archaeology, London, Ontario).
available for Praying Mantis. However, given the apparently tight temporal association between SSLs and the onset of the Middle Iroquoian period (e.g., MacDonald 1988), the presence of one at Praying Mantis – as at Bennett (see below) – suggests occupation in the mid to late 13th century.

Middle Ontario Iroquoian Settlements

Wellington (BcGw-55), ca. A.D. 1250-1280

The Wellington site was a small (<1 ha) early Middle Ontario Iroquoian hamlet entirely excavated in 1997 and 1998 in salvage operations undertaken by Archaeological Services Inc. and field directed by R. Pihl (Williamson 2005). The hamlet was located near the present-day village of Holly, within the city of Barrie, Simcoe County, Ontario. The site consisted of two unpalisaded longhouses situated on the Innisfill uplands adjacent to a bluff overlooking Bear Creek and the Minesing swamp (Williamson 2005). The excavations revealed two longhouses some 30m apart, one midden, and a refuse-filled depression. The houses were associated with four indoor semi-subterranean lodges, numerous interior features and hearths, and a mammal “ossuary” burial feature. Minimal evidence for outdoor activities or features was identified. The houses ranged from 6.3-6.7m in width and 22-37m in length. Low feature densities and a lack of obvious side platforms in House 2 may indicate seasonal or short-term occupation of the structure (Williamson 2005). The small size of the settlement and relatively limited use of House 2 indicate that Wellington should not be treated as a village proper. Therefore, longhouse attributes were included in the house-level analysis, but the settlement plan was not included in the village-level sample. A single AMS radiocarbon date run on maize kernels from a feature in House 1 was calibrated to A.D. 1256 (1215-1285, 68% C.I.) as reported in the site report (2005: 117). This date, along with a “Uren-like” (initial Middle Ontario Iroquoian) ceramic assemblage, indicates a mid-late 13th century occupation of Wellington (Williamson 2005: 118). This places Wellington, alongside the nearby Holly site, as associated with one of the earliest pioneering Iroquoian communities in Simcoe County.

Myers Road (AiHb-13), ca. A.D. 1280-1340

The Myers Road site was an early Middle Ontario Iroquoian village located in present-day Cambridge, Ontario. It was situated on the western side of the Galt Moraine above the edge of a scarp overlooking the Grand River some 650m to the west (Williamson 1998). The 2.4 ha site was fully salvage excavated by Archaeological Services Inc. in 1987 and 1988. The village
included ten longhouses, not all of which were occupied contemporaneously, and a single-row palisade that enclosed four of the houses (Figure 4.7). The site was intensively investigated by Archaeological Services Inc. as reported in Williamson (1998). These investigations led to the identification of four sequential occupation phases as indicated by house and palisade superposition, house extension and reconstruction, house post and feature densities, and ceramic assemblages (Williamson 1998: 193-203). The palisade was found to intersect Houses 1, 2, 5, and 7. Houses 2, 5 and 7 were superimposed by and predated the palisade, while the eastern extension of House 1 post-dated it. This clearly bracketed the palisaded phase, involving Houses 4, 9, 10, and 11, as a middle phase between the earlier Houses 2, 5, and 7, and the later House 1 extension. Meanwhile, the older western end of House 1 had been linked via a fence to the western end of the adjacent House 3, indicating that they were contemporary. Also, the younger eastern extension of House 3 was superimposed over the earlier House 2. At the same time, Houses 1 and 3 showed evidence for major wall reconstruction events, and had significantly higher densities of interior features, semi-subterranean lodges, and posts than other houses at the site, suggesting that their earlier pre-expansion western portions were occupied for lengthy periods. This inference is supported by the presence of three human burials in House 1, assuming that the accumulation of burials indexes a relatively long period of occupation.

Combined with ceramic evidence of relatively high proportions of early vessel and pipe styles (including early Uren and even Early Iroquoian Glen Meyer Oblique vessels) in Houses 1 and 3, these data suggest that the original western parts of Houses 1 and 3 were occupied from the earliest establishment of the site, and were heavily reconstructed and extended following the Middle palisaded phase. House 7 predated the palisade, but lacked the Early Iroquoian ceramics of Houses 1 and 3, indicating that it was added at a slightly later date. Houses 2, 5 and 7 must have been removed by the time the palisade was established. Ceramic stylistic data indicate that the palisaded occupation phase occurred during the early “Middleport substage”, or first half of the 14th century (Williamson 1998: 199). Following the abandonment of the palisade, Houses 1 and 3 were evidently occupied during the “Middleport substage” based on ceramic assemblages, and their reconstruction and eastern expansions over the palisade and House 2. House 6 was associated with Middleport vessels located in adjacent outdoor features, suggesting that it was inhabited alongside Houses 1 and 3 in the latest period of occupation.
Figure 4.7a. Plan map of the Myers Road site (redrawn from Williamson [ed.] 1998). Contour interval is 25cm (above/below datum).
Figure 4.7b. Occupation Phases 1-4 (a-d) of the Myers Road site.
Accordingly, following Williamson (1998), the following occupation phases were modeled in the village-level analysis (Figure 4.7):

Phase 1 (Transitional Early-Middle Iroquoian): Houses 1, 3, 5, 2
Phase 2 (Initial Middle Iroquoian [“Uren”]): Houses 1, 3, 7
Phase 3 (Middle Iroquoian [“Middleport”]): Houses 4, 9, 10, 11, palisade
Phase 4 (Middle Iroquoian [“Middleport”]): Houses 1 (plus extension), 3 (plus extension), 6

Radiocarbon dates have not been obtained for Myers Road. However, based on ceramic stylistic attributes, Williamson et al. (1998) argue for an occupation range between A.D. 1280 and 1340. This is coherent with the vessels they report.

Uren (AfHd-3), ca. A.D. 1285-1300

The Uren site was a relatively large palisaded early Middle Iroquoian village, and type site for J. V. Wright’s “Uren” substage (1966). The 1.1 ha site was located 2 km northeast of present-day Otterville, Ontario, South Norwich Township, in the regional municipality of Haldimand-Norfolk (Wintemberg 1928; M. Wright 1986). The Uren village was situated on a relatively level field bounded on the north and west by a steep ravine formed by a tributary of Big Otter Creek. The site was first investigated in 1920 by W.J. Wintemberg, when some 8500 square feet were excavated in a single month. This work produced large artifact collections but little information concerning settlement patterns. In 1977 the site was extensively excavated revealing a total of 11 closely-spaced longhouses surrounded by 2-7 parallel rows of palisade (M. Wright 1986). Houses were laid out in two primary aligned clusters set at a right angle from each other (Figure 4.8), and no major structural overlaps were apparent. However, Houses 3 and 4 were unusually closely spaced, and appeared to converge at their northeast ends so as to share an outer wall (M. Wright 1986: 14). Such a configuration seems highly improbable from an architectural and practical standpoint, particularly considering the fact that the entire length of the two walls was not shared. I therefore infer that one of the two houses most likely post-dated the other. In fact, given their very close similarities in length and width, Houses 3 and 4 may represent a reconstruction event by the same co-residential group. It is plausible that portions of the wall of the first house were considered sufficiently sound to be incorporated into the second. Unfortunately, data provided in M. Wright (1986) were not sufficient to determine the likely chronological order of the reconstruction event. Rim sherd mends linked the occupations of
Houses 1 and 2; 1 and 3; 2 and 3; 3 and 5; 7 and 10 (M. Wright 1986: 45). Along with their tight parallel layout, this supported the general contemporaneity of the Uren houses. It was possible, therefore, to identify two house configuration phases at Uren. With no implication of temporal order, Phase A included Houses 1-3 and 9-11, while Phase B included Houses 1-2, and 4-11 (Figure 4.8). It should be noted that “Houses” 9, 10, and 11 were not longhouses. In keeping with a pattern observed at villages such as Calvert, Dorchester and Elliott, these oval or square structures appear to have been outbuildings associated with the larger longhouses, although Houses 10 and 11 may have housed single nuclear families (M. Wright 1986: 15-16).

Three acceptable radiocarbon dates from Uren were calibrated to A.D. 1285 (1190-1410, 95% C.I.), A.D. 1290 (1220-1410, 95% C.I.), and A.D. 1295 (1266-1412, 95% C.I.) (Table 4.1). Uren is also noteworthy for having a large number of within-house features that contained burials or isolated human bone elements. These frequently occurred in large pits beneath the side platforms in a manner similar to that documented at the Myers Road and Crawford Lake sites. The multiple interment under the west side-platform of House 7 was associated with a carefully arranged bundle burial of modified deer bone (M. Wright 1986: 19). Also, a human femur had been “set deep into the subsoil, set flush with a large support post in House 1 (M. Wright 1986: 17).” Three other interior house posts also contained fragmentary human bone elements.

Figure 4.8. Modeled occupation phases of the Uren site (plan redrawn from M. Wright 1986): Phase A (left), and B (right).
Holly (BeGw-58), ca. A.D. 1290-1305

The 1.3 ha Holly site was an unpalisaded early Middle Ontario Iroquoian village located near the village of Holly, in the City of Barrie, Simcoe County, Ontario. It was completely salvage excavated by Archaeological Services Inc. under the field direction of R. Pihl, A. Clish, and D. Robertson between 1998 and 2000, revealing four major longhouses, four smaller houses or special purpose structures, and three middens (Carnevale, et al. 2009; Figure 4.20). The Holly settlement was situated on a promontory overlooking the Bear Creek ravine, several hundred meters west of the Wellington hamlet (described above). Artifact catalogues and original CAD files of the settlement plans were generously provided for this project by R. Williamson and D. Robertson. The longhouses at Holly were widely and evenly spaced and shared a general NW-SE trending orientation. The longhouses ranged from 31.5 to 42m in length and from 7 to 7.5m in width (Carnevale, et al. 2009).

Thanks to an internship grant from the University of Arizona AMS facility, I was able to produce a robust sample of seven AMS radiocarbon dates on cultigens from a wide variety of contexts at the Holly site (Tables 4.1 and 4.5). This was particularly useful since the Holly site dates to part of the calibration curve with a significant “wiggle”, such that a single date may calibrate to either the early or late part of the Middle Ontario Iroquoian period (i.e., to either the first or second half of the 14th century). Because the numerous dates varied slightly with respect to the calibration curve, it was possible to determine that the earlier set of intercepts was the most probable. These results accord with the estimates made by Archaeological Services Inc. based on ceramic type frequencies, and suggest that the Holly village was occupied between A.D. 1290 and 1305 (Table 4.1). All seven of the dates calibrate to this 15 year period, strongly suggesting a relatively brief and continuous occupation of the site at the turn of the 14th century. As an aside, the results of the Holly dating project demonstrate that modern AMS dating of cultigens can produce extremely tight chronological control for Iroquoian sites, provided there is adequate sampling of material from secure contexts.
Figure 4.20. Plan map of the Holly site (redrawn from CAD files provided by Archaeological Services, Inc.). Contour interval is 1m (above sea level).

Nodwell (BcHi-3), ca. A.D. 1300-1350

The Nodwell site was a 1ha Middle Ontario Iroquoian palisaded village situated on a plateau at the edge of a sand escarpment overlooking Lake Huron, in the present-day village of Port Elgin, Bruce County, Ontario (Wright 1974). The entire village was excavated in a salvage operation directed by J.V. Wright between 1969 and 1971. Wright’s efforts exposed eleven complete longhouses surrounded by two palisades, and part of a twelfth house located outside and directly south of the palisades (House 1; Figure 4.9). The Nodwell houses ranged from about 6 to 8m in width, and 12 to 42m in length. One structure, House 5, was overlapped by and predated Houses 6 and 9 (Wright 1974). House 8 had experienced an expansion event. The inner and outer palisade walls did not cross or overlap, and showed no signs of the “splitting” common at settlements where palisade modification and replacement was extensive. The two lines were closely spaced along their western courses adjacent to the escarpment edge, then widened out to encompass a considerable open area between the inner and outer rows on the
north and east sides of the village, and finally converged at a single location on the south side of the village immediately adjacent to the north end of House 1 (Figure 4.9). The palisade convergence point was associated with a probable entrance to the village, indicated by a gap in the posts at this location on the plan and an associated section of fencing running several meters to the south (Wright 1974). This configuration suggests that House 1 was intentionally placed with proximity to this entrance in mind, or that the palisades were constructed so as to take the position of House 1 into consideration.

Status of the Nodwell Site

Until the late 1980s, the Nodwell site was one of only a handful of extensively excavated Middle Iroquoian villages. J. V. Wright’s reporting of the settlement patterns at the village was also thorough and well illustrated. These two factors combined to make Nodwell prominent in comparative studies of Iroquoian longhouse and settlement organization throughout the northeast (e.g., Bamann, et al. 1992; Chapdelaine 1993; Dodd 1984; Engelbrecht 2009). However, Nodwell’s location in Bruce County is some 130 km from the nearest cluster of known Middle Iroquoian villages (1974: 303), and has accordingly prompted speculations about the source population and ethnic identity of the villagers (Wright 1974). Based on the ubiquity of Middle Iroquoian ceramic types, pipe styles, large longhouses with end vestibules and side platforms flanking a central hearth row, and a variety of other “classic” Iroquoian artifact types (e.g., modified deer phalanges), Wright concluded that the Nodwell site had been occupied by Middle Iroquoian ancestors of the Huron-Petun during the mid-14th century (Wright 1974). An apparent lack of other Iroquoian villages in the region led Wright to propose that the Nodwell community had migrated to the area in the early 14th century, perhaps attracted by the potential for trade with Algonkian-speaking hunter-gatherers (a relationship known to have existed historically between the Huron and several Algonkian groups [e.g., Fox 1990; Warrick 2008]) (Wright 1974: 304). However, Rankin has recently disputed Nodwell’s status as a semi-permanent sedentary Middle Iroquoian farming community (Rankin 1998, 2000), and argues that it developed in situ from local Middle Woodland foraging populations.
Figure 4.9a. Plan map of the Nodwell site (redrawn by D.G. Smith and J. Creese from Wright 1974).
No other village sites have been discovered in Bruce County that can be attributed to the Ontario Iroquoian Tradition at any time between A.D. 900 and the contact period. Particularly problematic for an *in situ* explanation for the appearance of Nodwell is the fact that no Early Ontario Iroquoian villages have been identified in the region. A number of nearby seasonally occupied campsites have yielded low frequencies of Middle to Late Iroquoian ceramic types, suggesting that they were used directly by the Nodwell community (Wright 1974), or that they may represent interaction between the Nodwell population and foraging bands in the area. The Inverhuron-Lucas site, a small seasonal campsite on Lake Huron which was occupied primarily during the Late Archaic and Middle Woodland, also shows evidence for an ephemeral Transitional/Late Woodland 1 occupation in the form of four vessels with cord-wrapped paddle impressions and rows of horizontal punctates (Kenyon 1959). A Middle-Late Iroquoian component at the site is represented by a small vessel assemblage dominated by Lawson/Huron Incised or Opposed (10), Pound Necked (4), and Ontario Horizontal (3) types (Kenyon 1957). A single Lalonde vessel, combined with the predominance of Lawson Incised and Pound Necked, may indicate use of the site during the later part of the 14th or early 15th centuries (Dodd et al. 1990).

Figure 4.9b. Modeled occupation Phases B (left) and C (right) at the Nodwell site.
The preceding Middle Woodland occupation of southern Bruce County had been significant, forming the basis for Finlayson’s definition of the Saugeen Culture (Finlayson 1977). The Saugeen Middle Woodland presence in the region seems to have continued somewhat later than it did in the lower Grand River Valley to the southeast, up to approximately A.D. 800 (Finlayson 1977). After that point, however, large macroband camps such as Donaldson seem to have been largely abandoned. A much more limited Late Woodland 1 presence in the area is indicated by a number of small camp sites with vessels decorated with cord-wrapped tools (such as those at Inverhuron-Lucas). As Finlayson has commented, “The ultimate fate of the Saugeen culture in the Bruce locality remains uncertain, due, primarily, to the apparent lack of a significant occupation of this area by a Late Woodland population (1977: 645).”

Accordingly, there seem to be no local predecessors for the large, nucleated Middle Iroquoian village which appeared in the region at the turn of the 14th century; the all-important period of sedentarization and nucleated village development documented elsewhere in southern Ontario between A.D. 900 and 1250 is virtually unrepresented in the archaeological record of southern Bruce County. All this seems to weigh in favour of Wright’s colonization hypothesis. Indeed, the end of the 13th century appears to have been a time associated with the initial colonization of new territories by Iroquoian communities, including the colonization of Simcoe County by Iroquoian migrants from south of the Oak Ridges Moraine (MacDonald 2002; Warrick 1998; Sutton 1996).

In spite of this, Rankin has critiqued Wright’s migration hypothesis based on her reanalysis of the Nodwell site and surrounding Middle and Late Woodland components. She rightly points out that migration models associated with the transition to farming (for instance in central Europe) have often tended to underestimate the sometimes significant role of local indigenous populations in structuring the terms of forager-farmer interactions and in influencing the selective adoption or rejection of new crops, technologies, and settlement systems (Rankin 2000, 1998). In her substantive analysis of the Nodwell site, Rankin makes a number of claims about the nature of the Nodwell community that challenge the idea that the Nodwell site represented a horticultural Iroquoian village (Rankin 1998). Rankin favours the theory that the Nodwell site was an in situ cultural development of an indigenous (and by implication, Algonkian-speaking) band that remained largely dependent on foraging for subsistence. Her claims in support of this position require further scrutiny.
Subsistence

Regarding the maize horticulture at Nodwell, Rankin states that: “archaeological evidence of a horticultural economy at Nodwell is slim. Only minimal quantities of cultigens were recovered from the village excavation… (1998: 38).” Rankin’s technical assessment of the archaeobotanical evidence of horticultural economy at Nodwell is, however, limited to the assertion that the recovery of 384 counted kernel and cob fragments “after extensive flotation to recover floral samples (Rankin 1998: 182)” represents “slim” evidence. These statements require contextualization.

A review of Wright’s findings casts serious doubt on Rankin’s interpretation of the Nodwell botanical record. With respect to quantification, Wright provides both kernel counts and weights in recognition of the fact that many of the remains were too fragmentary to provide reliable quantification through counting. In addition to the 384 counted “kernels” (which actually included whole kernels and kernel and cob fragments) weighing a total of 61.5g, kernels and cob fragments from two other contexts were not counted, since they were “too numerous to count”, as Wright put it (1974: 207). These included 6.3 g from House 4, and fully 100.8 g from the middens. Therefore, the total mass of kernel, cupule, and cob fragments recovered from Nodwell was in fact 168.6g, or more than double the mass of the counted fragments alone. It is strange that Rankin should have overlooked this data. Using the same fragmentation ratio as that found in the weighed and counted part of the sample, one arrives at a rough estimate of at least 960 fragments. However, because of potentially different fragmentation rates between contexts, mass provides a better quantification for maize remains at Nodwell than does fragment count.

The next question is whether mass or fragment counts are good indicators of the economic importance of maize at a site. Since numerous seeds may be preserved within a single deposition event, paleoethnobotanists often prefer measures of density or ubiquity when assessing the economic importance or prevalence of a crop in daily food preparation and consumption activities within a settlement (Ounjian 1998). Recovery of maize from a high proportion of contexts could indicate its prominence in ordinary on-site activities. Wright unfortunately does not list recovered maize quantities by feature, as would be normal contemporary practice. However, quantities of maize were recovered from all excavated contexts including the 12 longhouses, exterior pits, middens, and the ploughzone.

Additional insight into the significance of this ubiquity can be gained by considering how floral recovery and analysis was undertaken at Nodwell. Flotation samples were taken from pit features in five of the houses and in the exterior pits, accounting for 42.8 g, or just 25% of the
The remaining 75% was recovered in the field without the aid of flotation. This included recovery from 6 other houses, the middens, and the ploughzone, where flotation samples were not collected. Moreover, while 3-pound flotation samples were taken from four of the houses in 1969, this strategy was abandoned in 1971 when only 17 to 50cc samples were flotated. Recovery rates from such miniscule flotation samples can hardly be compared to those of more recent excavations where hundred or thousands of litres of soil have been processed (e.g., Lennox et al. 1986). This flotation strategy, combined with the fact that the resulting light fractions were not analyzed by a trained paleoethnobotanist with access to a comparative collection (Wright 1974: 291-292) probably also accounts for the lack of identification of other cultigens such as bean and squash seeds, which tend to be very rare on Iroquoian sites, and tobacco seeds, which are less easily recognized by a non-specialist.

Finally, it remains to compare the Nodwell maize recovery data with that of contemporary and later Iroquoian villages, something that Rankin omitted to do in spite of her assertion that the sample was “minimal”. A crude comparison of recovered kernel/cupule counts and mass can be made with Iroquoian villages of a similar scale, keeping in mind differences in recovery techniques. For instance, 90 kernels were reported for the Uren site (M. Wright 1986), where flotation was not reported to have been conducted. At the smaller Holly site, where 187 litres were floated, 723 kernel and cob fragments were recovered, amounting to a mere 6.65g (Carnevale, et al. 2009). This suggests a much more fragmented sample than that reported for the Nodwell site (not a surprising finding given that the majority of the Nodwell sample was recovered without the aid of flotation, and so would have been biased in favour of larger fragments or whole kernels). By comparison, the large late 14th century Alexandra site, with some 16 longhouses, produced 299 maize kernels and kernel fragments, and 154 cob fragments, together totalling just 6.54g from 178 litres floated (Robertson and Williamson 2008). At Myers Road, a less fragmented sample of 149 kernels had a combined mass of 22.38g from >200 litres floated (Williamson 1998).

In terms of mass, these site totals are comparable to those recovered from individual houses at Nodwell, including those where no flotation occurred. Only at sites where flotation was very intensive have similar total masses of maize kernel and cob fragments been recovered. At Wiacek, for example, fully 2073 litres from 107 samples were floated, yielding a total of 149.5g of kernel, cupule, and cob fragments (Lennox et al. 1986: 145). These crude comparisons demonstrate that kernel and fragment counts vary widely relative to total mass from one sample to another, and are a very poor way of estimating the abundance of maize at a site. Moreover,
total mass recovered has a great deal to do with sampling strategy (i.e., volume floated), and little to do with the size or consumption rate of a village population. What these comparisons also show is that the total mass of maize kernel and cob fragments recovered from Nodwell is 1-2 orders of magnitude higher than the total mass recovered from modern flotation efforts at other Middle Iroquoian horticultural villages such as Holly, Myers Road, and Alexandra. The Nodwell total of 168.6g was comparable to that recovered from Wiacek, where the floated volume was about ten times that of the former sites. There is, therefore, no valid reason to consider the botanical evidence for maize horticulture at the Nodwell village “slim” in comparison to other Middle Iroquoian village sites. In view of the methods by which the majority of the sample was obtained and analyzed, as well as the ubiquity of maize throughout the site, the evidence for maize horticulture at Nodwell should be considered substantial.

Rankin also emphasizes what she sees as a low incidence of land-clearing tools at Nodwell: “indirect evidence suggests that horticulture was not the dominant subsistence strategy [at Nodwell]. Only one axe was recovered from the village. If crops had been grown around the village, a higher frequency of implements which could be used to clear land would be expected (Rankin 1998: 188).” From a pragmatic standpoint, the argument is weak considering the over 15,500 documented posts comprising the twelve longhouses and two palisades that surely would have required numerous woodworking tools to fell, limb, and adequately shape for construction purposes.

In fact, celts in general, particularly whole/unbroken ones, have low recovery rates on Iroquoian sites, most likely because they were heavily curated until damaged beyond repair. To assess whether the frequency of celts is unusually low at Nodwell, we require a method for fair comparison with other Iroquoian villages that were engaged in land clearance and swidden farming. As with the paleoethnobotanical case, there is probably no adequate way of doing this, since the original population size, settlement occupation duration, number and scale of structures, presence/absence of a palisade, modern looting, and area and types of contexts excavated, will all have an impact on what is recovered.

Nevertheless, a basic comparison of whole and fragmentary celt counts from 17 other Early to Late Iroquoian village assemblages provides a context for the Nodwell finds (Table 4.6). While only one celt at Nodwell was functionally identified by Wright as an “axe”, a total of twelve complete celts were recovered. Not all site reports distinguish between whole and fragmentary celts, or between functional types such as axes, adzes and chisels, so a combined inclusive whole plus fragmentary celts category was created. In this category, Nodwell (45
pieces) ranked above most other sites including Uren (37 pieces), Myers Road (20 pieces), Alexandra (36 pieces), and Grandview (22 pieces). In an effort to normalize these frequencies.

Table 4.6. Celt recovery frequencies from a sample of 17 extensively excavated 12th to 16th-century Ontario Iroquoian village sites, and the Nodwell site.

<table>
<thead>
<tr>
<th>Site</th>
<th>“Axes”</th>
<th>Whole Cells</th>
<th>All Celts, Celt Frags, and Celt Preforms</th>
<th>Complete Celts Per Vessel</th>
<th>All Celts, Celt Frags, and Celt Preforms Per Vessel</th>
<th>Vessel Count</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nodwell</td>
<td>1</td>
<td>12</td>
<td>45</td>
<td>0.028</td>
<td>0.104</td>
<td>431</td>
<td>J.V. Wright 1974</td>
</tr>
<tr>
<td>Uren</td>
<td>37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>260</td>
<td>M. Wright 1986</td>
</tr>
<tr>
<td>MyersRoad</td>
<td>1</td>
<td>20</td>
<td>0.003</td>
<td>0.066</td>
<td>305</td>
<td></td>
<td>Williamson 1998</td>
</tr>
<tr>
<td>Bennett</td>
<td>31</td>
<td></td>
<td>0.083</td>
<td>201</td>
<td>372</td>
<td></td>
<td>Wright and Anderson 1969</td>
</tr>
<tr>
<td>Calvert</td>
<td>5</td>
<td>21</td>
<td>0.025</td>
<td>0.104</td>
<td>201</td>
<td></td>
<td>Timmins 1997</td>
</tr>
<tr>
<td>Barrie</td>
<td>2</td>
<td>5</td>
<td>0.008</td>
<td>0.020</td>
<td>246</td>
<td></td>
<td>Sutton 1996</td>
</tr>
<tr>
<td>Boys</td>
<td>13</td>
<td></td>
<td>0.034</td>
<td>379</td>
<td></td>
<td></td>
<td>Reid 1975</td>
</tr>
<tr>
<td>Alexandra</td>
<td>3</td>
<td>4</td>
<td>36</td>
<td>0.018</td>
<td>0.158</td>
<td>228</td>
<td>Robertson and Williamson 2008</td>
</tr>
<tr>
<td>Kirche</td>
<td>3</td>
<td>49</td>
<td>0.003</td>
<td>0.044</td>
<td>1115</td>
<td></td>
<td>Nasmith 2008</td>
</tr>
<tr>
<td>MacLeod</td>
<td>88</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>924</td>
<td>Reed 1993</td>
</tr>
<tr>
<td>Grandview</td>
<td>1</td>
<td>3</td>
<td>22</td>
<td>0.017</td>
<td>0.125</td>
<td>176</td>
<td>Williamson et al. 2003</td>
</tr>
<tr>
<td>Wiacek</td>
<td>1</td>
<td>4</td>
<td>12</td>
<td>0.025</td>
<td>0.075</td>
<td>160</td>
<td>Lennox et al. 1986</td>
</tr>
<tr>
<td>Baker</td>
<td>6</td>
<td>21</td>
<td></td>
<td>0.135</td>
<td>155</td>
<td></td>
<td>Robertson (ed.) 2006</td>
</tr>
<tr>
<td>Berkholder</td>
<td>3</td>
<td>25</td>
<td>0.036</td>
<td>0.301</td>
<td>83</td>
<td></td>
<td>Robertson (ed.) 2005</td>
</tr>
<tr>
<td>Hubbert</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>93</td>
<td>MacDonald and Williamson 2001</td>
</tr>
<tr>
<td>Dunsmore</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>177</td>
<td>Robertson and Williamson 2003</td>
</tr>
<tr>
<td>Holly</td>
<td>1</td>
<td>6</td>
<td>0.002</td>
<td>0.009</td>
<td>633</td>
<td></td>
<td>Carnevale et al. (eds.) 2009</td>
</tr>
<tr>
<td>Parsons</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>171</td>
<td>Williamson and Robertson (eds.) 1998</td>
</tr>
<tr>
<td>Mean (all sites less Nodwell)</td>
<td>26</td>
<td>0.015</td>
<td>0.099</td>
<td>171</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

for the overall size of the recovered artifact assemblage, whole and fragmentary counts were also divided by the number of analyzable ceramic vessels recovered from the sites. These values ranged widely from approximately one celt piece per thousand vessels, to one celt piece per 33 vessels. The average for all 17 sites (excluding Nodwell) was just under one celt piece per 100 vessels. Nodwell was perfectly average with respect to this sample. In terms of whole tools, Nodwell was well above average (Table 4.6).

With respect to the identification of “axes” vs. other functional types, reporting is extremely spotty, since the trend in regional archaeological practise has been to avoid functional terms for ground stone tools within the “celt” category (cf. Lennox et al. 1986). Where “axes”
are distinguished in the inventories of these 17 sites, reported counts ranged from 0 to 7, with some large, fully excavated villages such as Grandview and Alexandra producing just 1 and 3 axes respectively (Table 4.6). The majority of celts at Middle Iroquoian villages appear to have been adzes. At Uren, all 14 of the celts and celt fragments that were functionally identified were classified as “adzes” (M. Wright 1986), and all 5 complete celts at Bennett were described as “adzes” (Wright and Anderson 1969). The majority of celts at Nodwell appear also to have been adzes (J.V. Wright 1974). In sum there is no identifiable support from the Nodwell celt assemblage for the assertion that the occupants of the Nodwell site had an unusually low prevalence of land-clearing tools in comparison to other horticultural Iroquoian communities.

Settlement Patterns, Dating, and Occupation History

The attribution of houses at Nodwell to particular periods will affect the identification of diachronic trends, as well as how the settlement plan is modeled for the village-level spatial analysis. In terms of superpositional evidence, one house at Nodwell, House 5, was overlapped and post-dated by Houses 6 and 9. House 8 had experienced a southerly extension (Figure 4.9). Houses 4, 5, 7, and 8 were regularly spaced and aligned in a north-south orientation across the central area of the village. Houses 10 and 11 were similarly closely spaced and oriented east-west across the northern part of the settlement (Figure 4.9). Houses 2 and 3 were closely spaced and oriented southwest-northeast at the southern end of the settlement. After House 5 had been demolished, House 6 was added, oriented northwest-southeast, and House 9 was added, oriented southwest-northeast (Figure 4.9). Few between-context ceramic vessel cross-mends were documented at Nodwell. One of these linked a pit feature in the north end of House 8 with a pit in the south end of House 6 (Wright 1974).

While the superpositional pattern makes it clear that House 5 predated Houses 6 and 9, it does not determine the relationship of these houses with the others at the site. There are a number of inferential sources of evidence that can be used to clarify these relationships. However, using such evidence, Wright (1974) and Rankin (1998, 2000) came to radically different conclusions about the temporal depth and degree of contemporaneity represented by the Nodwell houses. It is therefore necessary to weigh the strengths of these two models, particularly in view of what is known about other Late Woodland villages in the Great Lakes region. Based on the observation that House 5 predated Houses 6 and 9 (and its low interior artifact and pit densities) Wright suggested that House 5 was the first structure erected at Nodwell, and that it was used to house workers while land was cleared and other structures were
built (1974: 34). It was subsequently demolished to make room for the addition of Houses 6 and 9. Wright therefore modeled the main occupation of Nodwell, for the purposes of a population estimate, as consisting of Houses 1-4 and 6-12 (Wright 1974). Based principally on a ceramic vessel attribute analysis, Wright placed the entire occupation of Nodwell within an estimated 20 year span during the “Middleport” substage of the Ontario Iroquoian Tradition (ca. A.D. 1350).

However, in his comparative analysis of the vessel assemblages by context, Wright noted two patterns that might indicate a somewhat longer occupation at the site. He observed that attributes of vessel profile form, body sherd treatment, shoulder form, and MacNeish type frequencies (MacNeish 1952), suggested that the vessel assemblages of some houses were relatively “conservative” (Houses 4, 7, 10 and 11) while those of others were more “progressive”, (Houses 1 and 8), with the remainder being “intermediate” (1974: 243). Wright did not explore the temporal or social implications of these observations. He also noted a similar pattern with respect to a comparison of the basal midden deposits and the ploughzone, which he did take as evidence of time depth (242). The all-important question is: what kind of time depth do these “conservative” and “progressive” tendencies imply? Wright apparently believed that they could be accommodated within a two decade span, and certainly within the Middleport substage.

Rankin offers a very different interpretation of the settlement history of Nodwell. Relying heavily on 12 conventional radiocarbon dates (see Table 4.7), she argues for Late Archaic and Middle Woodland occupations at the site, as well as a significant 11th-12th century component. Two clusters of dates were reported, including five dates that overlapped in the period A.D. 1030-1155, and three dates that overlapped in the expected period A.D. 1270-1340 (Table 4.7). Regarding these date clusters, she writes:

The implications of these two remaining clusters of dates are intriguing. They suggest that a more intensive occupation of the Nodwell site began much earlier than the 14th century and perhaps as early as the 11th century. This time frame is associated with the transition from Middle to Late Woodland periods elsewhere in southern Ontario and suggests that the origin of the Nodwell village could be dated to the preceding Early Iroquoian period when longhouse settlements are first established in other regions of the province [1998: 115].

She explains the apparent absence of a major early Late Woodland (ca. A.D. 1000-1250) component in the southern Bruce region by arguing that the Nodwell site itself was the focus of macroband settlement at this time (1998: 124). She states further that “Radiocarbon dates
demonstrate that as many as three of the Nodwell village houses may have been constructed
during this period (1998: 125)”, referring to dates from pit features in Houses 7, 8 and 10 that
formed the 11th-12th century cluster. Rankin also links House 5 to this early component, based
on a relatively high frequency of cord-impressed body sherds (16.7%), and
vessel rim sherds “not representative of the Iroquoian tradition…” but resembling “those made
by Western Basin foragers between A.D. 1100 and 1200 (1998: 125).”

There is, however, a lack of coherence between the 11th-12th century date cluster and the
archaeological record of the site. The artifactual evidence Rankin cites in support of an 11th-12th
century component at the site is extremely slim, and the architectural traits of the longhouses, as
analyzed in this dissertation, rule out the hypothesis that any of them were constructed in the 12th
century or earlier.

Ceramics
Ceramic Vessels:
Ontario Horizontal vessels had the highest frequency in the Nodwell assemblage (n=88,
21.6%), followed closely by Pound Necked (n=81, 19.9%), Black Necked (n=57, 13%),
(together totalling 32.3% of vessels) and Middleport Oblique (n=38, 9.3%). While Rankin is
quick to point out that the combined percentage of Ontario Horizontal, Middleport Oblique, and
Lawson Incised types was just 34.3%, not reaching Wright’s own 50% criterion for defining a
“Middleport” assemblage (1966), she fails to mention that the bulk of the difference lies with
later types, indicated by the high proportion of necked vessels. The combined frequency of the
eyear types, Iroquois Linear (n=27) and Ontario Oblique (n=3), was just 7.3%, while Huron
Incised (n=16), Lawson Incised (n=14), Lawson Opposed (n=7), Niagara Collared (n=2), Sidey
Crossed (n=19), Warmister Horizontal (n=8), and Warmister Crossed (n=1) collectively
amounted to 16.5%. Combined with the high proportion of Pound and Black Necked types,
these frequencies are not at all compatible with a 12th or even early 13th century occupation of the
site, and are more typical of a late 14th century assemblage (cf. Lennox et al. 1986; Dodd et al.
1990). Dodd et al. (1990: 337) point out that individual or combined frequencies of Pound and
Black Necked types do not exceed 25% in vessel assemblages until “mid-late Middleport”. In
this vein, it should be noted that among the houses deemed “conservative” by Wright (1974) and
corroborated by Rankin’s body sherd analysis (2000), Pound/Black Necked vessel frequencies
ranged from a low of 15% in House 11, to a high of 42% in House 10. By way of comparison, at
none of the Myers Road houses did necked types exceed 1%, while Glen Meyer Oblique and
Table 4.7. Radiocarbon dates for the Nodwell site as published by Wright (1985), and calibrated using Oxcal 4.1 (Reimer et al. 2009) (Note that radiocarbon dates are corrected for isotopic fractionation; CARD = Canadian Archaeological Radiocarbon Database, www.canadianarchaeology.ca/radiocarbon/card/card.htm)

<table>
<thead>
<tr>
<th>Lab Number</th>
<th>House</th>
<th>Material</th>
<th>Feature(s)</th>
<th>Calibrated Age A.D. (modes)</th>
<th>Calibrated Age A.D. (68% C.I.)</th>
<th>Calibrated Age A.D. (95% C.I.)</th>
<th>Radiocarbon Age (BP)</th>
<th>Radiocarbon SD</th>
<th>References</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-503</td>
<td>3</td>
<td>wood charcoal</td>
<td>unknown</td>
<td>1315</td>
<td>1298-1400</td>
<td>1272-1435</td>
<td>610</td>
<td>75</td>
<td>Wright 1985</td>
<td>CARD</td>
</tr>
<tr>
<td>S-1719</td>
<td>7</td>
<td>carbonized Zea mays (pooled)</td>
<td>unknown</td>
<td>1390</td>
<td>1486-1638</td>
<td>1437-1797</td>
<td>335</td>
<td>70</td>
<td>Wright 1985</td>
<td>CARD</td>
</tr>
<tr>
<td>S-1717</td>
<td>7</td>
<td>deer bone collagen (pooled)</td>
<td>F. 1035</td>
<td>1625</td>
<td>1060</td>
<td>95% C.I.</td>
<td>860</td>
<td>120</td>
<td>Wright 1985</td>
<td>CARD</td>
</tr>
<tr>
<td>S-1718</td>
<td>7</td>
<td>fish bone collagen (pooled)</td>
<td>F. 1081</td>
<td>1043-1262</td>
<td>899-1389</td>
<td>1025</td>
<td>Wright 1985</td>
<td>CARD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-1710</td>
<td>8</td>
<td>bear bone collagen</td>
<td>F. 77</td>
<td>1255</td>
<td>1216-1274</td>
<td>1172-1284</td>
<td>790</td>
<td>45</td>
<td>Wright 1985</td>
<td>CARD</td>
</tr>
<tr>
<td>S-1711</td>
<td>8</td>
<td>bear bone collagen</td>
<td>F. 82</td>
<td>1115</td>
<td>975-1155</td>
<td>891-1210</td>
<td>1000</td>
<td>75</td>
<td>Wright 1985</td>
<td>CARD</td>
</tr>
<tr>
<td>S-1712</td>
<td>8</td>
<td>deer bone collagen (pooled)</td>
<td>F. 153</td>
<td>1165</td>
<td>1050-1216</td>
<td>1035-1251</td>
<td>880</td>
<td>45</td>
<td>Wright 1985</td>
<td>CARD</td>
</tr>
<tr>
<td>S-1714</td>
<td>8</td>
<td>beaver bone collagen</td>
<td>F. 155</td>
<td>1030</td>
<td>1015-1153</td>
<td>981-1165</td>
<td>980</td>
<td>45</td>
<td>Wright 1985</td>
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<tr>
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<td>fish bone collagen (pooled)</td>
<td>unknown</td>
<td>540</td>
<td>433-574</td>
<td>412-632</td>
<td>1540</td>
<td>55</td>
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<tr>
<td>S-1716</td>
<td>8</td>
<td>carbonized mammal (pooled)</td>
<td>unknown</td>
<td>914 BC</td>
<td>1008-837 BC</td>
<td>1129-801 BC</td>
<td>2780</td>
<td>75</td>
<td>Wright 1985</td>
<td>CARD</td>
</tr>
<tr>
<td>S-1715</td>
<td>8</td>
<td>freshwater mollusc shell (pooled)</td>
<td>169 BC</td>
<td>350-49 BC</td>
<td>AD</td>
<td>2125</td>
<td>70</td>
<td>Wright 1985</td>
<td>CARD</td>
<td></td>
</tr>
<tr>
<td>S-1720</td>
<td>10</td>
<td>carbonized Zea mays (pooled)</td>
<td>1015</td>
<td>896-1148</td>
<td>780-1176</td>
<td>1035</td>
<td>80</td>
<td>Wright 1985</td>
<td>CARD</td>
<td></td>
</tr>
</tbody>
</table>

Ontario Oblique together reached 15% in House 1 (Williamson 1998: 151). In short, based on the ceramic vessel assemblages, the “conservative” houses at Nodwell may have been initially constructed during “Uren” times, (ca. A.D. 1280-1330) but if so, were probably occupied well into the 14th century, and show absolutely no evidence for a “pre-Uren” occupation.

This leaves House 5, which Rankin suggests was established in the 11th-12th century and contained vessels “not representative of the Iroquoian tradition” (1998: 125). Due both to the low density of pits in this house, and to the fact that pits located in the areas of overlap with Houses 6 and 9 were as a rule attributed to the latter structures by Wright (1974), only two ceramic vessels were recovered from House 5. One of these was considered too fragmentary to be analyzable by Wright, while the other was described as having horizontal push-pull decoration on the collar, and having been excluded from the Iroquois Linear type due to its convex interior profile (1974: 119). If, indeed, this single vessel exhibits attributes “resembling”
Western Basin Tradition vessels during the 12th century (Rankin does not provide detailed descriptions of the vessel or photographs), it certainly cannot be considered evidence for a “more intensive” macro-band/village component at Nodwell prior to the Middle Iroquoian period, nor can it be used to substantiate a 12th century date for the construction of House 5.

Body Sherds:

Rankin analyzed 6666 body sherds from the ceramic assemblages by house context and categorized them according to surface treatment (1998). Her results essentially mirrored those of Wright, with “conservative” houses showing higher frequencies of corded and rib paddled treatments. Corded body sherds occurred in Houses 4, 5, 7, 8, 9, 10, 11 and 12, ranging from 1.1% in House 8 to a maximum of 16.7% in House 5. Rib paddled treatments occurred in all houses and ranged from a low of 9.8% in House 1 to a high of 43.3% in House 5 (a frequency typical of “Uren” substage assemblages [Dodd et al. 1990]). Plain exteriors dominated, ranging from 40% in House 5 to 90% in House 1 (199). There was a clear pattern of high proportions of cording or rib paddling in the House 5 assemblage, and low proportions in Houses 1 and 8. House 7, falling in the “conservative” group and producing dates in the 12th century cluster, had 73% plain, 20.1% rib paddled, and 5.2% corded. House 10, also in the “conservative” group and yielding an 11th-12th century date, had 69.1% plain, 22.8% rib paddled, and 7.2% corded. Similarly, House 8, placed in the “progressive” group but also having two 12th century dates, exhibited 87.2% plain, 11.2% rib paddled and 1.1% corded (Rankin 2000: 76). These frequencies of vessel body treatments are indicative of Uren and Middleport occupations (Dodd et al. 1990:330-331; Wright 1966), and cannot be used to substantiate a 12th century date for any of the houses, including House 5. Moreover, the predominance of plain and secondary importance of ribbed-paddle in Houses 7, 8 and 10 is grossly inconsistent with the early radiocarbon dates from these structures. Altogether, the body sherd data are coherent with the establishment of House 5 during the late 13th century at the earliest, a subsequent addition of the “conservative” Houses 4, 7, 10, and 11, and finally the replacement of House 5 and the addition of “progressive” Houses 1, 2, 3, 6, 8, 9, and 12.

Given the ceramic evidence for “Uren” beginnings, we can perhaps revise the maximum temporal span of the Nodwell village to some 50 years between the turn of the 14th century and the mid-14th century, but the 11th-12th century radiocarbon date cluster remains anomalous and inconsistent with the ceramic vessel assemblages from all houses. It is also worth pointing out that House 8 pits yielded three of the unusually early dates, including one calibrated to the 6th...
century. While Rankin suggests this is indicative of a Middle Woodland presence at the site (1998, 2000), no Middle Woodland or early Late Woodland vessels or other diagnostic artifacts were associated with House 8, and, as discussed above, House 8 fell into the stylistically “progressive” group.

Architecture

Is it plausible from an architectural standpoint that House 5 was constructed prior to the Middle Iroquoian period, and as early as the 12th century? The “cigar-end” morphology of the north end of House 5 (Figure 4.9) is typical of many Middle and early Late Iroquoian Longhouses (Dodd et al. 1990). Moreover, in none of the Early Iroquoian villages included in this study does this morphology occur. While some Middle Iroquoian houses have rounded ends, no Early Iroquoian houses have “cigar-ends”. The “cigar-end” morphology appears quite abruptly in concert with “long” longhouses and large end-vestibules at the turn of the 14th century at sites such as Myers Road and Wellington. Dodd et al. date the appearance of “cigar-end” morphology to the early 14th century (1990: 349). Both “conservative” and “progressive” houses at Nodwell exhibit “cigar” taper end form on one or both ends, including Houses 1, 6, 7, 8, 9, and 10.

House 5 also exhibits centrally aligned post-cluster structures similar to those of other Middle and Late Iroquoian houses. These have been attributed to above-ground sweat lodges (MacDonald 1988; Finlayson 1985; Tyyska 1971) (Figure 4.9), and do not occur in houses predating the mid-13th century. These structures were observed in all of the Nodwell houses, and were normally located between central hearths.

Also, the dimensions of House 5 are incompatible with an 11th-12th century date. The house was 39m in length and 8.2m in width, well outside the 12th century range, but typical of larger Middle Iroquoian houses (see Dodd 1984, and Chapter 7).

In sum, the characteristic end-morphology, vestibule length, presence of medially aligned post-cluster structures, and overall scale of House 5 (as well as the other “conservative” Nodwell houses) is totally inconsistent with early Late Woodland architecture in the rest of the region, including the non-Iroquoian Western Basin Tradition (e.g., Lennox 1982). Moreover, the idea that these houses were occupied or reoccupied over a period of centuries is incompatible with the low incidence of wall reconstruction and other maintenance and remodelling activities at the site.

Given the absence of a material signature for Rankin’s hypothesized 11th-12th century macro-band camp or village component at the Nodwell site, we are forced to call into question
the validity of the early radiocarbon dates, particularly since they were taken from apparently secure contexts within the longhouses, but produced dates ranging, in the case of House 8, from the 1st millennium B.C. to the 14th century A.D. It may be relevant that all 12 Nodwell dates were processed at the same laboratory, and that most of the aberrant pre-Middle Iroquoian dates were derived from faunal remains, save one on a pooled sample of carbonized maize from House 10 (Table 4.7). Given current advances in sample pre-treatment and the advent of AMS technology, re-dating the Nodwell site may prove to resolve the dating issue. In the meantime, we must accept the fact that the early radiocarbon dates from Nodwell are not compatible with the material culture assemblage.

I therefore modeled three principal occupation phases at Nodwell:

Phase 1: House 5 only ("Uren” substage)
Phase 2: Houses 4, 5, 7, 10, 11 and palisade(s) added ("Uren” substage)
Phase 3: Houses 1-4, 6-12 ("Middleport” substage)

Given the even spacing of adjacent house ends in Phases 2 and 3, it seems unlikely that the “conservative” houses were abandoned prior to the construction of the “intermediate” and “progressive” houses, as Rankin advocates in her revision of population estimates of the settlement through time (1998, 2000). The high proportions of necked vessels in the “conservative” houses, and the presence of early types (Ontario Oblique) in the most “progressive” houses (1 and 8), argues for substantial temporal overlap between the occupations of these houses. Indeed, the statistical significance of the temporal trends identified in Wright’s longhouse vessel analysis is in doubt, and this problem cannot be overcome by artificially increasing sample sizes by analyzing rim fragments rather than vessels (contra Rankin 2000). The cross-mend linking the “intermediate” House 6 and the “progressive” House 8 also supports the contemporaneity of these structures. Similarly, fence lines appear to link the east ends of Houses 9 and 10, and the north ends of Houses 7 and 8 (Figure 4.9) in a manner that has been observed in other Middle Iroquoian villages such as Myers Road (Williamson 1998) and Dorchester (Martelle pers. com.), indicating the chronological overlap of “conservative” with “intermediate”, and “conservative” with “progressive” houses.

To conclude, the evidence in support of a “long chronology” for the Nodwell settlement is weak and self-contradictory (e.g., that House 8 was dated to the 12th century, but was
stylistically “progressive” and typical of the 14th century). There is also no substantive evidence from the botanical or stone tool assemblages to indicate that maize horticulture was a marginal economic activity at the village.

Crawford Lake (AiGx-6), ca. A.D. 1350

The Crawford Lake site was a 1.2ha Middle Iroquoian village located 21km north of Lake Ontario and 300m west of Crawford Lake, near the present day village of Campbellville, Halton County, Ontario. The settlement was situated on tableland overlooking the lake, and was bounded by a steep break-in-slope on its southeastern edge (Finlayson 1998). The village, considered a “satellite” by Finlayson (1998), was extensively excavated under his direction in a series of field seasons between 1973 and 1987. These efforts exposed portions of 10 longhouses, 7 of which were completely excavated. These structures ranged in length from 25 to 106.6m, and in width from 6.6 to 7.8m (Finlayson 1998), and were interpreted as evidence for two occupation phases by Finlayson (Figure 4.12). Based on the superposition of Houses 7 and 8 over House 6, and House 11 over House 1, as well as evidence for the extensive reconstruction and continued use of Houses 2 and 3 in both occupations, Finlayson identified the Phase 1 configuration as consisting of Houses 1-4 and 6, and the Phase 2 configuration as including the reconstructed and expanded Houses 2 and 3, and Houses 5, 7, 8, and 11 (Finlayson 1998: 235-240). The attribution of House 5 to Phase 2 was based on its close proximity to House 4, rather than stratigraphic evidence, and so it is likely that House 5 was also occupied during Phase 1. Based on the principle of maximum contemporaneity, therefore, House 5 was included in the present definition of Phase 1, which included Houses 1-6. Phase 2 followed Finlayson’s Phase 2 defined above. Structure 12, an ephemeral wall outline located near the centre of the site, was not contemporaneous with either occupation phase, and may represent an initial cabin used to house workers during village construction, in a manner similar to the Nodwell House 5. Substantive evidence for a palisade was weak or lacking despite an extensive search (Finlayson 1998: 240). It therefore seems likely that Crawford Lake, like many of its contemporaries, was not palisaded.

A number of problems were encountered in Finlayson’s published settlement plan maps and data (1998) that limited how the Crawford Lake site could be used in the present study. A major problem was that the published scale bars for each house plan were evidently incorrect, and had presumably been moved or resized independent of the settlement plans themselves. The result was that these house plans could not be adequately geo-referenced and scaled in a way that
produced results consistent with Finlayson’s published measurements. This problem meant that only basic house length and width data were available for the house-level analysis. Based on the assumption that Finlayson’s published plan of the village as a whole correctly represents the relative size and position of the houses (even though the absolute scale as indicated by the scale bar was not correct), I included the two Phase models outlined above in the village level analysis (Figure 4.12). No radiocarbon dates from the Crawford Lake site have been reported. However, ceramic attributes indicate a Middle Ontario Iroquoian (“Middleport substage”) occupation (Smith 1997; Finlayson 1998).
Robb (AlGt-4), ca. A.D. 1300-1330

The 2.5 ha, unpalisaded Middle Ontario Iroquoian Robb site was located in the present-day Town of Markham, York Region, Ontario. It was situated on slightly elevated level ground immediately south of, and bounded by, a ravine formed by a tributary of the Rouge River. Another Middle Iroquoian village, Faraday, was located directly across the ravine to the north (Kapches 1981). The site saw small excavations by members of the Ontario Archaeological Society between 1954 and 1958, by the University of Toronto in 1962, and was surface collected by Kapches in 1977 (Kapches 1981). Between 1998 and 2003 the site was entirely salvage excavated by Archaeological Services Inc. (Williamson, Robertson and Dieterman 2001). A full report of this project from ASI is forthcoming. Original settlement plan data (CAD files) and artifact catalogues were generously provided for the present research by R. Williamson and D. Robertson of ASI. The Robb village consisted of 9 longhouses evenly spaced in a fan-like formation oriented to the northern and eastern perimeter of the site, as well as several middens and outdoor activity areas (Figure 4.13). No structures were found to overlap, but two longhouses had experienced extensions. The evenly spaced, orderly alignment of the houses, combined with the lack of evidence for structure overlaps or realignments, indicates that the houses were occupied simultaneously. The Robb longhouses ranged from approximately 36 to
64m in length, and 7.5 to 8m in width. Disturbance on the north and eastern edges of the site had truncated the ends of 5 of the houses. This meant that house lengths for these structures had to be estimated for the village-level spatial analysis based on the proximity of the break-in-slope (Figure 4.13). House length measurements reported in the house-level analysis were only made on the complete houses.

No radiocarbon dates are available for the Robb site. In her dissertation on the Middleport occupations of the Markham area, Kapches (1981) estimated a date of A.D. 1300-1350 based on ceramic stylistic attributes. Similarly, Williamson and Pfeiffer (2003) provide an early 14th century date for Robb (ca. A.D. 1300-1330).

**Figure 4.13a.** Plan map of the Robb site (redrawn from CAD files provided by Archaeological Services, Inc.). Contour interval is 1m (ASL).
Serena (AhGx-274), ca. A.D. 1325-1375

The Serena site was a 1.25 ha Middle Iroquoian settlement situated on the crest of a till moraine on the Niagara escarpment (Williamson 2004), within the present-day City of Hamilton, Ontario. The site was bounded on the north and east sides by a gentle down-slope, and on the south by a steep break-in-slope associated with a tributary of Redhill Creek (Williamson 2004). The village was extensively excavated between 1995 and 1998 in a salvage operation conducted by Archaeological Services Inc. under the direction of R. Williamson. The Serena site was an unpalisaded settlement that included six longhouses (ranging from 23 to 67m in length, and 6.8 to 8.1m in width) as well as a 140m section of fencing or stockade that divided the site area from southwest to northeast and overlapped one of the houses (Figure 4.14). This structure may have served as a partial palisade for four houses located to the east of it, since the western approach to

Figure 4.13b. Modeled settlement plan of the Robb site.
the settlement was the only one that lacked a natural topographic boundary. Austin and Williamson propose the following occupation sequence for Serena (Figure 4.14):

Phase 1: Houses 1 and 2 were built and House 1 was subsequently reconstructed
Phase 2: House 1 was succeeded by the construction of the fence, at which point Houses 3-6 were built. House 5 was subsequently expanded or contracted, and Houses 3 and 4 were extensively remodelled over time.

The status of House 2 during the second phase could not be determined unequivocally. It may have continued in use after the erection of the fence, although the lack of evidence for reconstruction or long-term maintenance of House 2 appears to weigh in favour of the hypothesis that it was abandoned at the beginning of Phase 2. In the present study, Phase 1, with just two houses, was considered too small to be included in the village-level analysis. Thus, only the subsequent Phase 2 as defined by Austin and Williamson (Williamson 2004) was used in the village-level study.

The Serena site has not been radiocarbon dated. However, the predominance of Ontario Horizontal and Middleport Oblique vessel types (73%) indicate a mid-14th century occupation. It should also be noted that a chronological trend was not found between the ceramic assemblages of the different houses (in contrast to the situation at Myers Road), suggesting that there was no significant hiatus between the Phase 1 and 2 occupations (Williamson 2004: 34).

Figure 4.14a. Plan map of the Serena site (redrawn from CAD files provided by Archaeological Services, Inc.).
Wiacek (BcGw-26), ca. A.D. 1375

The Wiacek site was an unpalisaded 0.75 ha Middle Iroquoian village located on a tributary of Lover’s Creek, four kilometres south of Kempenfelt Bay in present-day Innisfil Township, Simcoe County, Ontario. Part of the site was excavated by Ministry of
Transportation archaeologists in 1983 in advance of road construction activities (Lennox et al. 1986). In 1990, additional salvage excavations were undertaken by Archaeological Services Inc. (Robertson, et al. 1995). Together, these projects exposed three substantial longhouses and two smaller structures that were similar to the small “outbuildings” documented at the nearby Holly site (see above). House 3 at the Holly site and House 7 at Wiacek were both short and narrow structures (about 5x10m), with exterior appended semi-subterranean lodges. The other three longhouses at Wiacek ranged from 36 to 44m in length and 7.7 to 8m in width, were evenly spaced, and aligned in a southwest-northeast orientation (Figure 4.21). Another local connection at Wiacek was indicated by the presence of two parallel lines of post moulds running southwest from either side of the southern door of House 1. The same architectural feature was present at the nearby Wellington site. No evidence was found for the existence of multiple occupation phases at the site so it was assumed for the purposes of the village-level analysis that the Wiacek houses were contemporary with one another.

Based on a ceramic seriation, Lennox et al. (1986) placed the Wiacek occupation sometime between A.D. 1350 and 1450. Two conventional radiocarbon dates (750±80 BP [I-13537], and 730±80 BP [I-13538]) run on wood charcoal from interior pit features were calibrated to A.D. 1200 and 1220, and therefore appeared too early (Lennox et al. 1986). A re-assay produced a result that was somewhat more consistent with the material culture assemblage (660±80 BP [I-13538c]), calibrated by Lennox et al. to A.D. 1320 (1986), but still apparently early. I have recalibrated these dates using the most recent calibration curve (Table 4.1). Two points are worthy of note. First, the newest calibration curve situates the dates somewhat later than Lennox et al.’s calibration did, at A.D. 1270, 1375 (A.D. 1048-1399, 95% C.I.) and A.D. 1295, 1375 (A.D. 1220-1424, 95% C.I.), placing most of the 14th century well within the 68% confidence interval. Second, the probability curves associated with these dates, particularly the latter, are markedly bimodal. In each case the secondary mode occurs at A.D. 1375. In the case of the latest date, the two modes (AD 1295 and 1375) have equal probabilities. Given the nature of the ceramic assemblage, we can confidently suggest that the later date is correct, and accept a calibrated date of ca. A.D. 1375 for the Wiacek occupation. Indeed, the combined ceramic assemblages from the MTO and ASI excavations indicated a mid-late 14th century date for the site (Robertson et al. 1995).
Alexandra (AkGt-53), ca. A.D. 1390-1420

The Alexandra site was a large (ca. 2.6 ha) later Middle Ontario Iroquoian unpalisaded village located on a knoll just west of a branch of Highland Creek in the northeastern part of the present-day City of Toronto, Ontario (Robertson and Williamson 2008). A gentle down-slope occurred on the eastern and southern boundaries of the site. The village was extensively excavated in a salvage operation conducted by Archaeological Services Inc. in 2000-2001, exposing 16 longhouses, 3 middens, several exterior fences, and 11 outdoor activity areas (Robertson and Williamson 2008). Original CAD files of the settlement pattern data were generously provided for the present study by R. Williamson and D. Robertson. The eastern end of House 3 was truncated due to the installation of a storm sewer and re-channelling of Highland Creek, and the eastern ends of Houses 1, 7, 12 and 13 were poorly defined and may also have been somewhat disturbed by these construction activities (Robertson and Williamson 2008). Ten
of the longhouses had seen expansions or contractions, including Houses 2, 3, 6, 7, 8, 9, 11, 12, 14, and 17. “House” 4 was a small (5.9x9.8m) poorly delineated structure apparently associated with a large fenced area directly to its west, and was probably not a residential building. The other longhouses at Alexandra ranged from 15.8 to 51m in length and from 6.9 to 7.6m in width. The longhouses were configured in a broad, fanlike configuration, and tended to occur in clusters that were similarly oriented (Figure 4.15) indicative of a coherent village plan. However, the overlap of several of the houses demonstrated that they were not all occupied simultaneously. The following houses were superimposed:

Houses 9 and 11
Houses 14 and 16
Houses 16 and 17

In each case the overlapping houses were of a similar size and orientation, suggesting that the same co-residential group had reconstructed their house adjacent to the original. Houses 8 and 9 were parallel and immediately adjacent to each other, appearing to share an eastern section of wall. It is possible that they were occupied sequentially or simultaneously. A clue to the chronological relationship between the houses is provided by the observation that they were linked via a semi-subterranean lodge, the body of which was located under a side platform in House 9, but which also had ramp access from the adjacent House 8 (as well as from the corridor of House 9). Given the architectural improbability that the two houses physically shared part of a wall, it seems most likely that House 9 was constructed first, and was later reconstructed to the north as House 8 in order to make room for the addition of House 11 to the immediate south. Parts of the existing wall of House 9 may then have been incorporated into the new House 8, and use of the SSL maintained by adding a side ramp from House 8. This is consistent with the fact that SSL entrance ramps normally occur at the ends of the structures, rather than the sides. The presence of a side ramp from House 8 suggests that it was added later to access the original structure in House 9. This evidence for the continued use of a semi-subterranean lodge between successive constructions of a longhouse by the same co-residential group signals the strength of the ritual and social values that were attached to these structures and the practices they involved (cf. MacDonald 1988).
The temporal relationships between Houses 14, 16 and 17 were less clear, since no definitive stratigraphic evidence was available to indicate which structures came first. However, it is probable that House 16 predated (or less-likely, post-dated) Houses 14 and 17. Given the evidence for SSL reconstruction, house extensions/contractions, and higher pit frequencies in Houses 14 and 17, it seems likely that these two houses were occupied longer than House 16, which was nearly devoid of features, and had experienced no remodelling. Based on this admittedly circumstantial evidence, I suggest that House 16 was briefly occupied, then reconstructed to the immediate west as House 17 when House 14 was also built. Combining the scenarios for Houses 8, 9 and 11, and Houses 14, 16, and 17, discussed above I modeled the occupation sequence as follows (Figure 4.15):
Phase A: Houses 1-7, 9, 10, 12, 13, 16
Phase B: Houses 1-8, 11-14, 17

Figure 4.15b. Modeled occupation Phases A (left), and B (right), at the Alexandra site.

However, given the weakness of the inference that House 16 predated Houses 14 and 17, the opposite temporal sequence relative to that deduced for Houses 8, 9, and 11 was also modelled as follows:

Phase C: Houses 1-7, 9, 10, 12-14, 17
Phase D: Houses 1-8, 11-13, 16

Obviously, the Phase sequences A to B, and C to D are mutually exclusive options, with slightly different effects on the overall configuration of space in the village. It should also be noted that there is a possibility that Houses 1, 5, 6, 7, and 10 were added to the village after the other houses were standing, based on higher proportions of early ceramic types in the vessel assemblages of the latter houses (Robertson and Williamson 2008). However, the comparative ceramic samples for each house were very small (vessel counts ranging from 1 to 11), and the
results of the comparative analysis cannot be considered statistically significant. Given the fact that the frequency seriation of small vessel samples is extremely susceptible to error, I did not model this possibility in the village-level analysis.

Two AMS dates were obtained from a carbonized textile mat recovered from a semi-subterranean lodge (Feature 168) at Alexandra (Tables 4.1 and 4.5). These two dates calibrated to A.D. 1410 (1315-1440, 95% C.I.) and A.D. 1420 (1405-1438, 95% C.I.), and are consistent with the late Middle Iroquoian estimate provided by Archaeological Services, Inc. (Robertson and Williamson 2008).

**Initial Late Ontario Iroquoian Settlements**

**Grandview (AlGr-59), ca. A.D. 1400-1450**

The Grandview site was an approximately 1 ha initial Late Ontario Iroquoian village consisting of 12 longhouses, three middens, and 12 outdoor activity areas (Williamson, et al. 2003). Grandview was located near present-day Taunton, in the City of Oshawa, Ontario, and was situated on loamy soils in the South Slope physiographic region within view of Lake Ontario to the south. The unpalisaded settlement had been constructed on gently sloping land bounded immediately on the west by the Harmony Creek break-in-slope and on the north by a shallow
swale (Williamson et al. 2003). Extensive salvage excavations at Grandview were conducted by Archaeological Services Inc. in 1993 (Williamson et al. 2003). Original CAD files of the settlement plans were kindly provided for the present study by R. Williamson and D. Robertson of Archaeological Services Inc. The Grandview longhouses ranged from 8 to 49m in length, and 6.6 to 8.6m in width, and most were oriented in generally southwest-northeast or east-west alignments. House 4 was found to superimpose and post-date House 2, and many of the other structures had experienced contraction/extension events, indicating that the occupation history of the site involved several building phases (Williamson et al. 2003). Three parallel, closely spaced houses (Houses 9-11) were set somewhat apart east of the primary village cluster, and were oriented differently than the other houses. The controlled surface survey conducted in advance of the excavation had produced a much lower density of artifacts in the area of Houses 9-11. This evidence suggests that these houses joined the village after its initial founding (in the western core area). In their analysis of the settlement pattern, Williamson et al. (2003: 8) identified three probable occupation phases for Grandview which are adopted in this study (Figure 4.16):

Phase 1: Houses 1, 2, 6, 12
Phase 2: Houses 3-5, 7, 8
Phase 3: Houses 3-5, 7-11

Evidence from the ceramic assemblages of these houses suggests that there was no significant hiatus between building phases and indicates that the “span of occupancy fell largely within the early Late Iroquoian period (ca. A.D. 1400-1450), but may have begun in the late fourteenth century (Williamson et al. 2003: 8).” No radiocarbon dates are reported for Grandview.
Figure 4.16a. Plan map of the Grandview site (redrawn from CAD file provided by Archaeological Services, Inc.). Contour interval is 1m (ASL).

Figure 4.16b. Occupation Phases 1 (left) and 2 (right) at the Grandview site.
Baker (AkGu-15), ca. A.D. 1425-1450

The Baker site was an approximately 1ha unpalisaded initial Late Ontario Iroquoian village located in the present-day City of Vaughan, York Region, Ontario (Robertson 2006). The settlement was situated on a southwest facing slope overlooking a series of small tributaries of the East Don River. Four aligned longhouses oriented southwest-northeast, three middens, and two outdoor activity areas were uncovered in extensive salvage excavations conducted by Archaeological Services Inc. in 2000 (Robertson 2006). The houses ranged in maximum length from approximately 20 to 89m, and in width from 7.2 to 8.2m. None of the four major longhouses overlapped, but they all showed evidence for repositioning, remodelling, and extension/contraction activities (Figure 4.17). House 1, the longest house, saw a significant 12m extension to the north. Houses 2 and 3 had experienced wall remodelling/reconstruction, and House 4 was constructed twice. It is uncertain which structure came first. House 4a was probably originally 33m in length, but was extended at some point by 12.6m. House 4b was smaller (20m), and overlapped the north end of House 4a (Figure 4.17). Accordingly two occupation configurations were modelled for Baker. With no implication of chronological order, Phase 1 consisted of Houses 1, 2, 3, and 4b, and Phase 2 consisted of Houses 1, 2, 3, and 4a (Figure 4.17).

No radiocarbon dates are available for the Baker site. However, the predominance of Black Necked, Pound Necked, Huron and Lawson Incised ceramic vessel types (along with several Lalonde High Collar vessels) at the site indicate an early-mid 15th century date for the village.
**Figure 4.17a.** Plan map of the Baker site (redrawn from Robertson [ed.] 2006). Contour interval is 0.5m (ASL).

**Figure 4.17b.** Occupation Phases 1 (left), and 2 (right), at the Baker site.
Berkholder 2 (AlGt-35), ca. A.D. 1425-1445

The Berkholder 2 site was a small (0.7 ha) unpalisaded initial Late Ontario Iroquoian village located in present-day Markham Township, York Region, Ontario (Robertson 2005). The entire settlement was excavated in 2003 in a salvage operation under the project management of R. Williamson of Archaeological Services Inc (Robertson 2005). Original CAD files of the settlement plans were provided by R. Williamson and D. Robertson for the present project. The village, which consisted of an aligned cluster of four longhouses, was situated on a rise between two tributaries of the Rouge River located to its east and west. The Berkholder longhouses ranged in maximum length from approximately 32 to 52m and in width from 7 to 7.5m, and were aligned in a broadly east-west orientation. There was no evidence to indicate that the four longhouses were not occupied simultaneously (Robertson 2005), and so they were modeled as such in the village-level analysis (Figure 4.18).

Based on the ceramic vessel assemblage, ASI estimated that Berkholder 2 was occupied in the late 14th or early 15th centuries (Robertson 2005: 23). Two direct AMS dates on maize (X14002) and nut shell (X14001A) were obtained by the author (Table 4.1). These were calibrated to A.D. 1425 (1329-1449, 95% C.I.) and A.D. 1445 (1418-1615, 95% C.I.), respectively. These two dates generally support the estimate made by ASI, and indicate an occupation of the Berkholder 2 village between A.D. 1425 and 1445.

Figure 4.18. Plan map of the Berkholder 2 site (redrawn from CAD files provided by Archaeological Services, Inc.). Contour interval is 0.5m (ASL).
Carson (BcGw-9), ca. A.D. 1445

The Carson site was a 2.1 ha unpalisaded initial Late Ontario Iroquoian village consisting of eight longhouses and six middens located at the top of an ancient beach ridge in present-day Vespra Township, Simcoe County, Ontario. The site was salvage excavated in 1988 and 1989, producing a very large artifact assemblage (>30,000 artifacts including 487 ceramic vessels) (Varley 1993). The Carson settlement was arranged in three clusters of similarly oriented longhouses, ranging from 50 to 75 meters in length (Figure 4.19). Carson is noteworthy for representing what has been termed the “Lalonde” focus of the Late Ontario Iroquoian sequence (Varley 1993), based on the prevalence of the Lalonde High Collar and Black Necked pottery types. Detailed plans of the Carson longhouse interiors were not available to the author at the time of analysis, so the Carson village was only included in the village-level spatial analysis. The apparently planned layout of houses and lack of structure overlaps at Carson supports an interpretation of contemporaneity for the longhouses. A single AMS date from Carson calibrates to A.D. 1445 (1419-1480, 95% C.I. [see Table 4.1]), and is consistent with expectations for Lalonde components.

Figure 4.19. Plan map of the Carson site (redrawn from Varley 1993).
Hubbert (BbGw-9), ca. A.D. 1425-1475

The Hubbert site was a 1 ha initial Late Ontario Iroquoian village located on the eastern edge of the Innisfil upland in southern Simcoe County, overlooking the Lover’s Creek river valley (MacDonald and Williamson 2001). The site was situated only one kilometre south of the mid-14th century Wiacek site (see above), and was bounded on the south by a ravine associated with a tributary of Lover’s Creek. Archaeological Services Inc. conducted salvage excavations at the Hubbert site in 1990, completely exposing two longhouses and the edge of a third house. Approximately 1/3 of the site was excavated, so the entire settlement configuration is as yet unknown. The two fully excavated houses ranged from about 16 to 36m in length, and from 7.1 to 7.4m in width. A distinctive aspect of the village was the high density of semi-subterranean lodges: 17 were uncovered in association with the three houses (MacDonald and Williamson 2001). Because the complete settlement pattern has not been exposed, the site could not be included in the village-level analysis. However, the two fully excavated houses were included in the house-level sample in Chapter 7.

Based largely on the ceramic vessel assemblage, MacDonald and Williamson (2001) assigned a mid to late 15th century date to the settlement. A single radiocarbon date calibrates to A.D. 1334, 1410 (AD 1280-1464, 95% C.I. [Table 4.1]). Given the nature of the artifact assemblage, the later intercept, A.D. 1410, is much more likely.

Dunsmore (BcGw-10), ca. A.D. 1450

The Dunsmore site was a 2ha initial Late Iroquoian village situated on a level promontory overlooking a tributary of Willow Creek, about 4.5km northwest of Kempenfelt Bay, in Vespra Township, southern Simcoe County (Robertson and Williamson 2003). Limited midden excavations at the Dunsmore site were conducted by F. Ridley in 1968, and by J. Hunter in 1977. A large portion of the site was subsequently excavated in a salvage operation by Archaeological Services Inc. in 1989 and 1990 (Robertson and Williamson 2003). These excavations exposed an area of approximately 1.45 ha leading to the identification of 16 structures, three middens, and several fence-like structures, but no evidence of a palisade (Robertson and Williamson 2003). The Dunsmore longhouses, ranging from 11.5 to 54m in maximum length, and from 6 to 7.8m in width, were widely spaced and exhibited a variety of orientations. Not all houses showed evidence for long-term or intensive interior activities, suggesting that some of the structures were used only during the warm-season, while others were associated with a year-round, semi-
permanent village occupation. Also, a number of smaller “houses” were unusually narrow (<6m wide), and lacked evidence for ordinary indoor domestic activities and spatial organization (e.g., Houses 2, 5, and 16 [Robertson and Williamson 2003]), while one unusually wide rectilinear structure (House 12) exhibited similarities to another unusual “house” at the Copeland site that may have had public/ceremonial rather than domestic uses (Robertson and Williamson 2003). A significant portion of the settlement plan was not exposed, and so it was not possible to include this site in the village-level spatial analysis. Also, only semi-permanent residential longhouses were included in the house-level analysis, since the purpose of that study was to document patterns in domestic architecture in particular.

The ceramic seriation of the Dunsmore vessel assemblage indicated a mid to late 15th century occupation. A single acceptable radiocarbon date on maize was calibrated to A.D. 1445 (1333-1642, 95% C.I. [Table 4.1]) and is compatible with the artifactual evidence (Robertson and Williamson 2003).

**Draper (AIGt-2), ca. A.D. 1450-1500**

The Draper site included a 3.4 ha Late Iroquoian village and a smaller outlying settlement that were both entirely excavated in salvage operations conducted by the University of Western Ontario in 1975 and 1978 under the direction of Finlayson (1985). The site was located on the west bank of West Duffin’s Creek in Pickering Township, Durham Region, Ontario, about 35 km northeast of Toronto. The villages occupied a relatively level area bounded on the north and east sides by a steep break-in-slope associated with the adjacent creek. A swale cut into the main village from the east, forming a partial division between the northern two-thirds and southern third of the settlement. The site included three distinct components: a major fortified town consisting of 38 longhouses, a smaller unpalisaded settlement of 6 longhouses located south of the main village (the “South Field”), and the isolated House 42 located outside and some 80m west of the main village palisade (Finlayson 1985). The Draper main village and the South Field village were treated as separate settlements in this study, both because of their physical separation and because they were judged to be non-contemporaneous by Finlayson (1985).

The main village showed evidence for a series of 5 major expansion events from an original core village. Each expansion involved extension of the palisade to incorporate new longhouses which were usually arranged in aligned or radial clusters (Figure 4.22). Finlayson details the occupation history of the main village in his major report on the Draper settlement.
patterns (1985). In the village-level analysis of the present study, I follow Finlayson in defining the following phases of growth (Figure 4.22) and the South Field village (Figure 4.23):

Phase A/Core Village: Houses 4, 6, 9-11, 12, 29
Phase B/Expansion 1: Houses 1, 4, 6, 9-12, 15, 23, 24, 29
Phase C/Expansion 2: Houses 1, 3, 4, 6-12, 15, 23-25, 29, 30, 38, 41
Phase D/Expansion 3: Houses 1-15, 17, 23-25, 26, 27, 29-31, 38, 41
Phase E/Expansion 4: Houses 1-21, 23-27, 29-31, 38, 41
Phase F/Expansion 5: Houses 1-21, 24-27, 28, 29, 31, 32, 34, 35, 38, 41, 43, 45
South Field: Houses 33, 36, 37, 39, 40, 44/47

The exact timing of the main village expansions is uncertain, but has been estimated by Warrick (1988; 2008) as having occurred between A.D. 1470 and 1500, and by Poulton (1979) and Timmins (1981) as involving the sequential coalescence of the nearby Pugh, Robin Hood, White, and Carruthers villages. Warrick also dates the South Field to ca. A.D. 1500, and sees it as the successor of the nearby Best village (Poulton 1979; Timmins 1981; Warrick 2008). The radiocarbon dates from the Draper site were found to range widely. However, three acceptable dates calibrate to A.D. 1430 (1296-1618, 95% C.I.), 1445 (1318-1648, 95% C.I.), and 1455 (1420-1640, 95% C.I.) (Table 4.1). These dates are somewhat earlier than Warrick’s estimates. Nonetheless, a mid-15th century date for Draper is plausible. More extensive AMS dating is needed to refine local chronologies currently based heavily on ceramic seriations.
Figure 4.22a. Plan map of the Draper site (redrawn from Finlayson 1985). Contour interval is 2ft.
Figure 4.22b. Draper Occupation Phases A-B (above left and right), and C-D (below left and right).
Figure 4.22c. Draper Phases E (left) and F (right).

Figure 4.23. Plan of the Draper South Field village.
CHAPTER 5
THE METRICS OF VILLAGE GROWTH

Introduction

The following two chapters deal with the changing nature of Iroquoian village spatial organization from the perspective of the exterior space system formed by the built environment of settlements. The large sample of settlements (20 sites, with 43 modeled occupation configurations) in this study precludes a detailed discussion of each site in the present work. Rather, my interest here is to summarize the broad trends that are evident in the development of village life between the tenth and the late fifteenth centuries A.D. Although the aim is one of pattern recognition and generalization, the theme that emerges is equally of the immense diversity present in village scale, density, form and configuration, even within small temporal and spatial distances.

This chapter is concerned with what might be termed “traditional” metrics of village structure, while Chapter 6 employs innovative techniques of visibility graph analysis and measures of spatial network topology that can be considered part of the space syntax family. By traditional metrics, I am referring to a Euclidean approach to space in which village elements are described using metric variables of length, area and angle. A chapter division between metric and relational approaches is logical since the methods and aims of each are distinct, but it is also practical because making sense of the relational measures presented in Chapter 6 depends strongly on an understanding of the metric measures presented here. This is the case both because the relational measures of space syntax are inherently sensitive to system scale (in spite of efforts to normalize them), and because architectural arrangements were different in systems of varying size and density. So the primary aim of this chapter is to provide a metric foundation from which space syntax variables can be calibrated, and a basic outline of village growth and reorganization that can be linked theoretically to the changing experience and use of space explored in Chapter 6.

In Iroquoian archaeology, there are three broad research topics in which intrasite settlement data have figured prominently: (1) site occupation history, (2) demography, and (3) socio-political organization. In addition to gestalt typologies of village form (Warrick 1984), these studies have depended on traditional metrics of settlement scale, feature and structure density, and longhouse orientation (Wright 1974; Dodd 1984; Finlayson 1985).
Perhaps the most successful of these research areas has been in the assessment of settlement architectural history and occupation duration (e.g., Finlayson 1985; Timmins 1997; Warrick 1988). Techniques developed to answer these questions have produced strong and sometimes surprising results, and have impressed on field archaeologists the need to consider the complexities of village life-histories (see Chapter 4).

Once models of synchronous village occupations have been established (or even when they have not), Iroquoian archaeologists have focused on measurements of settlement scale and density, usually as proxies for population characteristics. Warrick (2008) has successfully used this approach to develop a detailed population history of the Huron-Petun and their ancestors in south-central Ontario. His demographic research is based on the extrapolation of hearth densities from excavated village sites to unexcavated sites of estimated area to infer the size and growth rates of regional populations. Warrick’s work has revealed important changes in Ontario Iroquoian population history, including a veritable population explosion in the “Middleport sub-stage” (ca. A.D. 1330-1420) fuelled by a growth rate of 1% per annum (2008: 181). However, Warrick’s estimates are founded on density assumptions that likely require adjustment, based on the results of the present study.

Finally, the layout and orientation of houses has sometimes provoked hypotheses about kinship, the origin of the clan system, warfare and defence, population relocations, and prevailing wind direction (Birch 2008; Dodd 1984; Warrick 1984). Prominent among these is the notion that clusters of parallel houses represent the localization of clans or clan segments (Warrick 1984; Snow 1994; Tuck 1971). Such a claim is obviously difficult to test, and has not received any particular support from studies of longhouse construction or artifact content within and between house clusters (Dodd 1984; Martelle 2002). As Birch has recently pointed out, this theory has been used interchangeably with the idea that house clusters represent former village groups that had fused to form new, larger settlements (Birch 2008: 202). Little attention has been given to the potential conflict between these hypotheses. For instance, Warrick infers the emergence of “clan barrios” from the groups of longhouses with distinct orientations at the Uren site (2000: 150), but follows Finlayson (1985) in interpreting house clusters at Draper as evidence that it was formed by the accretion of previously independent villages (involving the Pugh, Robin Hood, White, Caruthers, and Best villages [1988; 2008]). This interpretation of Draper seems quite well founded, given the staged timing and scale of house cluster additions at Draper relative to the abandonment of the neighbouring sites. However, the same cannot be said for the inference of clan barrios at Uren. On top of this, modal house orientations for sites have
been used to infer a functional concern for retaining indoor heat during winter storms, in spite of the fact that most sites show major deviations around modal orientations (Dodd 1984; this Chapter).

Particularly problematic, from my perspective, is the fact that the clan segment hypothesis lacks any distinct connection to the experienced and affective qualities of the space that resulted from the formation of house “clusters”. For instance, if aligned and radially-clustered houses were arranged so as to form segregated clan barrios, why do separate orientation clusters frequently face a shared open space, or plaza, while the two end doors of a longhouse open onto different plazas (consider for instance, the Nodwell configuration)? While there might be an adequate explanation for these patterns within the clan-segment hypothesis, the point here is that the links between formal descriptions of village spatial organization and theories of how space might have been used and experienced in practice have not been drawn in Iroquoian archaeology. Likewise, house and village scale have not been systematically related to reliable metrics of house spacing and orientation patterns.

The goal of this chapter is therefore to provide a more secure understanding of the relationships among measures of village scale, density, and house angular arrangement than has previously been available for the study region, and to provide the scalar foundation needed for the analysis of settlement configuration in the following chapter. My approach depends on the use of completely or near-completely excavated sites and, to the extent possible, the careful modeling of occupation phases (see Chapter 4). Moreover, the treatment of various measurements of scale (e.g., hearth number, house area, surface scatter area, palisaded area) as equally consistent indicators of population size has been convenient when excavation data are lacking (Warrick 2008), but likely masks important changes in their relative values (i.e., in hearth, house, or artifact density) through time and space. It was important, then, that distinct measures of scale be treated independently, and the nature of their relationships tested rather than assumed.

Research Problem

As detailed in Chapter 3, four broad processes were involved in the emergence and development of the Iroquoian village in southern Ontario: sedentarization, increased reliance on maize agriculture, population growth, and settlement nucleation. At the centre of this development was settlement growth. This growth involved both endogenous demographic increases and the nucleation of houses and communities. Following Fletcher (1995), settlement
growth, particularly in a context of increasing sedentism and reliance on an agricultural staple, is expected to have produced scale and density-related interaction and communication stress within growing communities. Our interest here, then, is to plot when and how growth was experienced within and across settlements, and to begin to isolate how the organization of settlement space might have been altered, either in order to reduce or mitigate social interaction stress, or simply in relation to it.

The questions addressed in this section can be grouped as follows:

A) Questions about settlement scale, density and longhouse spacing:

1. How did settlements vary with respect to house size, total roofed area, and village area (measured in a number of ways)?
2. How did variation in village scale change over time?
3. Did villages grow primarily by adding new structures or by increasing the size of existing structures, or both? How did these patterns vary through time and space?
4. Was the characteristic density of roofed space variable over time and between site size categories?

B) Questions about longhouse orientation:

1. How did villages vary with respect to the orientation of longhouses?
2. Where settlement size or density was relatively high, were there distinct changes in layout with respect to the angular variation of houses?
3. Were changes in longhouse nearest-neighbour distance and angular clustering related?

Methods

Variables

Village scale can be measured from a number of different perspectives, including the estimated or actual number of indoor hearths (Warrick 2008), number of contemporaneous houses, total area of roofed space, area circumscribed by a palisade, area of a standard buffer zone around all architectural elements and exterior features, and area of the convex hull of
architectural elements. Although these different measures of scale have often been assumed to be directly correlated, their relationships may differ significantly among individual settlements, local and regional populations, and over time.

Two different methods for measuring settlement area were employed here. Controlled surface collection of artifacts was not consistently conducted or reported for all of the sites in the sample, so this was not a viable option for determining site area. Also, a number of cases indicate that surface artifact scatters may be poor indicators of below-ground feature distributions in Iroquoian villages (e.g., at the Grandview site [Williamson, et al. 2003]). For palisaded sites, the inner palisade area provides a convenient “culturally defined” boundary of settlement. However, this measure cannot be applied to sites lacking a palisade, and does not take into account potential structures or activities beyond the palisade. Unpalisaded sites can be assigned a boundary using a standard buffer zone around architectural elements, and occasionally by a break in slope or other significant topographical boundary. Here, a 20m convex buffer zone around architectural elements was found to encompass minimally all exterior features and middens, and so was adopted as a rule for boundary determination. “Estimated settlement area” is the term used throughout the rest of this chapter to refer to site areas determined in this way.

Producing a boundary that was close to representing a distinct sphere of cultural activity was important to the application of space syntax methods (particularly of Visibility Graph Analysis), discussed in the next chapter. However, for a strictly comparable approach to measuring settlement scale and density, a more direct technique was needed. The solution employed here was to measure the convex hull of the built structures in a settlement. The convex hull is the smallest convex polygon that can be drawn around a series of objects in a plane (here, longhouses) (Cormen et al. 2001: 947-957). While this metric does not consider the spread of activities beyond the architecture, it is unambiguous and can be applied to palisaded and unpalisaded settlements equally, providing a precise foundation for comparisons of roofed-area density. Ultimately, both the estimated settlement area and convex hull approaches produced directly correlated results. The $r^2$ value of the linear regression of estimated settlement area vs. convex hull area for the settlement sample was 0.91.

Hearth number was not used as a measure of settlement scale, since the sample was found to contain major inconsistencies in the recovery of hearth features (see Chapter 7). Most noteworthy is the fact that hearth identification was very poor for many of the sites that were
excavated in a salvage context. It would appear that deep ploughing or the characteristic practice of grade-all stripping is responsible for obliterating evidence for hearths from many sites.

**Total Roofed Area (m\(^2\))**

The total roofed area of each settlement was calculated simply by taking the sum of the areas of all built structures, including both longhouses and any “special purpose” structures.

**Mean House Area (m\(^2\))**

The average area of a longhouse for a settlement.

**Roofed Area Density**

The ratio of roofed area to the convex hull area of a settlement.

**Mean Nearest Neighbour Distance (m)**

The average distance between nearest neighbouring longhouses, measured from house centre to house centre, for a settlement.

**Longhouse Angular Variance and Standard Deviation**

The variance and standard deviation about a mean angle (as well as the mean angle itself) cannot be calculated in the normal manner applied to linear variables. The circular nature of the angular scale means, for instance, that 359° and 0° are only 1 degree apart. A special branch of circular or directional statistics has been developed to deal with this kind of data. Measures of angular standard deviation and variance that are directly analogous to the linear concepts were applied to measurements of house angular orientations for each settlement using the Oriana program. Descriptions of the formulae used can be found in Fisher (1993: 30-35), and Mardia and Jupp (2000: 15-20).

**Longhouse Angular Dispersion Index (Rayleigh’s Z)**

Lord Rayleigh’s test is a well-known test of the uniformity of a sample of directional data (Mardia and Jupp 2000: 94). Rayleigh’s Z measures a sample against a uniform circular distribution (the von Mises model). In such a model, all angles are equally likely to occur (the population has no tendency to cluster around a particular value). Higher Z values indicate that the sample is directionally biased (i.e., diverges from a uniform circular distribution). In applying the Rayleigh statistic to the distribution of house angles at a site, it is important to keep several things in mind. Low sample size (i.e., house number) will produce lower Z values even if directional bias is in fact present. Also, Rayleigh’s Z may be low if more than one modal orientation is present in the sample. For instance, houses may fall into a series of distinct clusters of parallel groups, each of which faces a different direction (e.g., at Uren and Draper).
Rayleigh’s Z may be low for such sites even though directional bias is present for each group of houses. More detailed discussions of Rayleigh’s statistic can be found in (Mardia and Jupp 2000: 94). Rayleigh’s Z was applied here using the Oriana program.

**Longhouse Angular Clustering Index (Rao’s U)**

Rao’s U statistic also tests the uniformity of a sample of directional data. Unlike Rayleigh’s Z, however, it is not confounded by multimodal angular distributions since it measures the degree to which sample measurements tend to cluster based on the assumption that they should be evenly spaced if no bias is present (Mardia and Jupp 2000: 108; Rao and SenGupta 2001). Thus, Rao’s U will be high when all houses are parallel (e.g., at the Baker site), and where multiple clusters of similarly angled houses are present (e.g., at the Uren site). On the other hand, Rao’s U may be relatively low where angular bias exists but each house is more evenly spaced on the angular scale (e.g., at Alexandra). Thus, “fan-shaped” house distributions may have a relatively low Rao’s U but a high Rayleigh’s Z. Detailed discussions of Rao’s spacing test can be found in Rao and SenGupta (2001). Rao’s U was applied in the present study using the Oriana program.

**Results - Settlement Scale, Density, and Longhouse Spacing**

Table 5.0 provides summary statistics on aspects of longhouse and settlement scale, categorized by culture-historic stage.

**Settlement Area**

Mean convex hull area for the Early Iroquoian sample was just 0.11 ha, while the maximum was near 0.2 ha. These Early Iroquoian settlements were quite small and compact from the perspective of the following period. Middle Iroquoian components were on average about six times larger in convex hull area (0.67 ha), with a minimum area greater than the Early Iroquoian maximum (at 0.29 ha), and a maximum of 1.74 ha. Mean initial Late Iroquoian components were a little larger still on average (at 1.0 ha), a value that is skewed high by the unusually large mid to late 15th century Draper phases. Meanwhile, the smallest initial Late Iroquoian settlement remained quite small, at just 0.15 ha, indicating that it is principally the high end of the site size distribution that increased between the Middle Iroquoian and initial Late Iroquoian. This pattern is consistent with the appearance of coalescent towns of much larger size than most of their local contemporaries at this time (e.g., Draper and Parsons).
While the convex hull area has obvious benefits for consistency and comparability of measurement between fully excavated sites, it is not easily compared to estimates of settlement area based on defining an artifact and feature-rich activity zone including and surrounding the built environment (e.g., as delineated by surface or test-pit artifact densities). A 20m activity buffer-zone approach was used to define estimated settlement areas (see methods, above) that are comparable to those typically reported in excavation reports and other summaries of Ontario Iroquoian prehistory.

By this criterion, average Early Iroquoian villages were 0.22 ha in area (with a range from 0.16 – 0.32 ha), Middle Iroquoian villages were about 5.5 times larger, at 1.2 ha, ranging from 0.5 – 3.0 ha, while initial Late Iroquoian villages averaged about 1.6 ha, ranging from 0.53 – 3.3 ha. This pattern indicates that, in the period between about A.D. 1250 and 1350, villages grew extremely rapidly, with many of the smallest villages almost double the area of the largest only a few decades earlier. Growth in average settlement area in the 15th century was comparatively moderate, but occurred in a less uniform process than it had in the past. Most villages remained within the size range typical of the 14th century. But, by the mid-to late 1400s, a few villages experienced exceptional growth, likely due to the coalescence of several distinct local villages.

Given that the present sample consists only of completely excavated sites, it is important to consider that these numbers may be unintentionally biased by the conditions that lead excavators to conduct a full excavation. For instance, given the resources needed to excavate very large Iroquoian sites, it is possible that the sample is biased in favour of smaller than average settlements. In order to assess this question, we can compare the present dataset to the much larger one compiled by Warrick in his demographic research (2008). Since most of Warrick’s sites were not excavated, it is likely that his sample does not suffer as strongly from size selection bias (although it may be biased in favour of large sites since they are more likely to be found during survey or accidentally). In general, Warrick’s numbers compare well with those in this study (see Table 5.1, below). However, while his Middle Iroquoian and Late Precontact mean site areas are quite close to those of my own sample, his average Early Iroquoian village is considerably larger (0.46 ha) than my maximum value (0.32 ha). This might indicate a size-bias toward small Early Iroquoian sites in the present sample. On the other hand, given that size-bias based on economic constraints should be higher for periods with larger sites, and given the very small scale of Early Iroquoian sites, it seems more likely that there is another cause for the discrepancy. For instance, rounding-up of estimated settlement areas will have a
disproportionate effect on values for small sites. Another cause might relate to site-formation processes. Early Iroquoian sites frequently involved multiple occupation or construction phases. As a result, site areas based on test-pitting or limited excavations are likely to overestimate the area of the site occupied at any one time. By contrast, the present study limited settlement area measurements to synchronic occupation phases. For example, the Early Iroquoian Calvert and Elliott sites consisted of two or three discrete but superimposed occupations that produced a palimpsest of significantly larger area than any individual occupation phase.

The sample of completely excavated settlements used here, then, compares favourably with the much larger body of existing data on Iroquoian site size, especially for the period from A.D. 1280 to 1500. The six-fold increase in site area between the Early and Middle Iroquoian samples might indicate a period of rapid population growth, or of the fusion of local clusters of small Early Iroquoian hamlets into significantly larger late 13th-century villages (e.g., Pearce 1984).

**House Size and Number**

To what extent was such growth in settlement area the result of increases in longhouse size vs. increases in the number of houses that constituted a village? Dodd’s pioneering study of Ontario Iroquoian longhouses has demonstrated that longhouses grew very rapidly between the middle and late 13th century, reaching their zenith in the mid-15th century (1984), before returning to the Early Iroquoian average in the contact period. Her sample was very large (417 longhouses), but a majority of these (314) post-dated A.D. 1450. Just 41 houses in her sample were derived from Middle Iroquoian sites. By contrast, not re-counting houses that span occupation phases, the number of houses in the pre-A.D. 1450 sample analyzed here is 260, 128 of which are from Middle Iroquoian settlements. This sample also has the benefit of being drawn from completely excavated villages, permitting us to explore the scaling relationships between village and house size, as well as intrasite variability in house dimensions.

Surprisingly, none of the growth in village area between the Early and Middle Iroquoian samples can be attributed to increases in the average number of houses in a village. Mean house number was about 7 for both periods (Table 5.0). By contrast, mean house area jumped from 79m² in Early Iroquoian villages, to 283m² in Middle Iroquoian, and 305m² in Late Iroquoian villages (Figure 5.0). Mean total roofed area appears to have been directly determined by this increase in house area for the Early Iroquoian to Middle Iroquoian transition, going from 472m² in the former, to 1852m² in the latter period (a four-fold increase). Total roofed area continued
to increase in the 15th century (for an average of 3840m²). This doubling of total roofed area from the preceding period involved both a moderate increase in average house area, and an increase in mean house number (to 12.4 houses).

Ontario Iroquoian villages therefore grew dramatically from the perspective of both estimated settlement area and total roofed area between A.D. 1250 and 1500. However, before the 15th century, this growth was almost totally due to increases in longhouse size, with houses reaching greater than 90m in length in some cases (e.g., at Crawford Lake). This growth in house size also occurred extremely rapidly, as houses of extreme length date as early as the late 13th century (e.g., Myers Road). In the early decades of the 15th century, growth in house area continued, but the major increase in mean total roofed area that occurred in the initial Late Iroquoian period was primarily driven by increases in house number at exceptionally large coalescent villages such as Draper. The disjunction between the dimensions of settlement growth before and after the Middle to Late Iroquoian transition is striking, and indicates that different social dynamics were at play in processes of settlement growth during these two periods.

Settlement Density

Studies of hearth density (Warrick 2008) and roofed-area density (Hatch and Bondar 2001) in Ontario Iroquoian villages have appeared to demonstrate surprisingly consistent values across site size classes from the Early Iroquoian to the Contact Period. For instance, Warrick calculated a relatively stable value of 50 ± 6 hearths/ha for Precontact Iroquoian villages in southern Ontario (2008). He applied this standard hearth density to unexcavated sites in order to estimate hearth numbers, and, by extrapolation, settlement populations. In a similar vein, Hatch and Bondar regressed roofed area against site area for a sample of excavated palisaded Iroquoian village sites, and found a strong linear relationship for Precontact settlements, suggesting that roofed-area density was consistent from small Early Iroquoian hamlets to large Late Iroquoian towns. Using Naroll’s (1962) argument for a constant relationship between settlement roofed area and resident population, these researchers sought to provide a foundation for estimating settlement population from site area.

In contrast, this study reveals a strong and statistically significant decrease in settlement roofed-area density during the Middle Iroquoian period, followed by a return to Early Iroquoian
### Table 5.0
Summary of village and house scale-related variables for Early, Middle and Initial Late Iroquoian settlement samples.

<table>
<thead>
<tr>
<th>Variables by Stage</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>SE</th>
<th>Min</th>
<th>Max</th>
<th>Range</th>
<th>ANOVA</th>
<th>F</th>
<th>p-value</th>
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<td>EOI</td>
<td>13</td>
<td>7.1</td>
<td>3.9</td>
<td>1.1</td>
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<td>14</td>
<td>11</td>
<td>2.7</td>
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<td>11</td>
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Table 5.1. Site area statistics (ha) for south-central Ontario (adapted from Warrick 2008: 125).
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Table 5.2. Summary of roofed-area density and longhouse orientation and spacing variables for Early, Middle and Initial Late Iroquoian settlement samples.
levels in the initial Late Iroquoian. Mean Early and initial Late Iroquoian roofed-area density (total roofed area/convex hull area) was 0.47 (± 0.12), and 0.40 (± 0.07), respectively, but only 0.32 (± 0.12) for Middle Iroquoian settlements (Table 5.2, Figure 5.1). Average nearest-neighbour distance between houses also reflects this pattern, rising from 12 (± 3) m in Early Iroquoian settlements to 26 (± 8) m in Middle Iroquoian, and back down to 19 (± 5) m in initial Late Iroquoian settlements (Table 5.2), indicating that houses were significantly more widely spaced in Middle Iroquoian times.

The relationship between settlement size and roofed area is even more complex than initially indicated by these period averages. The scatterplot of settlement convex hull area by total roofed area is revealing in this respect (Figure 5.2a-b). It is immediately apparent that there is a broadly linear scaling relationship between the two variables ($r^2 = 0.65$, p<0.001). But it is also evident that there is a marked bifurcation in the scatter. The residuals plot of the regression confirms the existence of two distinct curves (Figures 5.3 and 5.4).

Figure 5.0. Plot of settlement mean house area over time. Horizontal error bars represent uncertainty of date estimate based on $^{14}$C 68% C.I. or ceramic estimate (see Chapter 4). Vertical error bars represent standard deviation in house area at each settlement. Note the beginnings of longhouse expansion in the early 13th century, followed by a rapid increase in average area in the late 13th century.
Figure 5.1. Mean settlement roofed-area density by culture-historic stage (with standard error bars). Note the statistically significant reduction in roofed area density in the Middle Iroquoian sample (p<0.01).

Figure 5.2a. Scatterplot of settlement area vs. settlement roofed area, grouped by stage (Early Iroquoian $r^2 = 0.60$, Middle Iroquoian $r^2 = 0.68$, Initial Late Iroquoian $r^2 = 0.98$).
Figure 5.2b. Scatterplot of settlement area vs. settlement roofed area for sites under 2 ha, grouped by stage.

Figure 5.3. Residuals of the roofed area vs. settlement area regression plotted against settlement roofed area, grouped by stage. Positive residuals represent relatively densely-built settlements. Note the bifurcation of the scatter in settlements of between 1000 and 4000 m² in roofed area. The particularly low-density Middle Iroquoian settlements include Alexandra, Robb and Holly.
Figure 5.4. Residuals of the roofed area vs. settlement area regression plotted against settlement roofed area, as in Figure 5.3, grouped by settlement boundary type. Note that palisaded settlements were normally more densely built than unpalisaded sites. The single low-density palisaded settlement is the Middle Iroquoian Myers Road Phase 3 settlement.

Figure 5.5. Settlement roofed-area density by settlement boundary. Note the statistically significantly lower roofed area density of settlements with no palisade (p<0.0001).
By coding the scatterplot points according to site boundary class (Figure 5.4), it is clear that palisaded sites (black circles) tended to occur at or above the regression line, while unpalisaded sites (grey triangles) were frequently negative residuals. Thus, Middle Iroquoian villages were typically less densely built than those of earlier and later stages, and were more frequently unpalisaded. Palisaded villages were statistically significantly more densely built than unpalisaded villages (at 0.47 and 0.31, respectively; see Figure 5.5, p < 0.0001).

There is evidence to suggest that these Middle Iroquoian villages were not simply less densely built on average as a by-product of having been more frequently unpalisaded. For instance, unpalisaded villages in the Early and Initial Late Iroquoian periods were slightly less densely built than their contemporaries, but nevertheless were not strongly negative residuals in the plots in Figures 5.4 and 5.5. The most negative residuals in these plots are represented by the Middle Iroquoian Alexandra and Robb sites. Both of these were large in terms of total roofed area by Middle Iroquoian standards, indicating that a relationship of diminishing returns may have existed between settlement area and roofed area for Middle Iroquoian settlements. The recent excavation of an extremely low-density Middle Iroquoian village (the Tillsonburg site [Timmins 2009]) lends strength to this inference, and suggests that, as many Middle Iroquoian villages grew in total roofed area, they tended to be less densely built (see Figure 5.6).

When settlement roofed area density is regressed against total roofed area, we find that the relationship is linear and positive for Early Iroquoian (Figure 5.7), but nonexistent for the low-density Middle Iroquoian group (Figure 5.8), and strongly positive for the high-density initial Late Iroquoian group (Figure 5.9). This indicates that the relationship between village roofed area and density was unique for Middle Iroquoian villages. In the Early and initial Late Iroquoian periods, by contrast, the largest villages were also the most densely built.

This unique relationship between settlement density and growth for most Middle Iroquoian settlements does not accord with existing assumptions about consistent intrasite population densities across Iroquoian prehistory. For instance, it is curious that Warrick did not document a corresponding decrease in Middle Iroquoian hearth densities, given that houses at this time were more widely spaced. One possible explanation might be that hearth density increased within Middle Iroquoian houses, balancing the decrease in roofed density during the period. However, studies of hearth spacing in fact suggest just the opposite, that large Middle Iroquoian houses typically had more widely spaced hearths than those of other periods (Dodd 1984, Chapter 7). It seems more likely that Warrick’s method of estimating total settlement
Figure 5.6. Scatterplot of settlement area vs. settlement roofed area for the sample, grouped by stage, with the addition of the recently salvaged Middle Iroquoian Tillsonburg site.

Figure 5.7. Scatterplot of settlement roofed-area density vs. roofed area for Early Iroquoian settlements ($r^2=0.59$): 1. Auda; 2-4. Calvert (Early-Late Phases); 5-7. Elliott II (Phases 1-3); 8-9. Elliott III (Phases 1-2); 10-11. Ireland (Phases A-B); 12. Lightfoot; 13. Praying Mantis.
Figure 5.8. Scatterplot of settlement roofed density vs. roofed area for Middle Iroquoian settlements ($r^2$=0.001): 15. Alexandra (models mean); 16-17. Crawford Lake (Phases 1-2); 18. Holly; 19-22. Myers Road (Phases 1-4); 23-24. Nodwell (Phases 2-3); 25. Robb; 26. Serena (Phase 2); 27-28 Uren (Phases A-B); 29. Wiacek.

Figure 5.9. Scatterplot of settlement roofed density vs. roofed area for Initial Late Iroquoian settlements ($r^2$=0.82): 30-31. Baker (Phases 1-2); 32. Berkholder 2; 33. Carson; 34-39. Draper (Phases A-F); 40. South Field; 41-43. Grandview (Phases 1-3).
hearth number obscured an actual reduction in hearth density during the Middle Iroquoian period. He calculated hearth density by dividing the number of hearths excavated in a particular area of a site by the area excavated. Since partial settlement excavations have tended to concentrate on areas of high artifact density, or to “chase” post-moulds and delineate structures, it would stand to reason that extrapolating hearth densities from these areas to an entire site would typically overestimate hearth density where houses are more widely spaced. Warrick attempted to deal with this by applying a constant correction factor to “account” for unexcavated empty space between houses. However, for this correction factor to yield a suitable result, it would need to take into account the changing relationship between scale and density with time and settlement boundary type documented here.

Results - Longhouse Layout and Orientation

There is a well-known tendency for Iroquoian longhouses to fall into a wide variety of orientational patterns. Warrick (1984) used a typological scheme to describe what he considered to be normative village configuration classes, including “disordered”, “radial cluster”, “aligned cluster”, and “parallel row” villages. Dodd and others have also looked at regional longhouse orientation patterns in an attempt to identify functional causes related to prevailing wind direction (Dodd 1984; Norcliffe and Heidenreich 1974). However, measures of mean or modal orientation can be very misleading, since most villages display a variety of distinct longhouse orientations. Likewise, Warrick’s (1984) typology is intuitive, and not based on a rigorous measurement of angular disorder or clustering.

In order to characterize the nature of variation in longhouse orientation within settlements, measurements of angular dispersion were used (angular standard deviation and variance), as well as two complementary statistics, Rayleigh’s dispersion index ($Z$), and Rao’s angular clustering index ($U$). Angular variance in village longhouse orientation was similar in Early and Middle Iroquoian settlements (0.22 and 0.26, respectively), but was statistically significantly lower in initial Late Iroquoian settlements (0.14, see Table 5.2). Rayleigh’s dispersion index and Rao’s angular clustering index showed a similar pattern of increase in the initial Late Iroquoian sample (Table 5.2). This indicates both a greater tendency for directional bias and orientational clustering in 15th century settlements. However, these period means mask significant variation within these groups in terms of their characteristic relationships between house orientation and settlement size, house spacing, and roofed area density. For instance, the scatterplot of roofed area density vs. angular variance, below, is revealing (Figure 5.10).
Although the Early and Middle Iroquoian samples had similar average angular variance, angular variance was correlated quite differently with roofed-area density between the two groups. In contrast to the Early and initial Late Iroquoian groups, which showed no correlations between these two variables, Middle Iroquoian settlements showed a moderate but significant positive correlation between longhouse angular variance and roofed area density ($r^2=0.55$, $p<0.001$). Thus, the most densely built Middle Iroquoian settlements, such as Uren and Nodwell, tended to have the highest angular variance, while the lowest density settlements, such as Alexandra, tended to have low variance.

![Figure 5.10](image-url)  
**Figure 5.10.** Scatterplot of settlement longhouse angular variance vs. roofed-area density, grouped by stage. Note the positive correlation between roofed-area density and longhouse angular variance for the Middle Iroquoian sample alone ($r^2=0.55$).
Figure 5.11. Scatterplot of settlement longhouse angular clustering index (Rao’s U) vs. roofed-area density, grouped by stage. Note the negative correlation between roofed-area density and longhouse angular clustering for the Early Iroquoian sample alone ($r^2=0.46$, $p<0.001$).

Figure 5.12. Scatterplot of settlement longhouse angular variance vs. mean nearest-neighbour distance, grouped by stage. Note the weak negative correlation for the Middle and initial Late Iroquoian samples together ($r^2=0.32$, $p<0.05$), but not for the Early Iroquoian sample.

On the other hand, the Early Iroquoian sample exhibited a significant negative correlation between roofed area density and Rao’s angular clustering index, while the other periods showed no trends ($r^2 = 0.46$, $p<0.001$, Figure 5.11). In this case, high-density Early Iroquoian sites
tended to have less angular clustering, while high-density Middle Iroquoian and initial Late Iroquoian sites did not experience the same effect. Meanwhile, a linear regression between Rao’s angular clustering index and mean longhouse nearest-neighbour distance demonstrates a weak but significant negative correlation between the two variables for the Middle and Late Iroquoian samples together \( r^2 = 0.32, p < 0.05 \); Figure 5.12), but not for the Early Iroquoian sample. This indicates that, as Middle and initial Late Iroquoian longhouses were more closely spaced, they tended to exhibit angular clustering.

To summarize the pattern, it would appear that, while house configuration at Middle Iroquoian settlements exhibited greater angular dispersion in general than initial Late Iroquoian settlements, particularly at high roofed area densities, angular clustering also increased with density, and especially with low nearest-neighbour distances. Meanwhile, Early Iroquoian settlements, while having similarly high angular variance, showed a decrease in angular clustering with increasing density. Initial Late Iroquoian sites showed both a reduction in angular variance and an increase in clustering with density. In more general terms, this suggests that the relationship of settlement architectural density with house orientation was distinct in each period. Particularly intriguing is the observation that, where Early Iroquoian settlements show little organizational response to density or house spacing, Middle Iroquoian settlements exhibit both higher angular variance and clustering when houses are closely spaced, while initial Late Iroquoian settlements experienced rather uniformly lower angular variance and higher clustering. Interestingly, this development corresponds roughly with the emergence of Warrick’s “aligned” and “radial cluster” villages from “disordered” types. The “aligned cluster” village would produce both low angular variance and high angular clustering, as documented here for the initial Late Iroquoian sample. In a similar manner, the apparently “disordered” Early Iroquoian village exhibits neither increasing angular clustering nor decreasing angular variance with density, suggesting that houses were “fit” in with less regard for village-level orientation patterns than was the case in later periods.

With these similarities pointed out, I do not wish to reify Warrick’s typology since the variation exhibited among settlements of the same period overwhelms that implied by such a scheme. Moreover, as we shall see in the following chapter, the relationship between longhouse orientation “order” as measured here, and configurational “order” in terms of the syntactic intelligibility and integration of exterior space, is by no means direct. The idea of simply reading off the level of social organization at a site from the apparent angular “disorder” of longhouses is undermined by this experiential “missing link”. Much hinges on the complex relationships
among village scale, roofed-area density, house length, number and spacing, and specific orientation patterns. The effects of these unique configurations on the everyday experience of village space can only be explored by moving from generic metric descriptions of formal morphology to relational measures of village network topology.

Summary

Villages grew dramatically between A.D. 1250 and 1500, but the dimensions of growth were quite different in Middle and initial Late Iroquoian settlements. The six-fold increase in Middle Iroquoian village area from the Early Iroquoian period is attributable to an approximately four-fold increase in mean house area, and a simultaneous decrease in settlement roofed-area density that resulted from a trend toward increasing the average distance between neighbouring longhouses. Roofed-area density continued to decrease at some of the largest late Middle Iroquoian communities (e.g., Alexandra and Tillsonburg). At the same time, a small minority of palisaded Middle Iroquoian sites maintained high built-area densities (e.g., Uren). By the second stage of growth in the 15th century, built density returned to near Early Iroquoian levels, even at unpalisaded sites, and growth in village area was driven principally by increases in the number of houses at large coalescent villages.

Interestingly, the generally low-density Middle Iroquoian village also had significantly higher angular variance among houses than was documented for the initial Late Iroquoian. Considered against the Early Iroquoian sample, one might hypothesize that the increase in longhouse spacing in Middle Iroquoian villages reflects the difficulty of placing very long houses close together given topographic constraints such as the need for large continuous areas of level ground. However, considered against the initial Late Iroquoian sample, which exhibited even longer longhouses on average, but much higher roofed-area density, this topographic hypothesis falls short. Initial Late Iroquoian villages showed a significant decrease in both nearest-neighbour house spacing and angular variance from Middle Iroquoian settlements. Also, while the Middle Iroquoian villages showed high angular variance, much like Early Iroquoian settlements, they also demonstrated an unusual trend toward increasing angular dispersion in the densest settlements, which is quite the opposite of the trend in the other periods, especially in the initial Late Iroquoian. They also showed a tendency to increase angular clustering in these dense, closely spaced settlements.

In sum, village growth was structured quite differently in the 14th and 15th centuries. It is tempting at this point to speculate about the processes that might have given rise to these unique
relationships among village scale, density, and longhouse orientation, but this would be premature. Without linking the abstract measurements of village scale and arrangement to an understanding of how these variables were related to the system of exterior space that the houses composed, and especially to the network of access points, routes, and focal activity areas as they were experienced by a village’s inhabitants, our ability to interpret these measures meaningfully will be rather limited. It is to such an experiential approach that we will turn in Chapter 6.
CHAPTER 6
BIG HOUSES AND SMALL WORLDS

Introduction

The recent surge of theoretical interest in the role of space and place in past societies has typically developed within the somewhat disparate areas of “landscape” and “household” archaeologies. A number of important developments in theory and method have been made under these programs, many of which have influenced the approach taken here. Nevertheless, progress in thinking about the macro and micro scales of human spatial life has not been equally matched at the medium scale of settlements and the exterior spaces formed between buildings and other defining architectural and natural features (but see Cutting 2003; Robin and Rothschild 2002). This is curious from a theoretical standpoint, since the study of settlement arrangements offers the possibility of a kind of “scalar bridge” linking households, communities and regional societies. From such a perspective, the settlement scale can be studied as a primary context for the productive interaction of social entities at those dangerous thresholds between the familiar and the foreign that entail the development of privacy gradients, domains of domestic and public action, insider and outsider, neighbour and stranger (Lawrence and Low 1990; Lawrence 1996; Parker Pearson and Richards 1994). Houses and other buildings, we cannot forget, do not open onto an undifferentiated exterior space. Their placement vis-à-vis each other and various additional features of outdoor topography and construction provide a richly variable setting for conditioning social valences of “within-ness” and “between-ness”. The settlement scale should be of particular interest to those studying social practice, since it is situated at the messy interface between the various relationally defined agencies from which “community” emerges.

There are, of course, many practical reasons why the settlement scale has been neglected. Large horizontal exposures are often challenging and prohibitively expensive to dig, and sorting out issues of architectural contemporaneity can be a major difficulty. Moreover, some archaeologists may feel that there is little to be gained from excavating the “empty” space between structures. As a result, suitable datasets are hard to come by. The sample of complete settlements analyzed here therefore represents an unusual and important opportunity to explore settlement spatial organization from a regional and diachronic perspective.
**Why Study Configuration?**

One of the foundational assumptions of this chapter is that the arrangement of architectural features in a village setting will have profound impacts on how its inhabitants and visitors experience daily life. I do not wish to argue here that settlement configurations were direct reflections of, or dictated by, ideational systems such as kinship or cosmology. At the same time, we need to resist the assumption that architectural configurations themselves directly determined past behaviour and social comportment within them. Both idealist and materialist stances fail to take account of the “mutuality” of space and social life (after Gosden 1994). Rather, the principal interest of this chapter is in what the material remains of settlement structure can tell us about past dwelling (in the sense advocated by Ingold [2000]), and how experiential factors may have mediated social and architectural dynamics over the long term.

The approach to the spatial analysis of precontact Iroquoian settlements espoused here may at first appear at odds with the more general arguments I have made about space in the preceding pages. The space syntax methodology has frequently been critiqued on the grounds that it promotes a brand of architectural determinism, a reduction of the richness of the human lifeworld that is intolerable (e.g., Leach 1978). Certainly, titles such as Hillier’s *Space is the Machine* (Hillier 1996) do little to lessen this impression. Apparently arcane graph theory and matrix algebra seem equally suspicious in the realm of cultural and social analysis to many anthropologists. Others will see these methods as the return of “normative” thinking, of a structuralism in which numbers purport to evince thoughts, or rules by which ancient vernaculars expressed the particularities of their distinctive cultural templates. For instance, Shapiro writes that, “Space syntax analysis connects built forms and social organization through the idea that societies arrange space in accordance with the same rules that govern their social arrangements (2005: 39).” At different times, Hillier and Hanson (1984) appear to espouse both a structuralist view in which spatial arrangements express an abiding internal cultural “logic”, and a materialist view in which spatial configuration determines human social behaviour.

These variable understandings of how space syntax analysis might be used to link materiality and sociality in fact reflect a wider dispute in the social theory of built environments that revolves around the primacy of the material versus the ideational, or what Adam T. Smith has termed *absolute* and *subjective* ontologies of space (2003). For instance, Rapoport’s nonverbal communication approach to architecture has been influential for archaeologists interested in considering how conceptual categories of social order are expressed in architectural patterns. However, this perspective conflicts sharply with approaches that emphasize the
tendency of built environments to influence behaviour and social experience in ways that could not have been apprehended in advance, particularly over the long term. From the latter perspective, Fletcher writes of the material as “‘an actor without intent’ with which people try to engage,” and he decries what he sees as the dominant premise that “the material has its function in relation to familiar verbalized expressions of sociality (2004:111).”

I believe that a rapprochement between these positions is possible by turning analytical attention to the generative engagement of space with society in practice, an approach that can be termed a relational ontology of space (after A.T. Smith’s usage). As a relatively simple set of techniques for representing and describing spatial network topology, space syntax can arguably be employed in either absolute or subjective modes of interpretation (e.g., compare its use by Ferguson 1996, Martindale and Supernant 2009, Van Dyke 1999, A.T. Smith 2003, and Shapiro 2005). And while space syntax methods are indeed reductive (as are all effective methodologies), their particular reductionism focuses analytical attention on one of the most relevant features of spatial experience: its relationality. The relational aspect of dwelling, so fundamental to social life (Ingold 2000), is an irreducible component of analysis in the study of spatial topology. Space syntax, then, provides a relational model of spatial order that resonates not only with relations among architectural structures, paths, and places, but inevitably among the people who built, lived, and experienced them (Bafna 2003). This makes it an eminently appropriate method for an analysis of community life. Using this method, we will come to identify elements of spatial arrangement that both regulated and responded to experience, and ultimately made village social life possible.

Interpreting the Configuration of Village Space

Too often archaeologists think of “social integration” as a self-explanatory end goal of community life, one that, if not explicitly promoted by agents, was certainly a functionally adaptive result of cultural evolution. However, social integration is not a generic state, nor is it always seen by community members as a universal social good. Rather, it is achieved through specific practices, occurring with a where and a how, promoted by some and not others. And where subgroups or institutions are integrated, the resulting identities are reified only at the expense of other competing definitions and identities. There will inevitably therefore be tensions associated with any integrative process; both between scales of social agent (e.g., between the individual and society), competing social agents that are of a similar scale and definition (e.g.,
between “individuals”, “households”, “villages”), and between interest groups of heterarchical position and authority (e.g., “peace chiefs” vs. “war chiefs”; clan segments vs. sodalities).

The point, then, is not simply to identify how spatially “integrated” village space was, and to equate this with a simple ranking of social cohesion. We must interrogate the where and how of spatial integration (and network structure generally) so as to infer the nature of integrative structuration. A corollary of this is that maximizing spatial integration does not necessarily support social cohesion. Spatial segregation can in fact be indicative of sub-group formation, which might in turn promote peaceful coexistence (most of the time), but also factionalism and fission (at other times).

**Potential Responses to Scalar Stress**

The idea that interaction and communication stress emerge at scalar thresholds, and that this kind of stress can be mitigated by various organizational responses (Johnson 1982; Fletcher 2004), permits us to develop a theory of spatial responses to growth, and to express its expectations in terms of space-syntax measurements.

To begin with, community-level social cohesion will not necessarily be improved by maximizing face-to-face social interactions of all members of that group all the time. Indeed, this is likely to promote stress when scale and density are sufficient. Thus, counter-intuitively, I do not expect a direct relationship between space syntax measures of “integration”, and social “integratedness”. Rather, a (probably unstable) balance between the segregative delineation of social agencies and the village-level integration of these subgroups was likely found in rapidly growing, nucleated communities. I propose that the emergence of sequential socio-political heterarchies (by the historic period) might have been grounded in everyday spatial practices that promoted the formation of social sub-networks or factions (a double-edged sword for middle-range societies), and that long-term developments in village organization can be understood as the historical outcome of factional dynamics that were conditioned by the interaction of spatial arrangements, social practices, and nucleated settlement growth.

**The Spatial Dimension of Social Experience**

The physical nature of settlement growth (e.g., house extension vs. addition), density, and arrangement all have an impact on the experience of space. In general, system scale and density will have a negative impact on global visual and axial integration. This means that coordinated adjustments to the scalar and density dimensions of growth (for instance by maintaining house
numbers or reducing house density) can promote relatively high integration while absolute built area increases. However, the layout of structures in space also affects the relative integration of a settlement, particularly when the independent effects of scale and density factors are taken into account. Beyond promoting or reducing global integration, the configuration of outdoor space can take a wide variety of forms that will variously structure the relative predictability, intensity and social scale of interactions at various depths in the system.

One explicit model of network morphology that has received a great deal of recent attention, and appears to have relevance to Iroquoian village organization, is the Watts and Strogatz (1998) model of “small-world” networks. A small-world network model of spatial configuration provides distinct expectations about village topological structure that have wider significance for the potential movements of people and things, the communication of ideas, and social interactions within such a system. “Small worlds”, in the Watts and Strogatz model, occur when large, low-density systems (with many nodes, and relatively few edges), exhibit high values of local clustering, but relatively low mean depth (or characteristic path length) (2008). Clustering occurs when a node’s neighbours are also neighbours of each other. In social network terminology, they form a clique. Graphs with high average clustering coefficients are therefore cliquey since most nodes participate in cliques. Both regular ring lattices and high-density or small-scale random networks tend to have high average clustering coefficients. In the latter cases, this is because the entire system forms a single clique, as numerous edges link each node to many others globally across the system. In the case of the ring lattice, local clustering remains high with growth, but mean depth (the average number of steps in the shortest path between two nodes) increases rapidly and linearly with the number of nodes. This makes lattices cliquey “large worlds”. As random graphs increase in size, they tend to retain global integration (low mean depth), but lose clustering, since global connections are just as likely as those between neighbours. Random graphs then become un-clustered “small worlds”. True small worlds occur in the zone between these two extremes, where the probability of local connections is high, but a relatively few global connections render system depth low. “Small worlds” appear to be common in natural and social systems, including neural networks and film actor collaboration graphs (Watts and Strogatz 1998).

So what makes small worlds interesting for the analysis of Iroquoian village spatial topology? Small worlds promote intensive local connections between clusters of entities, like lattice networks, but not at the expense of permitting significant depth to occur between entities of different clusters. From a communication standpoint, small worlds display “enhanced signal
propagation speed, computational power, and synchronizability (Watts and Strogatz 1998).” At
the same time, the impact of global scale on local experience is almost imperceptible, since the
average number of local connections remains nearly constant with system growth. In short, small worlds provide a balance between promoting sub-group interaction and maintaining global system integration.

While small-world networks need not be spatial, the potential for spatial network topologies to form small worlds is interesting to consider in light of the development of village exterior space. If spatial topology that is small-world-like promotes, at least in a probabilistic manner, an interaction network with similar qualities, it would be conducive to a kind of de facto sequential hierarchy. Clustered sub-networks of spaces or routes would promote intensive, regular contacts among a smaller segment of the community, fostering common interests, local communication, shared activity areas, and mutual surveillance. However, the formation of such sub-networks would not come at a significant cost to global integration. In such a system, community-level interactions need not be intensive nor occur at large collective scales in order to ensure rapid global information exchange or decision-making. It should also be pointed out that such a spatial model can be contrasted with the de jure sequential hierarchy that was the structured product of formal tribal and confederacy “constitutional” practices by the 17th century (e.g., Foster 1984). Although the two are isomorphic in many ways, we cannot automatically assume that the latter was the direct product of the former, or vice versa.

Methods

What is Space Syntax Analysis?

At a methodological level, the space syntax approach involves two distinct steps: (1) the reduction of a real-world spatial configuration, usually as represented by a plan map of a settlement or building, to a graph in which spaces are represented as “nodes”, and the connections between them as “edges”, (2) the calculation of various measures of network structure from the resulting graph (Hillier and Hanson 1984; Hillier 1996; Cutting 2003; A. Turner 2003; Bafna 2003; Penn 2003). The “meaning” of the graph measurements produced in stage 2 will depend in many ways on the definition of spaces and their connections in stage 1. There is no best method for producing a spatial graph. The different methods used here (Visibility Graph Analysis and Axial Analysis) are used to describe somewhat different
dimensions of the spatial system. At the same time, they corroborate one another in ways that make for more powerful final interpretations.

Stage 1: Creating Graphical Reductions

**Access Analysis**

Access Analysis, or gamma-analysis, as Hillier and Hanson (1984) term it, is the most widely used topological approach in the archaeology of architecture (e.g., Shapiro 2005; A.T. Smith 2003; Cutting 2003; Bustard 1999; Dawson 2002; Fisher 2009; Martindale and Suprenant 2009; Van Dyke 1999). It is normally applied to building plans or complexes where the spatial system is defined by clear architectural boundaries forming rooms, halls, or courtyards linked by doors and passageways. Rooms are then represented in an accessibility graph as nodes, and the doorways linking them as edges (Figure 6.0). The application of access analysis has proven challenging in many archaeological contexts because the structure of the access graph depends on the reliable identification of doorways (Cutting 2003). At Çatalhöyük, and Pueblo sites of the U.S. southwest (e.g., Shapiro 2005), house entry was often made from the rooftops, preventing archaeologists from adequately reconstructing accessibility between rooms (Cutting 2003). Missing upper stories present a similar problem.

Given the usual lack of well-defined walls or other interior divisions aside from end vestibules in Iroquoian longhouses, access analysis was not applied to longhouses in this study. Rather, following Cutting (2003), I use access analysis in a limited manner as a “tool to think with” when considering the potential for the arrangement of interior longhouse space to have structured intra-house social relations.
Axial Analysis

Axial analysis is normally applied to the exterior space system of a settlement, or else to large continuous interior spaces with significant complexity (Penn 2003). It has very rarely been applied in archaeological contexts (but see Ferguson 1996), perhaps because of the need for complete settlement plans. Exterior settlement space is a continuous system. This means that the definition of the network graph is not subject to the vagaries of door preservation and identification. On the other hand, it means that the subdivision of continuous outdoor space into a series of connected spaces can be undertaken in any number of ways, and some consistent rationale must be applied that bears significance for human spatial experience or behaviour. Axial and visibility graph analyses represent different ways of reducing the continuous outdoor space of settlements to network topologies.

In axial analysis, exterior space is traditionally represented as a minimum set of one-dimensional straight lines that pass through all convex spaces and make all possible axial links, where convex spaces are determined by finding the least set of “fattest” spaces that cover a settlement (Hillier and Hanson 1984: 92; Figure 6.1). In practice it has been observed that, according to this definition alone, several axial “solutions” can be found by different analysts for the same settlement, since the definition of a unique minimal set of maximum convex spaces is impossible (Batty and Rana 2004; Turner, et al. 2005). Turner et al. have produced an algorithmic implementation of axial map generation that gets around this problem. They point out that axial lines need not be defined according to particular “convex” solutions, but rather

Figure 6.0. Hypothetical building floor plan (left) and associated justified access graph (right).
need only pass through all *possible* convex spaces (2005). This can be further refined by the statement that axial lines should pass through all completely intervisible regions. Turner et al. therefore redefine the axial map as: “the minimal set of axial lines such that the set taken together fully surveils the system, and that every axial line that may connect two otherwise unconnected lines is included (2005: 428).” Through a process of subset elimination (as opposed to a “greedy algorithm”), Turner et al. propose an algorithmic implementation that leads to a unique minimal solution while preserving the surveillance and connectedness requirements of the definition. This algorithm is implemented in UCL’s Depthmap program (Turner 2004), and was used in the present study to automatically generate axial maps for the archaeological plans following digitization in GIS.

**Figure 6.1.** Axial map of the Robb site plan (Middle Iroquoian). Line thickness indicates global integration.

From a phenomenological perspective, axial maps focus attention on the network of routes or of movement potential between all regions of a plan. It is also possible to interpret axial lines as lines-of-sight, which may be appropriate if vision is unobstructed along their extent, but they need not be thought of in this way, and the potential for visual obstruction in the past does not render them spurious.
A modified axial map was also used in the present study, which I will refer to as an “axial interface” map, much like Hillier and Hanson’s convex interface map (1984). This consists of the regular axial map of a settlement with the addition of houses represented as single nodes in the graph, linked to the exterior graph topology according to a simple connection rule such that a line of sight, or axial route, extending directly from the house end (parallel to the house’s long axis) is connected with the first axial line it intersects.

**Visibility Graph Analysis (VGA)**

Visibility graph analysis is based on an explicitly visual model of spatial arrangement, and emphasizes two-dimensional rather than one-dimensional relations. VGA originates with the concept that the complete set of isovists (viewsheds) from all positions in a system could be connected to form a network consisting of all direct visual links between spaces (Turner and Penn 1999). Turner’s implementation of this method in the Depthmap program was used in the present study (Turner 2004). Plans were digitized in ArcGIS and exported into .dxf format for use in Depthmap. Depthmap then permits the user to define the scale of “points” from which the visibility graph will be constructed. A grid of 1x1m squares was projected over settlement plans, since finer grids required processing time of greater than 12 hours, and larger grids tended to excessively pixilate the map and eliminate subtle visual transitions (for instance around the curving ends of longhouses). Depthmap then produces the visibility graph by connecting all intervisible points (grid cells) (Turner 2003, 2004). This graph is then used to calculate relational space syntax measures such as global integration, control, controllability, point depth entropy, and visual clustering (explained below; e.g., Figure 6.2).

There are several benefits and drawbacks to this method. Its benefits are that it provides a continuous “surface” model (albeit rasterized) of global visual relations. This permits subtle gradations in global integration or control values to be apprehended, and the specific relational visual properties of particular locales can be assessed (for instance, mean visual integration and control can be calculated for areas of interest such as middens, outdoor features, and other activity areas). Also, like Hillier and Hanson’s convex analysis (1984), it draws attention to relations of co-presence or mutual surveillance. A major drawback of the method is that it is somewhat scale- and density-dependent. This is because large convex spaces are not reduced to
single nodes in the graph. Instead, the larger a convex space, the more pixels it will contain, and so the more “integrated” it will be relative to smaller convex spaces in the same graph. This “biases” integration values heavily toward large open areas of a plan. In one sense, such areas are appropriately viewed as integrating, in that they hold the potential for greater volumes of human co-presence, or what Hillier and Hanson term “simultaneity” (1984). On the other hand, however, this approach causes global integration values to be determined in large part by the local visual connectivity of a single large convex space when it proportionally dominates a plan. For this reason, both VGA and axial analysis were conducted so that results could be compared. Additionally, randomly reconfigured iterations of “village” plans with the same scale and density properties as the archaeological sample were produced in ArcGIS and analyzed in Depthmap. This permitted comparison of archaeological village syntax values with their “null” counterparts at any given level of scale/density.

Stage 2: Network Measures
Most measures of the network topology resulting from axial maps and VGA used here are to be found in the standard references on space syntax (e.g., Hillier and Hanson 1984; Hillier, et al. 1987) and network analysis in archaeology (e.g., Conolly and Lake 2006). I will also explain Turner’s application of point depth entropy to visual and axial graphs, since it has not been frequently applied in publications on space syntax. Finally, I will describe expectations for several possible models of spatial topology, including “small-worlds”.

**Connectivity**

Connectivity, $k_i$ (also called “nodal degree” by network analysts) is perhaps the most elementary description of local system structure, and is simply the number of connections (edges) linking a spatial node to its directly accessible neighbours. For the VGA, the connectivity is the count of all intervisible grid cells from a given cell. This is equivalent to the area of its isovist in square meters when a 1m$^2$ grid is used. For the axial map, the connectivity of an axial line will be the number of other axial lines it intersects. Mean connectivity, $K$, is the average nodal degree of all nodes in the system, and is given by:

$$K = \frac{1}{N} \sum_{i=1}^{N} k_i$$

(6.0)

The measure is “local” because it describes only the immediate neighbourhood of each node.

**Total Depth**

Total depth, or graph “diameter”, $\delta$, is the count of the number of steps needed to traverse along the most direct route between the two most distant nodes in a graph.

**Mean Depth**

Mean depth, or characteristic path length, $L$, is the average number of topological steps between any two nodes. This is a “global” measure since it describes the relationship between each node to all other nodes, rather than simply to its direct neighbours.
\[ L = \frac{2}{N(N-1)} \sum \sum l_{ij} \quad i \neq j \]  

(6.1)

**Local Mean Depth (R-2)**

Local mean depth is mean depth calculated for all nodes within two axial or visual steps from each node (at network “radius 2”). Local mean depth at “radius 1” is the same as mean degree.

**Network Density**

Not to be confused with metric measures of settlement built area density, this is the proportion of nodes (\(N\)) to edges (\(E\)) in a graph. For visibility graphs, all else being equal, network density is actually negatively correlated with built-area density, since high density of construction means relatively less intervening exterior space between structures, leading to lower general visual connectivity from any given position (node) in the plan.

\[ D = \frac{N}{E} \]  

(6.2)

**Clustering Coefficient**

The clustering coefficient, \(C_i\), of a node, \(i\), measures the extent to which its immediate neighbours are also each others’ neighbours. It is calculated as:

\[ C_i = \frac{2e_i}{n_i(n_i-1)} \]  

(6.3)

Where \(n\) is the number of nodes neighbouring node \(i\), and \(e\) is the number of edges among them. The mean clustering coefficient, \(C\), of a graph is therefore given by:

\[ C = \frac{1}{N} \sum_{i=1}^{N} C_i \]  

(6.4)
Global Integration

The global integration of a node measures its accessibility relative to all other nodes in
the system, and can be thought of as the reciprocal of a “normalized” mean depth. Integration
relativises the mean depth of the node with respect to the maximum depth possible for the
number of nodes in the graph, and then standardizes that value (known as relative asymmetry,
RA) for systems of different numbers of nodes by comparing RA to the RA of a node at the root
of a diamond-shaped regular lattice of the same nodal size (Hillier and Hanson 1984: 109-113).
The normalization of relative asymmetry to integration is particularly critical in the present
study, since graphs of very different scale are compared. Teklenberg et al. (1993) present an
alternative normalization to that proposed by Hillier and Hanson, in which the graph
respective to an ideal axial grid is used, rather than the diamond lattice. This approach
produced superior results in simulation trials of scale-normalization for large modern urban
systems, where an ideal grid is normally more integrated than any actual street configuration, and
where lattice-like growth is very unlikely. In the present study, the Hillier and Hanson measure
is relied upon since Iroquoian villages were often more axially integrated than an ideal grid of
equivalent node size, under which circumstances the Teklenberg normalization is less reliable
(1993).

The mean global integration of a settlement was therefore calculated according to the
following steps:

1. The relative asymmetry, $RA_i$, of a node, $i$, in the graph was calculated thus:

$$RA_i = \frac{2(L-1)}{N-2}$$

(6.5)

Where $L$ is the node’s mean depth, and $N$ is the total number of nodes in the graph.

2. $RA$ values for all nodes in the graph were then normalized by $D_N$, which is the $RA$ of the root
node in the diamond-shaped lattice of $N$ nodes as follows:

$$I_i = \frac{D_N}{RA_i}$$

(6.6)

A table of D-values is provided in Hillier and Hanson (1984: 112).
3. The mean global integration for a settlement was then calculated simply by taking the average of the integration values of each node in its graph.

**Local Integration (R-2)**

The local integration at radius-2 was calculated in the same manner as global integration. This provides a measure of local integratedness within two axial or visual steps from each node.

**Control \((E_i)\)**

Control is a local measure of the extent to which a node “controls” access to its neighbours. It is calculated by summing the reciprocals of the connectivities of each of a node’s neighbours (Hillier et al. 1993: 35). Thus, if a node, \(i\), represents the only route to/from neighbour \(j\), it will receive a 1/1 for that neighbour. If node \(i\) is one of two routes to/from neighbour \(j\), it will receive a 1/2 for that neighbour, and so on. This process is repeated for all of node \(i\)’s neighbours and the results summed, as follows:

\[
E_i = \sum \frac{1}{N_j}
\]

(6.7)

Where \(N_j\) is the connectivity of neighbour \(j\).

Values above 1 will therefore indicate high control, since a controlling node will provide access/visibility to/from other nodes which themselves can see/access relatively few other nodes. This means that well-connected nodes will only be controlling if their neighbours are not well connected.

**Controllability**

Controllability measures the extent to which a node may be controlled by its immediate neighbours, and is calculated as the proportion of the total number of neighbouring nodes up to radius-2 relative to its own connectivity (the number of nodes at radius-1) (Turner 2003). When the value is high, a node’s neighbours have many neighbours (are well connected) relative to the node’s own number of neighbours. Thus, a node that is only accessible from two neighbouring nodes, each of which connect to five other nodes, would receive a controllability value of 12/2, or 6, indicating that it is highly controllable.
Turner has introduced “point depth” entropy as a relevant measure of graph structure, based on the calculation of Shannon’s measure of uncertainty, $s_i$, as applied to the frequency distribution of geodesic path lengths from a given node, $i$, to all other nodes in a visibility or axial graph. Average system entropy is then calculated by taking the mean of Shannon’s uncertainty for all nodes. In order to understand how entropy describes system structure, it is useful to consider the case of random die casts. With an unbiased 6-sided die, the probability of getting any specific result (for instance, the number 6) will be 1/6. On the second throw, the probability of getting another specific result will also be 1/6. The probability of casting two sixes in a row will be $(1/6)(1/6)$. Thus for a set of $n$ trials, or throws, the likelihood of getting a run of $n$ sixes is $(1/6)^n$. We are far more likely to throw some combination of ones through sixes, and the more trials that are made the more the sequence generated will “balance” at around a frequency of 1/6 for each side of the die. Entropy is maximized in such a scenario. On the other hand, if the die is weighted, then the probability of certain outcomes will be higher than others. Such a system is biased since, for any toss of the die, we know that a specific outcome is more likely than others, and so its entropy will be lower.

![Figure 6.3](image_url)

**Figure 6.3.** Justified graphs of maximal (a) and minimal (b) point depth entropy from the perspective of the root.

Now consider the analogous situation for a graph, $G$. If we create a justified graph of the system from the perspective of node $i$ (the “root”), with all nodes at distance 1 on one level, nodes at distance 2 on the second level, and so on up to distance $d_{\text{max}}$ then we can retrieve the distance degree sequence, $dds_{(i)} = (n_1, n_2, \ldots n_d)$, where $n_d$ is the positive integer representing the number of nodes at distance $d$ from the root. If we make a series of random walks through the
graph from the root, \( i \), to other nodes selected at random (analogous to our die toss), then the probability of a walk of a certain depth, \( P_d \), will be given by \( n_d / N - 1 \), where \( N \) is the total number of nodes in the graph. Entropy is maximized in a system where each node occupies a distinct depth from the root (an asymmetric justified graph, such as that in Figure 6.3a, where \( dds(i) = (1,1,1,1,1,1) \)). By contrast, in a fully connected, maximally symmetric graph (Figure 6.3b), all nodes will be found at depth 1, and the probability of walks of this distance, \( P_1 = 1 \). In the asymmetric graph, then, uncertainty is high regarding the potential length of a randomly determined trip, while in the symmetric graph, uncertainty is low.

The point depth entropy of a node, \( s_i \), in a graph can therefore be calculated according to Shannon’s uncertainty index:

\[
s_i = \sum_{d=1}^{d_{\max}} -P_d \log P_d
\]

Where \( d_{\max} \) is the maximum depth from node \( i \), and \( P_d \) is the probability of a path of point depth \( d \) from \( i \).

Considering an entire graph, the mean global entropy will then be high when the uncertainty of potential path lengths from any node to all others is generally high (depth is distributed among nodes). This is correlated positively with asymmetry (and negatively with global integration) for the reasons outlined above. Meanwhile, entropy will be low when there is greater certainty regarding the distribution of potential path depths from most nodes to most others. Figure 6.4 illustrates the plan of a contemporary suburban development in Las Vegas. Suburban sprawl can be especially difficult to navigate without a map because depth disorder is high. The axial entropy of this suburb was 2.9. This can be compared to an ideal urban grid with the same number of streets, having a global entropy value of 1.0. A simple labyrinth puzzle with 23 nodes (Figure 6.5) had an entropy of 3.17, while the entropy of a circular village of the Monongahela tradition (Figure 6.6) of about the same network scale (nodes=36) was just 0.88. Global entropy values for Iroquoian villages appear to have been maintained at levels just higher than an ideal grid and well below those of a modern suburb (Table 6.0; 6.14).

**Local Entropy**

Local entropy is simply the measure of Shannon’s uncertainty applied to the distance degree sequence of a node within its local neighbourhood (radius=2). When local symmetry is maximal, local entropy will be low.
Figure 6.4. Axial map of a 20\textsuperscript{th} century Las Vegas suburb. Thicker lines indicate higher local entropy.

Figure 6.5. Axial map of simple labyrinth puzzle. Thicker lines indicate higher local entropy.
Explicit Configuration Models for Village Structure

Having defined the network measures that were applied to visibility and axial graphs, it will be useful to describe several “ideal” models of spatial topology, and our expectations for how this systemic structure will be expressed in terms of syntax values. The “behaviour” of these systems with increasing settlement and system scale is particularly important to consider, as it provides a benchmark for understanding the synchronic and diachronic patterns that occur in the archaeological sample.

Grids

Ideal and near-ideal grids produce high-density graphs in which connectivity increases rapidly with the addition of new axial routes, since each new route intersects all existing perpendicular routes. Global integration and local integration are high, and identical in the ideal case, as no axial line can be more than two steps distant from any other. Entropy will be low, but not minimized. Integration is also evenly distributed across space, since no axial routes are significantly more segregated than others. Although connectivity is high and system structure is distributed (all spaces are part of rings), axial clustering is absent as grid form prevents routes from forming local triads (see Figure 6.7).
Radial and Circular Plans

Circular village plans, particularly when houses are round or short rectangular structures, produce a nearly fully connected graph (a clique; see Figure 6.8). This means that network density is high (though built density may be low), and clustering, controllability, and integration are also high. Depth and entropy will be close to the minimum possible. As circular plans grow, connectivity increases rapidly, since the addition of new structures in the circle produces an additional axial line that will normally intersect with most others through the central “plaza”. As in the grid, then, global level growth immediately affects local integration (connectivity) throughout the system. Unlike the grid, however, simultaneity is maximized since the configuration acts as a single large cluster or clique. Radial arrangements of longhouses have many features in common with circular plans. Axial routes tend to converge, creating high clustering coefficients, low entropy and high simultaneity in the axial graph. In Iroquoian villages, however, the relatively close placement of houses relative to their length means that these configurations were often less visually integrated than axially integrated.

Small-World Networks

Small world network structure has been discussed above. The circular village is a kind of small world, in that clustering and integration are both very high. However, the density of connections is also very high. In short, the village acts as a single cluster. When villages grow and network density decreases, “true” small worlds will occur when local clustering and global integration remain high in spite of the overall low connectivity of the graph. This implies the emergence of multiple spatial clusters that are nevertheless well integrated in spite of the scarcity of global links (e.g., Figure 6.9).
Figure 6.7. Network topology of an ideal simple 4x4 axial grid. Note the global connectivity but lack of clustering.

Figure 6.8. Network topology of a near-ideal radial “star” of 14 axial lines. Note the global connectivity and clustering, but lack of multiple sub-networks. This layout forms a single integrated clique.
Figure 6.9. Network topology of the exterior axial map of the Draper village (Phase F). Its high density of local connections and clustering, with relatively sparse global links, and 4-5 distinct “cliquey” sub-networks are indicative of “small world” structure.

Other Methodological Issues

Boundaries

Settlement boundaries are required in order to conduct visibility and axial analyses. Interestingly, the issue of boundary determination has not been the focus of much consideration in the space syntax literature. Nevertheless, because VGA in particular is sensitive to differences in built density, the determination of an appropriate boundary was especially important. If a settlement boundary is very distant from structures, open space dominates the plan and obscures configurational differences among settlements. On the other hand, a convex hull approach, which provided the best measure of built density in Chapter 5, could not be used since it prevents movement and visibility around structures at the edge of the settlement, severely distorting the network topology. Palisades, when present, provided an obvious “cultural” limit to settlement area that was coherent with the visual premise of the VGA. This posed a problem, however, for unpalisaded sites. In the absence of obvious topographic limits, a uniform convex buffer approach was used. Trial and error demonstrated that a convex buffer of 20m around built structures contained all exterior features. While this solution has limitations, potential comparability problems between palisaded and unpalisaded settlements were mitigated in some respects by the creation of a sample of comparable “randomly configured” plans of the same scale and density as the archaeological sample after boundary determination (see below). Also, experimental production of 20m convex buffers for palisaded settlements resulted in fair correlations in shape and area with actual palisades, suggesting that the buffer approach bears
reasonable correspondence to a culturally relevant boundary. We can of course never escape from the fact that there is no objective way to determine a boundary where none existed.

Randomly Configured Plans

Notionally, a sample of random settlement configurations could provide a “baseline” of comparison for understanding the effects of changes in village scale and density on integration and other space syntax variables, independent of any “cultural” decisions regarding the orderly layout of the built environment. However, there are in fact several levels of order that must be introduced when creating “random” plans. First, it is necessary to define the built density of the random configuration. Second, structure size and shape must be determined (e.g., circular, square, rectangular). Also, for the plans to have any relevance in relation to actual human behaviour, we require a rule than prevents structures from overlapping. These choices will all influence the form of the resulting graphs of network topology. We have, then, already introduced limits on the configuration of the plans. These parameters of density, size, shape, and mutually exclusive position mean that some degree of order emerges in the resulting network topologies. Thus, randomly configured plans must not be confused with randomly connected graphs, wherein the edges between nodes are generated in purely random fashion for a given set of N nodes of predetermined connectivity.

In the present study, a comparative sample of randomly configured “settlements” was generated so that the effects of longhouse layout and orientation decisions in the archaeological data could be “teased apart” from the independent effects of house number, size, shape, and built density on space syntax variables. This was deemed necessary when it was observed that total roofed area and density were the strongest predictors of global visual integration in the archaeological sample. The generation of a randomly configured “null” baseline might appear unnecessary to those familiar with space syntax methods, since integration is already meant to normalize for system size. However, an important distinction must be made between metric scale and density, and the resulting scale of the network graph. While the measure of integration normalizes asymmetry values relative to networks of the same scale (i.e., number of nodes), it is still sensitive to changes in metric scale and density parameters, depending on how these factors influence spatial topology with growth.

This “null” approach required that the randomly configured sample have the same metric characteristics as the archaeological dataset, and differ from it only in that house placement and orientation be determined at random. While it would have been possible to generate unique
randomly configured samples for a range of different house shapes and dimensions, built densities, and house numbers, preliminary results of this process proved to be difficult to relate directly to the archaeological case since coordinated variation in these variables occurred from settlement to settlement. In order to provide an appropriate sample of “null” plans against which to compare the archaeological sample, plans from each archaeological site were reconfigured in ArcGIS by randomly generating positions and orientations for each structure, with the rules that (i) positions must be mutually exclusive, and (ii) resulting built area density must be the same as in the original settlement. A minimum of three random iterations were produced for each plan. The resulting sample was submitted to VGA in Depthmap, and the results analyzed alongside the archaeological sample.

Results

Visibility Graph Analysis (VGA)

Table 6.0 summarizes the general VGA results for the modeled village plans (n=43) by culture-historic period. At first glance, these results appear unremarkable. Visual clustering, controllability, global and local entropy, global and local integration, and mean depth all show insignificant fluctuations over time. Global mean depth exhibits a near-significant increase in the initial Late Iroquoian to 1.94 ($p < 0.10$), due to the combined increase in village roofed area, house number and built density at this time. Global integration increased slightly in the Middle Iroquoian and decreased in the initial Late Iroquoian, but these changes were not statistically significant (at $\alpha=0.05$).

This might lead one to conclude that village configuration changed little over the study period, or that variation between individual villages overwhelmed any systematic temporal developments. However, what is truly remarkable about these numbers is their stability over time given the changes in house size and shape, village scale and built density documented in Chapter 5. By comparing the archaeological dataset to the “null” sample in which longhouse placement and orientation was randomly determined (but mean and standard deviation in longhouse size, number, total roofed area and roofed-area density matched the archaeological sample) it is apparent that organizational change must have been required to maintain visual integration as settlement scale rapidly increased. Others things being equal, increases in house number, length, and village built-area density can all be shown to have had a negative effect on global visual integration, in absolute terms (in mean visual depth), but also normalized for
differences in network scale (see Tables 6.5 and 6.7). This is because increases in settlement size and density affect network scale and topology disproportionately. A settlement with more longhouses than another of the same density will not only result in a larger visibility graph (i.e., one with more nodes), but the average depth of those nodes from each other will become higher. Likewise, of two settlements with the same set of houses, but differing in built-area density, the higher density settlement will produce a visibility topology with relatively fewer visual connections per node. In the absence of any organizational developments, the combination of increasing settlement scale and density will have a pronounced effect on global visual integration for the longhouse village, since longhouses at close proximity are especially disruptive to visual connectivity. The relative weakness of such an effect in the archeological case indicates that organizational responses occurred to mitigate the effects of scale and density on visual integration.

Tables 6.1 - 6.4 provide comparisons of VGA variable values between the archaeological and corresponding random samples for the entire dataset (Table 6.1) and for each culture-historic class (Tables 6.2 - 6.4). Overall, global integration was significantly higher in the archaeological sample (and mean depth significantly lower) than in the null sample. However, this pattern did not hold during the Early Iroquoian period, where global integration did not differ significantly from the random case (Table 6.2).

Global visual entropy follows the same pattern, being significantly higher in the randomly configured samples than in the archaeological dataset (1.38>1.19; p<0.001). This pattern was strongest for the Middle Iroquoian period (1.36>1.15; p<0.01), weaker for the initial Late Iroquoian (1.49>1.27; p<0.10), and nonexistent for the Early Iroquoian period (Tables 6.2-6.4). It is important to note that, while global integration and entropy measures did not differ significantly from the random sample in the Early Iroquoian period, this does not imply that these settlements were more visually disordered and segregated than those of later periods. Visual point depth disorder was in fact very low in the Early Iroquoian sample (1.14 ±0.12), and global integration was high (14.6 ±2.8). The lack of depth and complexity at these sites is likely due to the small average size of the houses, rather than configurational “order”. Thus, randomly configured sites of the same scale and house dimensions also produced low global entropy (1.19 ±0.22). As settlements grew in house length (in the Middle Iroquoian sample) and in number and density (in the initial Late Iroquoian sample), global entropy increased and integration decreased significantly more for the randomly configured “null” sample than for the
archaeological sample (Figure 6.10), indicating that visual entropy must have been mitigated by increasing configurational order in larger settlements.

Settlements from all periods showed significantly lower mean visual clustering than those in the random sample (0.73 ±0.06 in the former vs. 0.81 ±0.07 in the latter; Table 6.1). Low visual clustering is associated with rapidly changing visual fields and appears to have been an important result of configurational choices made in village construction. While visual clustering on average increased in settlements during the 15th century, it was still well below the level observed in randomly configured plans. Within settlement plans, visual clustering was found to correlate negatively with global integration, suggesting that locales with low visual clustering were key to the promotion of global integration. Interestingly, while visual clustering is a local measure, it correlates more strongly with global than local integration, suggesting that, from the perspective of way-finding, the experience of local visual clustering is a strong indicator of one’s position within the global structure of a settlement. Low visual clustering is also related to the significantly lower visual controllability of spaces found in archaeological settings (Table 6.1). Visually clustered spaces will be bounded on most sides such that the isovist of a situated observer does not change substantially as he or she moves locally. These spaces are often visually controllable, since an area of clustered space can be controlled from a small passage or
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Table 6.0. Visibility Graph Analysis variable summary statistics for model villages organized by stage (HH = Hillier and Hanson normalization; Tekl = Teklenberg normalization; R2 = local integration calculated to visual radius 2; * ANOVA significant at 95% confidence).
Table 6.1. Visibility Graph Analysis variable summary statistics comparing the archaeological (Arch) and random (Ran) samples (HH = Hillier and Hanson normalization; Tekl = Teklenberg normalization; R2 = local integration calculated to visual radius 2; * ANOVA significant at 95% confidence).
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Table 6.2. Visibility Graph Analysis variable summary statistics comparing the Early Iroquoian archaeological (Arch) and random (Ran) samples (HH = Hillier and Hanson normalization; Tekl = Teklenberg normalization; R2 = local integration calculated to visual radius 2; * ANOVA significant at 95% confidence).
Table 6.3. Visibility Graph Analysis variable summary statistics comparing the Middle Iroquoian archaeological (Arch) and random (Ran) samples (HH = Hillier and Hanson normalization; Tekl = Teklenberg normalization; R2 = local integration calculated to visual radius 2; * ANOVA significant at 95% confidence).
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<td>1.49</td>
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**Table 6.4.** Visibility Graph Analysis variable summary statistics comparing the initial Late Iroquoian archaeological (Arch) and random (Ran) samples (HH = Hillier and Hanson normalization; Tekl = Teklenberg normalization; R2 = local integration calculated to visual radius 2; * ANOVA significant at 95% confidence).
Figure 6.11. Scatterplot of settlement total roofed area vs. mean global visual integration. Settlement points are coded by culture-historic stage. Open circles represent the “null” sample.

Figure 6.12. Scatterplot of settlement total roofed-over area vs. mean global visual entropy. Settlement points are coded by culture-historic stage.
opening. A weak but statistically significant positive correlation between visual clustering and controllability ($r^2=0.15, p < 0.05$; Table 6.7) supports this inference. Visually clustered spaces may therefore be indicative of the presence of cul-de-sacs that could sometimes be controlled by
a few access points from the surrounding system, while un-clustered spaces are indicative of globally visually integrated “hubs”.

The changing relationships between village scale, density, and configuration can be explored by examining the correlations of metric and space syntax variables in more depth (Tables 6.5-6.8). Figure 6.11 is a scatterplot illustrating the negative correlation between village total roofed area and global visual integration. The randomly configured “null” sample and the sample of Early Iroquoian settlements both show a steep reduction in global visual integration with growth in roofed area, while the Middle and Late Iroquoian samples exhibit significantly shallower slopes. Taken as a whole, the archaeological sample produced a slope of -0.17 ($r^2 = 0.42$) which can be compared to a much steeper slope of -0.43 ($r^2 = 0.53$) for the “null” sample (Tables 6.5-6.6). A similar pattern is evident in the scatterplot of total roofed area and global visual entropy (Figure 6.12). Here, entropy increases very rapidly with village built area for the Early Iroquoian (slope = 0.23, $r^2=0.57$) sample, more gradually for the initial Late Iroquoian settlements (slope = 0.21, $r^2=0.91$), and not at all for the Middle Iroquoian sample (slope = -0.01, $r^2=0.00$). The slope for the total archaeological sample was 0.09 ($r^2 = 0.40$), while that of the null sample was 0.20 ($r^2=0.51$). Similarly, stronger correlations occurred between space syntax measures and built-area density for the “null” sample (Figures 6.13-6.14), with archaeological correlations exhibiting shallower slopes (Tables 6.5-6.6). It is readily apparent that with both increasing village scale and density, changes in village architectural organization occurred that prevented the rapid increases in entropy and decreases in visual integration that would otherwise have emerged. Additionally, the distinctly different slopes evident in each period indicate that different organizational responses occurred over time.

The shift in responses to growth between Early and Middle Iroquoian villages is particularly striking. Early Iroquoian villages display a rapid emergence of entropy with growth in total village area (slope = 0.23, $r^2 = 0.57$), and reduction in global visual integration (slope = -0.42, $r^2 = 0.64$). Remarkably, Middle Iroquoian villages, while on average four times larger in roofed area, exhibit no significant relationships between village scale and visual entropy (slope = -0.01, $r^2 = 0.00$) or integration (slope = -0.15, $r^2 = 0.17$). Three distinct dimensions of organizational change help to explain this pattern. The first two have to do with the manner in which Middle Iroquoian settlements accommodated growth. As we saw in Chapter 5, growth in settlement built area between the Early and Middle Iroquoian periods was primarily attributable to increases in average longhouse length. At the same time, house spacing increased dramatically, and built area density was reduced, particularly as villages increased in total built
area. Increasing house size rather than adding houses limited the complexity of exterior space by maintaining system scale in terms of the number of freestanding buildings. Additionally, the impact of increasing house length on visual entropy was reduced by reductions in built area density. Since the null comparative samples for each period had the same metric scale and density properties as their archaeological counterparts, we see evidence of this pattern, independent of changes in longhouse configuration, when comparing the slopes of the correlations for these null samples (Table 6.6). For instance, the slope of the correlation between global visual integration and total roofed area for the null “Early Iroquoian” sample was -1.37 ($r^2 = 0.67$), but decreased to -0.38 ($r^2 = 0.18$) for the null “Middle Iroquoian” sample. This indicates that a large part of the maintenance of global integration with growth between these two periods was achieved by a shift in the dimensions of village growth. The pattern of diminishing returns between increasing village area and total built area documented for low density Middle Iroquoian settlements (see Chapter 5) may therefore be related to the maintenance of visual integration in larger settlements, although it is premature at this stage to infer causation in the sense of human intentionality. There might have been other discursive motivations for reducing settlement density in the Middle Iroquoian that incidentally promoted global visual integration.

The third factor in mitigating the impact of settlement growth on visual entropy and integration cannot be explained by changes in the metric dimensions of growth. The slopes of the correlations between built area, integration and entropy for both periods were much steeper for the “null” samples (Tables 6.5-6.6). Moreover, when built-area density is regressed against these configurational measures, the slopes for both Early and Middle Iroquoian samples are significantly lower than their “null” counterparts, which is not what we would expect if the maintenance of integration was only attributable to decreasing density in the Middle Iroquoian group. The initial Late Iroquoian sample appears more sensitive to increases in built density than settlements in earlier periods (e.g., slope = -0.84, $r^2 = 0.82$ for built area density x global integration), but even this value is well below its null counterpart (slope = -1.21, $r^2 = 0.86$).

Given the combination of increasing house size, number, total village roofed area, and density in the initial Late Iroquoian, we should expect an interaction effect leading to much higher entropy and lower integration. This is apparent for both the archaeological and null samples, but leads to a much sharper increase in mean entropy (to a “labyrinthine” maximum of 2.5) in the null case. All this suggests that the specific organizational layout of longhouses, independent of changes in built-area density, played an important role in permitting the maintenance of global visual integration with village growth.
Table 6.8 is a correlation matrix that summarizes key relationships between metric and space syntax variables for the archaeological (above diagonal) and “null” (below diagonal) samples. A number of bivariate relationships were either stronger or weaker in the two different samples, while local entropy was associated with a series of reversed correlations in the archaeological sample. The divergent correlations found in the archaeological case help to clarify the specific manner in which actual village configuration differed from the “null” scenario. Most significantly, local and global entropy were not correlated in the “null” sample ($r^2 = 0.01$), but strongly negatively correlated in the archaeological case ($r^2 = 0.62$, $p < 0.001$). This translated into a host of distinct relationships between local entropy and other variables in the archaeological sample. Local entropy, unlike global entropy, was very negatively correlated with measures of scale and density (house number, roofed area, and roofed-area density) and reversed a positive relationship with mean house area in the null sample to a negative one in the archaeological case. Local entropy was also significantly positively correlated with global and local visual integration in the archaeological case ($r^2 = 0.79$ and $0.48$, respectively) while these relationships were significantly negative for the “null” sample ($r^2 = 0.23$ and $0.29$, respectively). This pattern is reflected in the contrast in mean global and local visual entropy values over culture-historic class presented in Table 6.0. While global entropy increased with village scale from 1.14 in Early Iroquoian to 1.27 in initial Late Iroquoian ($p=0.11$), local entropy decreased marginally from 0.90 to 0.87 ($p=0.38$). All this indicates that decreasing local entropy in large-scale, high-density villages was a factor in the configurational “compensation effect” that we have inferred from the archaeological sample. The axial interface analysis (discussed below) demonstrated a similar reduction in the local entropy of the position of house ends within the exterior space system with increases in village scale and density (Table 6.19).

A principal components analysis was conducted in order to summarize the various scalar and density factors contributing to space syntax variable values (“PCA 1”; Figure 6.15). Variables were log-normalized where necessary and the correlation matrix and component loadings are provided in Tables 6.9 - 6.10. The majority of the variance (47%) was explained by the strong positive correlations between measures of scale, density, and longhouse orientation bias and clustering with global visual entropy, and the negative correlations of these with global integration. With this primary dimension accounted for, the second principal component (explaining 25% of the variance) indicated a relationship between settlements with relatively low longhouse angular dispersion and high angular clustering, large houses at low roofed-area density, low global entropy and high global integration.
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<th>R</th>
<th>MSE</th>
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Table 6.5. Summary statistics of least-squares regressions between log normalized metric (independent) and space syntax (dependent) variables, arranged by culture-historic sample (MSE = Mean Square Error).
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**Table 6.6.** Summary statistics of least-squares regressions between log normalized metric (independent) and space syntax (dependent) variables for randomly configured “null” samples (MSE = Mean Square Error).
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<th>Rao’s U</th>
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<th>Visual Clustering Coefficient</th>
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<td>***0.61</td>
<td>†-0.28</td>
<td>-0.33</td>
<td>-0.06</td>
<td>***-0.51</td>
<td>-0.02</td>
<td>***-0.59</td>
<td>0.33</td>
<td>**0.35</td>
<td>***0.94</td>
<td>***0.62</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6.7. Pearson correlation matrix of metric and space syntax variables for the archaeological sample († signifies p<0.1; * signifies p<0.05; ** signifies p<0.01; *** signifies p <0.001).
<table>
<thead>
<tr>
<th></th>
<th>House Number</th>
<th>Roofed Area</th>
<th>Mean House Area</th>
<th>Roofed Area Density</th>
<th>Visual Clustering Coefficient</th>
<th>Visual Controllability</th>
<th>Visual Entropy</th>
<th>Visual Entropy (R2)</th>
<th>Visual Integration</th>
<th>Visual Integration (R2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>House Number</td>
<td>***0.90</td>
<td>0.09</td>
<td>***0.56</td>
<td>-0.29</td>
<td>***-0.71</td>
<td>***0.82</td>
<td>***-0.83</td>
<td>***-0.79</td>
<td>***-0.61</td>
<td></td>
</tr>
<tr>
<td>Roofed Area</td>
<td>***0.85</td>
<td>***0.46</td>
<td>***-0.43</td>
<td>-0.07</td>
<td>***-0.63</td>
<td>***0.82</td>
<td>***-0.77</td>
<td>***-0.72</td>
<td>***-0.51</td>
<td></td>
</tr>
<tr>
<td>Mean House Area</td>
<td>0.02</td>
<td>***0.48</td>
<td>-0.11</td>
<td>0.34</td>
<td>-0.15</td>
<td>0.23</td>
<td>-0.20</td>
<td>-0.13</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Roofed Area Density</td>
<td>***-0.43</td>
<td>***-0.33</td>
<td>-0.14</td>
<td>0.15</td>
<td>***-0.60</td>
<td>***0.79</td>
<td>***-0.71</td>
<td>***-0.78</td>
<td>***-0.59</td>
<td></td>
</tr>
<tr>
<td>Visual Clustering Coefficient</td>
<td>**-0.36</td>
<td>-0.05</td>
<td>***0.42</td>
<td>0.07</td>
<td>**0.39</td>
<td>0.13</td>
<td>0.24</td>
<td>0.12</td>
<td>**0.35</td>
<td></td>
</tr>
<tr>
<td>Visual Controllability</td>
<td>**-0.36</td>
<td>***-0.45</td>
<td>**-0.36</td>
<td>***-0.33</td>
<td>**0.33</td>
<td>***-0.68</td>
<td>***0.82</td>
<td>***0.90</td>
<td>***0.94</td>
<td></td>
</tr>
<tr>
<td>Visual Entropy</td>
<td>***0.54</td>
<td>***0.71</td>
<td>***0.49</td>
<td>***0.69</td>
<td>**0.29</td>
<td>***-0.52</td>
<td>***-0.79</td>
<td>***-0.89</td>
<td>***-0.62</td>
<td></td>
</tr>
<tr>
<td>Visual Entropy (R2)</td>
<td>**-0.32</td>
<td>-0.20</td>
<td>0.20</td>
<td>-0.06</td>
<td>0.17</td>
<td>**0.25</td>
<td>0.12</td>
<td>0.83</td>
<td>***0.69</td>
<td></td>
</tr>
<tr>
<td>Visual Integration</td>
<td>***-0.43</td>
<td>***-0.51</td>
<td>***-0.50</td>
<td>-0.10</td>
<td>***0.80</td>
<td>***-0.78</td>
<td>***-0.48</td>
<td>***90</td>
<td>***0.90</td>
<td></td>
</tr>
<tr>
<td>Visual Integration (R2)</td>
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<td>***-0.35</td>
<td>**-0.34</td>
<td>**-0.36</td>
<td>0.18</td>
<td>***0.91</td>
<td>***-0.55</td>
<td>***-0.54</td>
<td>***-0.88</td>
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</tbody>
</table>

Table 6.8. Pearson correlation matrix of metric and space syntax variables for the archaeological sample (above diagonal) and “null” sample (below diagonal) († signifies p<0.1; * signifies p<0.05; ** signifies p<0.01; *** signifies p < 0.001). Bold = correlation significant for archaeological sample only; underlined = correlation significant for “null” sample only; outlined cell = sign of correlation opposite between samples.

<table>
<thead>
<tr>
<th></th>
<th>Log House Number</th>
<th>Angular Variance</th>
<th>Rayleigh’s Z</th>
<th>Rao’s U</th>
<th>Log Total Roofed Area</th>
<th>Log Ave House Area</th>
<th>Log Roofed Area Density</th>
<th>Log Visual Entropy</th>
<th>Log Visual Integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log House Number</td>
<td>0.29</td>
<td>***-0.61</td>
<td>0.14</td>
<td>***-0.66</td>
<td>-0.01</td>
<td>**0.46</td>
<td>***-0.66</td>
<td>**-0.82</td>
<td></td>
</tr>
<tr>
<td>Angular Variance</td>
<td>0.29</td>
<td>***-0.52</td>
<td>**-0.44</td>
<td>***0.56</td>
<td>0.21</td>
<td>0.12</td>
<td>**0.44</td>
<td>**-0.47</td>
<td></td>
</tr>
<tr>
<td>Rayleigh’s Z</td>
<td>***0.61</td>
<td>***-0.52</td>
<td>**-0.42</td>
<td>***-0.56</td>
<td>0.21</td>
<td>0.12</td>
<td>**0.44</td>
<td>**-0.47</td>
<td></td>
</tr>
<tr>
<td>Rao’s U</td>
<td>0.14</td>
<td>**-0.44</td>
<td>**0.42</td>
<td>0.25</td>
<td>0.21</td>
<td>-0.04</td>
<td>0.08</td>
<td>-0.10</td>
<td></td>
</tr>
<tr>
<td>Log Total Roofed Area</td>
<td>***-0.66</td>
<td>0.06</td>
<td>***0.56</td>
<td>0.25</td>
<td>***0.75</td>
<td>0.24</td>
<td>***0.63</td>
<td>***-0.64</td>
<td></td>
</tr>
<tr>
<td>Log Ave House Area</td>
<td>-0.01</td>
<td>-0.17</td>
<td>0.21</td>
<td>0.21</td>
<td>***-0.75</td>
<td>-0.09</td>
<td>0.25</td>
<td>-0.13</td>
<td></td>
</tr>
<tr>
<td>Log Roofed Area Density</td>
<td>**0.46</td>
<td>0.39</td>
<td>0.12</td>
<td>-0.04</td>
<td>0.24</td>
<td>-0.09</td>
<td>***0.77</td>
<td>***-0.73</td>
<td></td>
</tr>
<tr>
<td>Log Visual Entropy</td>
<td>***0.66</td>
<td>0.26</td>
<td>***0.44</td>
<td>0.08</td>
<td>***-0.63</td>
<td>0.25</td>
<td>***0.77</td>
<td>***-0.93</td>
<td></td>
</tr>
<tr>
<td>Log Visual Integration</td>
<td>***-0.82</td>
<td>-0.32</td>
<td>***-0.47</td>
<td>-0.10</td>
<td>***-0.64</td>
<td>-0.13</td>
<td>***-0.73</td>
<td>***-0.93</td>
<td></td>
</tr>
</tbody>
</table>

Table 6.9. Pearson correlation matrix between log-normalized measures of settlement scale, density, and visual configuration with longhouse orientation († signifies p<0.1; * signifies p<0.05; ** signifies p<0.01; *** signifies p < 0.001).
Table 6.10. Principal component variable loadings for PCA 1. Values in brackets are percent of sample variance explained by component.

<table>
<thead>
<tr>
<th>Variables</th>
<th>PC1</th>
<th>PC2</th>
<th>PC3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log House Number</td>
<td>0.87</td>
<td>-0.10</td>
<td>-0.18</td>
</tr>
<tr>
<td>Angular Variance</td>
<td>0.15</td>
<td>-0.85</td>
<td>0.32</td>
</tr>
<tr>
<td>Rayleigh's Z</td>
<td>0.64</td>
<td>0.58</td>
<td>-0.36</td>
</tr>
<tr>
<td>Rao's U</td>
<td>0.23</td>
<td>0.63</td>
<td>-0.30</td>
</tr>
<tr>
<td>Log Total Roofed Area</td>
<td>0.82</td>
<td>0.32</td>
<td>0.44</td>
</tr>
<tr>
<td>Log Mean House Area</td>
<td>0.37</td>
<td>0.52</td>
<td>0.75</td>
</tr>
<tr>
<td>Log Roofed Area Density</td>
<td>0.67</td>
<td>-0.53</td>
<td>-0.18</td>
</tr>
<tr>
<td>Log Visual Entropy</td>
<td>0.93</td>
<td>-0.21</td>
<td>-0.02</td>
</tr>
<tr>
<td>Log Visual Integration (HH)</td>
<td>-0.94</td>
<td>0.22</td>
<td>0.10</td>
</tr>
</tbody>
</table>

Table 6.11. Principal component variable loadings for PCA 2. Values in brackets are percent of sample variance explained by component.

<table>
<thead>
<tr>
<th>Variables</th>
<th>PC1</th>
<th>PC2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log House Number</td>
<td>0.69</td>
<td>0.57</td>
</tr>
<tr>
<td>Log Total Roofed Area</td>
<td>0.98</td>
<td>-0.17</td>
</tr>
<tr>
<td>Log Mean House Area</td>
<td>0.65</td>
<td>-0.70</td>
</tr>
<tr>
<td>Log Roofed Area Density</td>
<td>0.32</td>
<td>0.73</td>
</tr>
</tbody>
</table>

Table 6.12. Pearson/Spearman correlation matrix of longhouse orientation variables vs. the residuals of the correlations between PCA2 PC1 and Visual Entropy and Integration (Outliers Serena Phase 2 and Myers Road Phase 3 excluded) († signifies p<0.1; * signifies p<0.05; ** signifies p<0.01; *** signifies p <0.001).
Figure 6.15. Scatterplot of PCA 1, components 1 and 2 on x and y axes respectively. Points represent settlements (Early Iroquoian = grey circles; Middle Iroquoian = black X’s; initial Late Iroquoian= black triangles; variable loadings = labelled squares). Global visual integration loads low on the first PC (contrasting with the measures of scale and density) and high on PC2, in common with visual clustering, house and total roofed area, and against visual entropy, roofed-area density, and angular variance.

Figure 6.16. Scatterplot of settlement scores on the first principal component of PCA 2 vs. the log of their global visual integration (coded by sample). Note the relatively steep slope for the null sample as compared to the archaeological sample.
Figure 6.17. Scatterplot of settlement scores on the first principal component of PCA 2 vs. the log of their global visual entropy (coded by sample). Note the relatively steep slope for the null sample as opposed to the archaeological sample.

Figure 6.18. Scatterplot of settlement scores on the first principal component of PCA 2 vs. the log of global visual entropy, coded by culture-historic stage.

While causation is difficult to infer from this analysis, both the first and second principal components indicate that increasing longhouse angular bias and clustering were associated with a) increasing village scale and density on PC1, and b) relatively high visual integration and low
entropy on PC2. The second principal component demonstrates that with the main effects of village scale on visual entropy and integration taken into account, reductions in roofed-area density, longhouse angular variance, and increases in angular clustering were all associated with relatively low global entropy and high global integration. Figure 6.15 illustrates the results of PCA1 on a scatterplot of settlement and variable component loadings. There is an evident gradient in the distribution of settlement culture-historic class from low to high values on both axes. This gradient is the result of the “conservation” of visual integration that has been documented. Early Iroquoian villages dominate low values on both axes, indicating that they owe their high absolute visual integration values primarily to their small scale, and that for their size they were relatively high in entropy and angular variance, and low in angular clustering. As we move up on both axes, sites become larger in total area and house area, but maintain relatively moderate to high integration for their size by limiting house number and density, reducing angular variance and increasing angular clustering. No settlements exhibit high values on the first principal component and very low values on the second, indicating that large and densely-built settlements were relatively visually integrated, had low longhouse angular variance, and high angular clustering.

From this analysis it is not entirely clear how important longhouse orientation patterns were for producing relatively high integration and low entropy in specific settlements and for different chronological groups, since these syntactic variables were correlated with both density and longhouse orientation variables on the second principal component. A more directed approach to identifying the influence of longhouse orientation on visibility graph structure was to conduct a principal components analysis only on scale and density variables (PCA2), and then to regress the settlement scores on the first principal component against settlement global visual integration and entropy. Because measures of village scale and density were generally positively correlated, the first principal component of this analysis represents a compressed “scale-density” dimension, where settlements with high scores exhibit large total roofed area, house numbers, houses, and high roofed-area density (Table 6.11). The residuals of the regression of PC1 against global integration (or entropy) then represent variation in global integration (or entropy) that is not explained by this scale-density dimension. I expected that the angular arrangement of houses would have an impact on how integrated a site was relative to its score on PC1. In order to test this, the residuals of the regressions between PC1 and log normalized global visual entropy and integration (Figures 6.16-6.18) were correlated with longhouse orientation variables (Table 6.12). Both Rao’s U and Rayleigh’s Z were not strongly, but significantly, positively
correlated with the residuals of PC1 and global visual integration \( r^2 = 0.2, p < 0.01; r^2 = 0.12, p < 0.05 \), respectively; Figure 6.19), and Rao’s \( U \) was negatively correlated with the residuals of PC1 and global visual entropy \( r^2 = 0.12, p < 0.05 \). Weaker correlations with longhouse angular variance and standard deviation were significant for the Spearman rank order correlation coefficient (Table 6.12).

Longhouse angular bias and clustering, then, were both predictors of global visual integration and visual entropy for a settlement of a given size-density, and became more important as village scale and built density increased. By the initial Late Iroquoian, when village scale and density both increased at the same time, angular clustering became a particularly important way of mitigating the effects of scale and density on global integration. Mean longhouse nearest-neighbour distance was also negatively correlated with longhouse angular clustering for the Middle Iroquoian and initial Late Iroquoian samples (Figure 6.20), indicating that angular clustering was a distinct organizational response to increasing built density. Angular variance in longhouse orientation was a relatively weak predictor of scale/density-relative visual integration and entropy, most likely because angular variance was often high at larger or densely built settlements where longhouse angular clustering helped to reduce entropy and increase integration (for instance at Uren, Robb and Draper).

![Figure 6.19](image)

**Figure 6.19.** Scatterplot of longhouse mean nearest-neighbour distance (m) vs. Rao’s longhouse angular clustering index for Middle and initial Late Iroquoian settlements \( r^2 = 0.32, R = -0.57, p < 0.05 \).
Figure 6.20. Correlation of the residuals of the first principal component of PCA2 and global visual integration, and longhouse angular clustering ($r^2 = 0.20$, $R = 0.45$, $p < 0.05$).

From these two principal components analyses we can conclude that villages were arranged so that the impact of increasing village scale and density on global visual integration and entropy was lessened, and that the increases in longhouse angular clustering and directional bias, and decreases in angular variance (particularly by the 15th century) documented in Chapter 5 played an important role in achieving this result.

Axial Analysis

The foregoing analysis leaves us with a general understanding of the impacts of changing village configuration on global visual order and integration over the long term. However, it is not yet clear what specific configurational forms produced these general results. Many different organizational schemes might produce a moderately visually integrated plan, and these could have had very different impacts on the daily experiences of village inhabitants. The data presented so far make no reference to the different uses people made of space, or to the manner in which outdoor and indoor spaces were interfaced. In the visibility graph analysis, all outdoor spaces were treated equally. This is problematic since what we really want to know is how people’s everyday tasks, movements and social encounters were influenced by the arrangement of village space. For instance, while overall village visual integration was maintained with major increases in the scale of built environments from the 10th to the 15th centuries, this does not
necessarily mean that access to houses occurred in correspondingly integrated spaces over time. Patterns in outdoor behaviour, or in the interface between house interiors and the exterior system, should be able to tell us more about how people experienced and responded to settlement configuration in the development of the longhouse village.

These experiential concerns can be distilled into the following questions:

1) As villages grew in topological complexity, how did the characteristic structure of spatial topology develop?

2) What did the nature of this structure mean for the scale of local and global social encounters, the situation of various outdoor activities, and the potential for subgroup formation and outdoor surveillance from house doors?

In attempting to address these questions, our attention is drawn to the structure of routes, intersections, activity foci, and access to interior spaces. As discussed above, the axial map is a representation of exterior spatial topology that emphasizes through-movement, or the structure of linear routes through exterior space surrounding the built environment (axial type 1). A modified form of axial map can be called the axial interface map, and consists of the axial map of exterior space, with single nodes representing indoor house spaces connected to the exterior axial system (axial type 2). Both types of representation draw attention to the structure of settlement space as a potential system of pathways; in the first case from one outdoor space to another, and in the second, from house to house.

Summary statistics of axial syntax variables for the analysis of outdoor space (type 1) are presented in Table 6.14. Axial controllability decreased slightly from Early Iroquoian to initial Late Iroquoian (from 0.51 ±0.11 to 0.45 ±0.11), while global axial entropy and global and local mean depth all increased slightly over the same period. None of these trends were statistically significant (Table 6.14). As was the case for the VGA, global and local integration show non-significant decreasing trends over time (e.g., from 3.17 ±1.24 in Early Iroquoian to 2.68 ±0.44 in initial Late Iroquoian for global integration), reflecting the impact of increasing house and settlement scale over time (Table 6.19). Scatterplots of village total roofed area with global axial entropy (Figure 6.21) and global axial integration (Figure 6.22) indicate that settlements in each culture-historic period experienced significantly different relationships between village built area
and space syntax values. As with the VGA, axial entropy rapidly increased with increasing roofed area in the Early Iroquoian sample. The initial Late Iroquoian sample experienced a shallower slope, while the Middle Iroquoian sample when taken as a whole experienced no significant relationship. The Middle Iroquoian pattern in fact belies a distinction between a steeply positively-correlated subgroup, and a second subgroup of large roofed area, and relatively low entropy. The second group, consisting of modeled phases at Alexandra, Robb, Holly and Crawford Lake, appears to have achieved particularly low entropy via low built area density, and high angular bias and clustering values. A similar pattern (but with correlation slopes reversed) is evident in the relationship between roofed area and global integration (Figure 6.22). Particularly impressively, the successive stages in the growth of the Draper site, each of which represented an unprecedented expansion in village area and house number, experienced only slight reductions in global axial integration with growth, indicating the careful planning of village additions (Figure 6.22). When global axial integration is correlated with roofed-area density (Figure 6.23), we find that Early Iroquoian villages show relatively high integration at low density, likely because of their small absolute scale. However, settlements of the Middle and initial Late Iroquoian stages show little evidence for decreasing global axial integration with built density.

**Figure 6.21.** Scatterplot of settlement total roofed area vs. global axial entropy coded by culture-historic stage.
Tables 6.15-6.16a summarize syntax variable values for the axial interface analysis (type 2) for the entire system (Table 6.15) and houses alone (Table 6.16a). Fascinatingly, viewed from the perspective of the houses, the characteristic temporal trends for integration and entropy were reversed, with a special emphasis on local integration. Local axial entropy from houses
decreased from 0.77 ±0.11 in the Early Iroquoian to 0.72 ±0.13 in the initial Late Iroquoian sample, although this trend was not statistically significant. Meanwhile, local integration of houses increased significantly from 1.55 ±0.14 in Early Iroquoian to 1.81 ± 0.29 in the initial Late Iroquoian (p<0.05) (Figures 6.26-6.27). The emphasis on local longhouse integration also had an impact on global integration. This indicates that the mitigative effects of longhouse angular reorganization on global visual integration and entropy discussed above not only had a generalized effect on settlement visual configuration, but had an especially profound local effect on the way that longhouse interior spaces were integrated with neighbouring houses and outdoor pathways. Comparing system-wide values to the houses alone, global entropy was considerably higher from houses than from an average system node (e.g., 1.43 vs. 1.36, respectively, for the initial Late Iroquoian sample), but local entropy was significantly lower from houses (e.g., 0.72 vs. 0.84, respectively, for the initial Late Iroquoian sample). Table 6.16b presents same data as 6.16a with the addition of two settlement phases of the early 17th century Ball village. The diachronic trends noted for the A.D. 900-1500 sample are strengthened by the addition of the Ball settlement phases, indicating that the initial Late Iroquoian pattern of reduced local axial entropy and high local integration may have been continued at large contact-period villages such as Ball.

Table 6.19 is a correlation matrix for settlement metric and axial space syntax variables for the type 1 system analysis (above diagonal) and the type 2 interface analysis for houses (below diagonal). The contrasting correlations for the system and for longhouses reveal a number of important trends. Increases in average house size and roofed-area density were negatively correlated with global and local axial integration for the exterior system (as in the VGA), but these relationships were reversed from the perspective of houses. Likewise, system local axial entropy was weakly and non-significantly correlated with house number and total roofed area ($r^2 = 0.03$ and 0.06, respectively, $p > 0.10$), but longhouse local axial entropy was significantly negatively correlated with them ($r^2 = 0.58$ and 0.36, respectively, $p < 0.001$). As settlement scale increased, then, longhouse local entropy was significantly reduced, and local integration increased in spite of the absolute decrease for the exterior system alone. It is also apparent that longhouse orientation variables, especially angular bias and clustering, had an important effect on the local integration of houses (Figures 6.24-6.25). Angular bias (Rayleigh’s Z) was particularly well correlated with the global and local axial integration of houses.
Table 6.14. Summary of axial (type 1) space syntax variables organized by culture-historic period.

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>SE</th>
<th>Min</th>
<th>Max</th>
<th>Range</th>
<th>F-value</th>
<th>p-value</th>
</tr>
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<tr>
<td><strong>Connectivity</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>EOI</td>
<td>13</td>
<td>4.92</td>
<td>1.38</td>
<td>0.38</td>
<td>3.14</td>
<td>8.07</td>
<td>4.93</td>
<td>0.10</td>
<td>0.90</td>
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<td>5.12</td>
<td>1.64</td>
<td>0.41</td>
<td>3.14</td>
<td>9.29</td>
<td>6.15</td>
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<td>ILOI</td>
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<td>1.46</td>
<td>0.39</td>
<td>3.25</td>
<td>7.41</td>
<td>4.16</td>
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<td></td>
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<tr>
<td><strong>Global Entropy</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>1.25</td>
<td>0.30</td>
</tr>
<tr>
<td>EOI</td>
<td>13</td>
<td>1.03</td>
<td>0.15</td>
<td>0.04</td>
<td>0.81</td>
<td>1.29</td>
<td>0.49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOI</td>
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<td>1.09</td>
<td>0.20</td>
<td>0.05</td>
<td>0.89</td>
<td>1.50</td>
<td>0.61</td>
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Table 6.15. Summary of axial (type 2) space syntax variables organized by culture-historic period (system-wide).
Table 6.16a. Summary of axial (type 2) space syntax variables organized by culture-historic period (Houses only).
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Table 6.16b. Summary of axial (type 2) space syntax variables organized by culture-historic period (Houses only) with the early 17th century Ball site included in LOI sample.
Table 6.17. Summary of longhouse intervisibility variables organized by culture-historic period.

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When village inhabitants made decisions about how best to site longhouses vis-à-vis each other, the axial interface analysis discussed above indicates an interest in placing longhouses so that house ends were more and more locally integrated even as villages became generally more globally segregated with growth. This raises the possibility that maintaining a number of intervisible (or at least topologically or metrically close) neighbours was a motivating factor in
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Table 6.19. Pearson correlation matrix of metric and space syntax variables for the axial system (above diagonal) and for the axial intersection of houses within the system (below diagonal) († signifies p<0.1; * signifies p<0.05; ** signifies p<0.01; *** signifies p<0.001). Underlined = only house sample significant; Bold = only system sample significant; cell outline = opposite sign for house and system samples.
Figure 6.24. Scatterplot of settlement Rayleigh’s Z value and global axial integration of houses (coded by culture-historic stage). Note that a relationship is lacking for the Early Iroquoian, but stronger for the Middle and initial Late Iroquoian samples.

Figure 6.25. Scatterplot of settlement Rayleigh’s Z value and local axial integration of houses (coded by culture-historic stage). Note that a relationship is lacking for the Early Iroquoian, but stronger for the Middle and initial Late Iroquoian samples.
Figure 6.26. Mean global (left; non-significant) and local entropy (right; non-significant) of longhouse axial interface grouped by culture-historic stage. Whiskers are standard error.

Figure 6.27. Mean global (left; p<0.06) and local integration (right; p<0.05) of longhouse axial interface grouped by culture-historic stage. Whiskers are standard error.
village planning. The average number of visible house ends (and houses in general) from all house ends in a settlement was measured for a representative sample of settlement components from each period (Table 6.17). The results of this analysis indicate consistency over time, with a nearly significant increase to 2.25 ±1.0 intervisible neighbouring house ends for the Middle Iroquoian sample. This increase was likely due to the reduction in house density during this period, which permitted more neighbours to be viewed at once. When these numbers are considered as a proportion of the total number of house ends that might be viewed (i.e., in an optimal circular arrangement), we see a significant decrease from 0.36 ±0.11 in Early Iroquoian to 0.22 ±0.09 in initial Late Iroquoian. Since the total number of houses increased in initial Late Iroquoian, and density also increased, this reduction in proportion is not unexpected. This suggests that there was no major effort to maintain a proportion of intervisible neighbours as villages grew. Rather, an absolute number between one and two, up to a maximum of four, appears to have been normal in all periods, regardless of settlement size. In turn, this indicates that increasing direct end-to-end longhouse intervisibility was not the driving force behind increasing local integration of houses in the initial Late Iroquoian, although it might have played a role in the Middle Iroquoian. This is not entirely surprising since parallel but staggered house ends, which are common in many Iroquoian settlements, will be locally integrated within two axial steps since they both face an adjacent axial space, but are not always mutually intervisible.
Outdoor Activities

An important question at this point is whether there is evidence that people’s use of outdoor space was habitually related to aspects of configuration. A sample of components with 10 or more exterior features (pits and hearths) and 1 or more middens (and excluding sites with confounding architectural phase overlaps), was analyzed with respect to the visual syntax values for each activity location. The results of this analysis are presented in Table 6.13. Consistent and significant differences were found between the typical locations of exterior features when compared to middens. Interestingly, middens tended to occur in less visually clustered, more visually controlling but controllable locations of above-average global and local visual integration, and below-average entropy. These low visual clustering locations also tend to correlate strongly with junctions between axial routes. Pit and hearth features were situated in significantly more visually clustered locations, with lower visual control and controllability, higher entropy, and lower local and global integration. At the same time, middens were rarely found in the most globally integrated positions at a site, but tended to be adjacent (e.g., at Alexandra). Likewise, features were rare in the most segregated areas of a site. In general, feature and midden-related activities tended to avoid “extreme” values on the visibility graph, clustering just above or below settlement averages. Nonetheless, significant differences in mean visual syntax values for these activity types appear to relate to their potential social contexts.

There were typically much fewer middens than houses at a site. Likewise, ceramic cross-mends demonstrate the use of middens by the occupants of several houses. Given this, it is not surprising that middens should form at or beside the junctions of axial routes between houses. The more segregated, less generally controllable situation of exterior pit-forming activities suggests that the social activities associated with them were more restricted, or participation was limited to relatively few. At Nodwell, exterior pits were also biased in favour of visibility from house end-doors, even when the conspicuous “fencing” activities at that site are taken into account (Creese 2010). In at least that case, visual surveillance of exterior pit-forming activities from specific houses supports the general inference that these types of behaviours were most often significantly more restricted in terms of social participation than was refuse disposal.
Table 6.13. Summary of visual space syntax variable values for exterior activity contexts.

**Large Villages and Small Worlds?**

So far we have focused on the way in which the otherwise negative impacts of increasing village scale on visual and axial global integration were managed in a context of rapid nucleated settlement growth between the 10th and 15th centuries A.D. I have shown how maintaining low house numbers, decreasing built density, and changing longhouse orientation patterns were all developments that permitted the conservation of exterior global spatial integration in spite of growth. However, the longhouse intervisibility analysis also shows that the goal of the builders of these settlements was certainly not to maximize the direct visual accessibility of house end doors. Similarly, the pattern of exterior features indicates that relatively segregated areas were preferred for many outdoor activities. The occurrence of randomly configured null “settlements” that were more visually integrated than some archaeological cases also indicates that the promotion of global integration was not the only, or even primary, motivation in village planning. Rather, the strong influence of longhouse orientation angular bias and clustering on the local axial integration of houses suggests that local, rather than global relations may have been in some sense the primary aim of these longhouse orientation patterns. As discussed in Chapter 5, high-density Middle Iroquoian settlements (i.e., Uren and Nodwell) exhibited higher angular dispersion and clustering than the dominant low-density group. This pattern suggests that when faced with building at high density, these communities balanced the formation of system depth (via high longhouse angular dispersion) with the local axial integration of clustered
houses. Local integration of houses would have secondarily improved global integration, but global depth was also preserved.

Was this balancing of global integration with depth and local sub-system formation a kind of spatial small-world phenomenon? The question of whether exterior settlement space exhibits small-world network topology is really only relevant when villages become large and exterior space is sufficiently complex. Small villages are necessarily small worlds in the sense that the absolute potential for system depth is low in any case. In order to explore this question, a sub-sample of initial Late Iroquoian villages, as well as Early Iroquoian and Middle Iroquoian villages with more than six houses, was selected for analysis. Since Draper was the only settlement in this sample with more than 20 contemporaneous longhouses, the large early 17th century Huron Ball site was also included for comparative purposes. As discussed above, hypothetical models of axial network topology were tested against the archaeological dataset and a comparative randomly configured null sample. Summary statistics from this analysis are presented in Table 6.18. Network terminology is used here, so that “vertices” refers to spatial nodes (that is, axial routes), “edges” to connections between vertices produced by the intersection of axial routes, “degree” to the immediate connectivity of a vertex (i.e., its number of intersecting neighbours), “density” to the proportion of edges to vertices in the graph, and “diameter” to the total depth of the system.

As was the case for the visibility graph analysis, the archaeological sample exhibited significantly higher axial global and local integration, lower mean depth, and lower entropy than its null counterpart (Table 6.18). At the same time, archaeological settlements had higher mean local clustering coefficients and higher mean degree than the null sample. Since ideal grids are globally integrated but not locally clustered, the high average clustering coefficient of the archaeological sample indicates considerable deformation from an ideal axial grid in most villages, and significantly more clustering than for the null case, where neighbouring houses at randomly determined angles relative to one another tended to produce a moderate level of local axial clustering. While archaeological villages were typically axially clustered, they nevertheless experienced significantly lower mean depth and higher global integration than their less coherently clustered null counterparts. Indeed, clustering appears to have promoted global integration, rather than inhibiting it.
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</tr>
</tbody>
</table>
Table 6.18. Summary of axial (T1) network variables for archaeological and null sub-sample

<table>
<thead>
<tr>
<th>Variable</th>
<th>Arch</th>
<th>Null</th>
<th>CC1_Norm/MD</th>
<th>Null</th>
<th>CC1_Norm/Entropy</th>
<th>Null</th>
<th>CC1erdnorm/Density</th>
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</thead>
<tbody>
<tr>
<td>Arch</td>
<td>24</td>
<td>0.34</td>
<td>0.16</td>
<td>0.03</td>
<td>0.16</td>
<td>0.87</td>
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<tr>
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<td>8</td>
<td>0.21</td>
<td>0.09</td>
<td>0.03</td>
<td>0.10</td>
<td>0.34</td>
<td>0.24</td>
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<tr>
<td>CC1_Norm/MD</td>
<td></td>
<td></td>
<td>5.19</td>
<td>0.030*</td>
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</tr>
<tr>
<td>Arch</td>
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<td>0.22</td>
<td>0.11</td>
<td>0.02</td>
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<td>0.39</td>
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<td>0.05</td>
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<tr>
<td>CC1_Norm/Entropy</td>
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<td></td>
<td>5.34</td>
<td>0.028*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arch</td>
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<td>0.32</td>
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</tr>
<tr>
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<td>0.03</td>
<td>0.07</td>
<td>0.37</td>
<td>0.29</td>
</tr>
<tr>
<td>CC1erdnorm/Density</td>
<td></td>
<td></td>
<td>4.31</td>
<td>0.047*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arch</td>
<td>23</td>
<td>4.12</td>
<td>3.48</td>
<td>0.73</td>
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<td>11.63</td>
<td>4.11</td>
<td>1.69</td>
<td>32.59</td>
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</tbody>
</table>

Figure 6.29. Scatterplot of settlement axial clustering coefficient (CC1) vs. global axial integration (black circles = archaeological sample, grey triangles = randomly configured sample).
Figure 6.29 shows that both the archaeological and null samples experienced a positive correlation between the mean axial clustering coefficient and global integration. However, at any given level of axial clustering, the archaeological sites tended to have higher global integration. The ratio of the settlement clustering coefficient to axial mean depth was calculated for each sample, and was found to be considerably higher in the archaeological case (0.34 vs. 0.21, p < 0.05; Table 6.18). This combination of high global integration (low mean depth) with relatively high axial clustering is what we expect to find in a small-world topology. But there are problems with this interpretation. Not only was mean depth low and clustering high in the archaeological sample, but the proportion of edges to vertices (network density) was also much higher. This means that, rather than representing a signature of locally “cliquey” sub-network formation, high clustering coefficients in the archaeological sample were largely the result of the high connectivity of a relatively few vertices. In other words, most archaeological villages in the sample exhibited high global integration and axial clustering because their topology constituted a single integrated cluster or clique. As a result, network diameter (i.e., total system depth) was significantly lower for the archaeological sample than for the null (at 3.08 vs. 4.31, respectively). In villages with fewer than about 10 houses, longhouse arrangements normally appear to have reduced exterior axial complexity (thereby reducing the number of axial routes or vertices relative to the null case), and promoted axial clustering, improving the overall connectivity of the system. The relevant question now becomes whether there is evidence for small world organization (in the sense of integrated sub-networks) in settlements with sufficient axial depth and low-density graphs. The primary candidates in this sample are phases of Alexandra, Draper, Nodwell, Ball and Elliott. These settlements each had 10 or more contemporaneous houses, and produced a minimum of 12 axial lines.

Returning to Figure 6.29, it is evident that these large systems generally exhibited lower clustering coefficients and global integration than smaller systems (with the exception of the Alexandra phases). Nevertheless, the much larger networks at Draper (with up to 40 vertices) and Ball (56 vertices), show significantly higher global integration at similar levels of axial clustering in comparison to their null counterparts, suggesting that, in contrast to the null sample, clustering was directed so as to reduce system depth and increase global integration. One way to identify significant levels of local clustering is to normalize the clustering coefficient by the clustering coefficient of a randomly generated network (importantly, distinct from the randomly generated settlement plans) with the same number of vertices at the same network density. Randomly generated networks at high network density will typically lead to high clustering.
coefficients, since the system will act as a single large cluster. However, as network density decreases, randomly generated networks will produce significantly less locally clustered graphs than a hypothetical small-world network composed of locally clustered sub-systems.

When settlement clustering coefficients were normalized by their Erydos-Renyi random values, the null sample turned out to have relatively high clustering for its relatively sparsely connected graphs. The large archaeological settlements also exhibited relatively high clustering for their reduced network densities, although not as high as the null sample. The significant question, however, is whether the archaeological villages exhibited higher global integration for their level of clustering relative to the null sample. The ratios of settlement global integration and connectivity to the Erydos-Renyi normalized axial clustering coefficient were calculated for each settlement. Mean global integration, and especially mean connectivity were both higher relative to their Erydos-Renyi normalized clustering coefficients as compared to the null sample. In short, in large settlements, particularly Draper and Ball, exterior axial network topology was relatively clustered for its density compared to a comparable scale-free random network but, compared to their null counterparts, these settlements had significantly higher global and local integration at the same level of relative clustering. Figure 6.30 is the scatterplot of the Erydos-Renyi normalized clustering coefficient vs. axial connectivity. It is evident that while relatively clustered settlements had higher local integration, the archaeological cases were significantly more integrated on average than their null counterparts, though slightly less relatively clustered.
These data support the inference that, while small villages were highly axially clustered, high in global integration, and low in mean depth, these villages were not large enough to be organized into several sub-networks or cliques linked through relatively few connections. However, villages with 10 or more houses tended to experience relatively higher axial clustering than expected for their lower network connectedness, and higher global and local integration at these levels of clustering than exhibited by their randomly configured null counterparts. Such a pattern is consistent with a model of incipient small-world networks emerging as villages increased in scale and especially in house number at the end of the 14th century.

Discussion

Taken as a whole, these results indicate that nucleated village growth did not occur in a haphazard manner, but was patterned in coherent ways in spite of being variable from settlement to settlement. Trends in the dimensions of village growth, longhouse spacing, and orientation patterns all appear to have conserved global visual and axial integration relative to what otherwise might have been. I have emphasized the role of reductions in built density in the Middle Iroquoian, and reductions in longhouse angular variance and increasing clustering in the initial Late Iroquoian, but it is also instructive to consider the trajectory of integration and entropy during the Early Iroquoian period. At the Early Iroquoian rate of increase in global visual entropy with roofed area, other things being equal, the average initial Late Iroquoian village of about 3600 m² in roofed area would have experienced global entropy in a labyrinthine range of 2.5 - 3.5. While Iroquoianists have tended to consider internal economic (Trigger 1976), demographic (Warrick 2008), or kin-based (Kapches 1990) reasons why longhouses emerged and grew, it is worth considering the significant impact this trajectory of growth had on the complexity of outdoor village space. Outdoor space remained relatively shallow as long as villages grew by increasing house size rather than number. This promoted the visual and axial integration of outdoor space even as the focus of much village social interaction must have turned inward toward the expanding longhouse and its continuing social and material constitution. Together with decreases in built density in the Middle Iroquoian, followed by increases in angular clustering in the initial Late Iroquoian, all this permitted the avoidance of otherwise sharp reductions in global visual and axial integration with growth.

What I will call a principle of “conservation of integration” appears to have been a critical element in the development of Iroquoian village organization over time. Although achieved differently in different settlements, global spatial integration was conserved. Moreover,
while the variability in syntax values in the sample was significant (militating against the inference that a structural “template” for village organization was dominant at any given time), variability was considerably lower than in the randomly configured “null” dataset. This underlines the fact that a particular set of organizational procedures was drawn upon and variously deployed in the configuration of Iroquoian villages over time. With that said, it is almost certainly a mistake to infer that the “conservation of global integration” was of direct concern to the builders of these villages. Since this principle is most clearly evident over the long term and at the regional scale, it is important to avoid teleology with respect to its causes. Setting aside for now the issue of the emic understandings or discursive motivations of past decision-makers, we can treat this pattern as an emergent property of village organization over the long term. From this perspective, it is intriguing to note that a similar pattern has been hypothesized to be a regular feature in the successful scaling-up of human settlements. Hillier et al. (1993) have argued for a “principle of sufficient axiability”, whereby the intelligibility of a spatial system is maintained by “…scaling spatial elements upwards to preserve the intelligibility and functionality of the system in accordance with the size of the system, and to keep both within the compass of the peripatetic observer... (1993: 65).” Increases in house length rather than number, reductions in angular dispersion and increases in angular clustering all promoted the “axiality” of Iroquoian villages with growth. If Hillier et al. are correct, the conservation of integration with village scale relates to a general process by which the intelligibility of spatial systems is maintained with growth. Whether or not this is a kind of cross-cultural socio-spatial imperative, we can conclude that, at least within the context of 10\textsuperscript{th}-to 15\textsuperscript{th}-century Ontario Iroquoian villages, the maintenance of subjects’ experience of outdoor village space within a relatively narrow range of visual and axial depths and network disorders was an important result of the configurational decisions made as villages were built and rebuilt.

The significance of this pattern can be better understood when we consider more precisely how village spatial structure developed and changed over time. Mean global visual and axial integration are generalized system properties and, as we have seen, can be influenced by numerous aspects of village metrics and organization, and might be promoted by a variety of organizational forms. Nor do these measures tell us about how interior spaces interfaced with the exterior, or how particular types of outdoor activities were situated with respect to them. In attempting to understand the relationship between the development of spatial network form and the accessibility of house interiors and outdoor activities, it becomes evident that maximization of global integration cannot have been the primary goal of village configuration. Global depth
was certainly permitted, or even promoted in cases. The situation of various outdoor activities was sensitive to differences in visual integratedness and control. On average, pit-forming activities occurred in more visually segregated and uncontrollable locations as compared to middens, indicating the importance of gradients of depth in the structuring of various outdoor practices.

Longhouse interface analysis indicates that the primary result of configurational changes (particularly in decreasing longhouse dispersion and increasing orientational clustering) was to promote the local axial integration of house ends. These changes had a weaker, secondary impact on global axial integration, both of the system in general, and of houses. Meanwhile, global entropy was increasingly divorced from local entropy with settlement growth. Local axial entropy from houses was significantly lower in large Middle and Late Iroquoian villages, while global entropy, both of the system in general, and from longhouses, remained higher. Large villages such as Draper, Robb, Ball, Alexandra, Carson, Nodwell, and even Uren to a lesser extent, show a particular disjunction between global and local axial entropy. Longhouse clustering patterns produced relatively low local entropy and high global integration at these sites, while global entropy was also relatively high. All of these settlements contained two or more longhouse orientation clusters, producing a divergence between local and global order.

This evidence leads to two important inferences:

(1) global visual and axial integration were conserved with nucleated settlement growth as a secondary outcome of specific efforts to increase significantly the local axial integration (though not necessarily direct intervisibility) of longhouses in large or dense settlements

(2) the maintenance of global order in such settlements was balanced against the formation of locally integrated and ordered sub-systems

It is apparent that the relative diachronic stability and narrow range of settlement integration values documented in the sample indicates that global integration was held in balance in most successful settlements: neither extreme topological segregation nor shallowness was the primary goal (or at least result) of village configuration. Rather, global integration was preserved by the promotion of local longhouse axial integration, a pattern that in large villages implied the maintenance of some degree of global depth and, particularly, entropy. Examination
of the network topologies of the exterior axial systems at settlements with more than 10 houses also leads to the conclusion that they share certain characteristics with small-world systems, as compared with grids or regular lattice graphs. These include high clustering coefficients for their graph densities, and high global integration for their clustering coefficients relative to a randomly configured comparative sample. Small worlds permit the balancing of locally dense and intensive connections of spatial nodes with the maintenance of global integration, without equally dense global interconnections.

**Spatial Topology and Social Experience**

Having described the organizational patterns of village spatial topology in detailed but rather abstract terms, it remains to be seen how these spatial relations were associated with daily experiences of inhabitation and, further, social dynamics. It is difficult to overestimate the interpretive leap that occurs when attempting to relate a reductive system of axial lines to the actual patterns of habitual movement within villages. Nonetheless, the method provides a measure of systemic structure that, short of the preservation of footpaths themselves, is our best hope of describing the probable patterns of use of and movement through outdoor space.

So what was the significance of small-world axial structure for the everyday experience of space? Axial clusters occur when a set of three or more axial routes are all direct neighbours; that is, they are all mutually accessible to each other through one axial step. Described geometrically, they can take the form of “triadic circuits” and “radial foci”. A triadic circuit occurs when three axial routes form a triangle around a built structure, or set of built structures. A radial focus occurs when three or more axial routes all intersect at a junction area, creating a radial pattern of converging routes. Radial foci and triadic circuits can form various combinations, producing more or less local or global integration. Clustering by radial foci can be identified when a settlement’s mean relativised clustering coefficient is strongly positively correlated with axial connectivity, a pattern that was observed in the archaeological sample of large villages.

Interestingly, a single radial configuration of longhouses, such as that found in the early phases of Draper (Figure 6.28), produces a graph rich in both kinds of axial clustering. Movement around a single house or pair of houses typically involved traversing a triadic circuit. However, each triadic circuit participated in a much larger radial focus, composed of all the adjacent circuits coincident through the junction area in the “plaza”. A large number of axial routes were made mutually accessible in this configuration, while at the same time multiple
circuits were drawn in to form a unified system that was both distributed and symmetric. When we compare a randomly configured counterpart to the Draper radial core of phases A and B, we find that, while the random configuration is rich in triadic circuits, these do not participate in a unified larger radial focus, and so mean connectivity is lower, and total depth, higher.

From the perspective of local movement, this pattern achieves several things:

(1) it minimizes the possible exterior depth between the two ends of a single house
(2) it constitutes outdoor space such that the shortest topological route is almost always through the “plaza” area, except when a destination space is already adjacent
(3) if longhouses are themselves used as routes, they participate in, and add to the density of the cluster of circuits.
(4) if longhouse access was primarily through house ends, then topological (and metric) distance between houses was minimized on the “plaza” side, and not more than one axial step deeper from house to house on the “outer” side.

This means that constituent houses in a radial cluster were more or less equally accessible to each other, and typical routes around houses, or from house to house, would have tended to intersect in the same locations, particularly in the “plaza” area adjacent to house ends. As mentioned earlier, areas of axial intersection correlate strongly with low visual clustering in the VGA. Somewhat counter-intuitively, then, axial clustering is associated with low visual clustering. This explains why visual clustering was significantly lower in the archaeological sample as compared to the null, as low visual clustering corresponds to the formation of axial foci. Not only did these promote local integration, they can be considered important decision points; areas from which an array of potential routes were available.

As villages became large enough, axial clusters did not increase in size indefinitely. Rather, multiple clusters emerged. These clusters were not linked haphazardly, however. Instead, key axial routes (or network “hubs”) tended to directly link locally clustered foci, so that global integration was maintained. The network graphs of Draper phase E and Ball phase B illustrate that densely clustered sub-networks were all topologically “close” to each other at the centre of the graph (Figures 6.31 and 6.32).
Figure 6.31. Kamada-Kawai free energy representation of network topology at Draper Phase E (rendered in Pajek).

Figure 6.32. Kamada-Kawai free energy representation of network topology at the Ball village (rendered in Pajek). Note the formation of densely interconnected sub-regions.
Still yet another level of clustering lay below these patterns in exterior space, to the extent that the longhouse itself acted as a kind of spatial cluster. Setting aside a detailed discussion of longhouse interior spatial organization for Chapter 7, its basic arrangement of shared central hearths in a relatively integrative corridor area, and segregated from outdoor space by vestibules at both ends, suggests its importance in local (interior) spatial integration. From this perspective, the Iroquoian village small-world system emerged as soon as the preponderance of village growth began to be directed inward toward longhouse expansion. As long as houses were few and long, local connections inside the house were strong, and system global integration remained high. As villages began to increase in house number, especially after the 14th century, outdoor space too began to be globally integrated but axially clustered. These exterior axial clusters, it turns out, were effectively clusters of clusters; an emerging secondary level of spatial ordering that mirrored the primary intrahouse level.

This multi-level small-world system is likely to have influenced the scales and settings of various kinds of social encounters within village space in particular ways. Arguably, it impacted the relative intensity and predictability of (at least chance) social interactions of subjects as they moved through the village environment. Space was structured so that the intensity of regular interactions was inversely proportional to topological distance from household space. Encounters immediate to a subject’s interior household space were the most intensive, routine, face-to-face, even “obligatory” given the sharing of hearths by paired nuclear families. Simultaneity and mutual accessibility were thus highest locally. This had the effect of making the scale and context of probable encounters limited and predictable throughout the system. An inhabitant would have known who he or she was likely to meet in various areas of the settlement, with the highest predictability and greatest limits at the house level, followed by the local focus of clustered circuits, followed by “hubs” linking several sub-areas of the settlement. The small world system thus limited the typical human scale of intensive, regular encounters, and likewise limited the scale and probability of encounters with less well-known individuals while maintaining low overall topological depth.

It is helpful to contrast this arrangement with that of an ideal grid, which also promotes global integration. Grids are globally integrated because they are densely connected. This means, however, that encounters with any inhabitant of the system are about equally likely in any axial space. As an ideal grid expands, this high density of network connection is maintained through a corresponding increase in the connectivity of each space or axial route with many others on a global scale. As grids grow, then, the increasing social scale of possible encounters
is felt throughout the settlement, and the predictability of specific encounters in specific areas decreases. By contrast, randomly configured settlements have local clustering, but it is arranged so that settlements are deep and disintegrated. This means that the ease of interaction between sub-areas is reduced, and global communication is more likely to be difficult.

Local Quality vs. Local Exclusion

It is important to emphasize that this evidence does not indicate that access to locally clustered foci was easily controlled, or that exclusion and segregation of sub-groups was an important aspect of configuration (although it may have been in some cases). Indeed, the very observation of axial clustering implies a centripetal deformation of the grid so that many routes are drawn in toward a focus from across space. This is the opposite of visual clustering, which occurs when a large space is bounded on most sides. Axial space was highly distributed. This is reflected in low visual and axial controllability values across all periods. So if axial foci did not effectively segregate or control well-delineated sub-spaces, how did they influence the experience of village space? The temporal dimension is the key factor here. As the network graphs of Draper Phase E and Ball indicate (Figures 6.31 and 6.32), it was normally a single axial step from one network focus to another. This lack of depth notwithstanding, these foci could only be experienced sequentially, rather than simultaneously. In short, they promoted a local spatial quality without requiring local exclusion.

Small Worlds and Sequential Hierarchies

The general “local-to-global” logic of village spatial organization identified here has important structural parallels to elements of contact-period Northern Iroquoian socio-political organization that I have suggested may have been consonant with a pattern of sequential hierarchy, or perhaps more accurately, heterarchy. In Johnson’s original work on the subject (1982), he argued that the communication stress load experienced by members of a social group increased exponentially with the number of basal decision-making “units” due to fundamental limits on the human capacity to process information. He proposed that socio-political organizational forms serve to reduce the impact of information and communication stress in larger groups by reducing the number of decision-making units through either simultaneous or sequential hierarchies. In sequential hierarchies, the formation of integrated organizational units (these might be residential, kin, or larger groups such as clans or sodalities) promotes communication and decision-making within such subgroups whose decisions are represented as
unified positions at the community level. This in turn permits consensus to be reached at the global level by a relatively few sub-group representatives. Johnson’s model thus anticipates that settlement population growth will lead to the expansion in size of basal organizational units so as to maintain organizational scale at the “system” level.

This model of socio-political structure seems to mirror the topological organization of village space so far described, where local spatial integration and sub-system formation were intensified and expanded as total village population increased. The emergence of the longhouse as the primary “vector” of growth in village built area (at least until the end of the Middle Iroquoian period) seems particularly compelling support for a model of Iroquoian sequential hierarchy. The earliest Ontario Iroquoian settlements exhibit a diversity of house styles, only some of which show evidence of having been multi-family dwellings (see Chapter 7). Between the 10th and 12th centuries, the multi-family longhouse became the dominant form, and once established, began to expand rapidly. As discussed in Chapter 5, growth in house area alone accounted for the four-fold expansion in total village roofed area between the Early and Middle Iroquoian samples. If the residential groups occupying longhouses acted as fundamental “organizational units” within the village, this expansion in house size, rather than number, would have permitted major increases in settlement population without appreciable increases in the organizational scale of the community. Further, the small-world-like pattern of the axial networks of villages with numerous houses suggests that a secondary level of supra-house organizational unit may have emerged as an “upward extension” of the sequential hierarchy when houses were unable to absorb growth completely.

Beyond “Fitting” Models

From a “model-fitting” perspective, this isomorphic convergence of spatial organization with a social model of sequential hierarchy appears rather strong evidence for the model, assuming that socio-political development was reflected in architectural arrangements. In many ways, such a conclusion might place the present work as a refinement of the clan barrio hypothesis for longhouse clustering (if clans emerged to structure longhouses into secondary “organizational units”). However, this conclusion is problematic. It assumes that the definition of politically relevant “organizational units” was stable over time, unified, internally homogenous, and rather directly reflected in spatial organization. Moreover, it provides no explicit explanation for how such a pattern should come about, except its inferred function in promoting social cohesion by reducing communication stress. But there is a distinct danger of
tautology when the apparent social functionality of sequential order is considered sufficient to explain its emergence.

From a perspective of practice, social structures that we might call “organizational units” are never finished, objective entities, but always in a state of *becoming*: social definitions require a great deal of social work for their continued existence at all levels, and alternative definitions and arrangements continually threaten to breach any sanctified categorical boundary. From a pragmatic standpoint, we need only consider the different social experiences of the “longhouse” as a (potentially) well-defined residential and social category. Even if concepts of kinship and post-marital residence, lineage segment unity, continuity, rebirth, rights to trade routes, collective “ownership” of the products of agricultural labour, and so on, all served in the same *emic* definition of the longhouse group as a unified political “unit” in the 13th and 14th centuries, it can hardly be said that such a unit was socially and phenomenologically constituted in the same way when its typical population was 20 and when it was 80. The scalar extension of a social category is therefore by no means a simple metric operation. Changing social experience will become increasingly dissonant with shared conceptual orders unless they are continually reworked, reproduced and once again reified. In the terms of Johnson’s sequential model, the maintenance of system “organizational scale” by “unit extension” with population growth is only ever a half-truth, one that can hold only as long as “unit definition” can be convincingly realized in praxis.

When the apparent objectivity of social structure is recast in this light, we can begin to understand its continual ontogeny, and to consider the social “work” involved in such a process. As I emphasized in the chapter introduction, practical engagement in the world sits at the crux of the material – social recursion. A great deal of the social “work” involved in structuration is inevitably carried out through the material world, not merely as emblems of predetermined social classes, but as an inherent, inescapable component of structuring practices (see also Chapter 2). Rather than viewing village spatial order as a kind of epiphenomenal reflection of a logically prior social structure, we would do better to consider how it played a role in socio-cultural constitution.

Returning to our discussion of how village topology structured spatial experience, we can now draw the constitutive links between spatial patterns and social dynamics. As Fletcher (2004) has argued, settlement organization will have distinct social effects that go beyond the intentionality of individual agents. In particular, social interaction stress associated with nucleated settlement growth can be mitigated by the way in which spatial arrangements influence everyday interactions. I suggest that the “local-to-global” order of Iroquoian villages was
experientially *consonant* with sequentially ordered patterns of habitual social interaction. By promoting relatively intense and predictable local interactions, and limiting the scale and intensity of global interactions while maintaining global integration, spatial order was itself instrumental in promoting a fluid, informal network of interaction probabilities that resembles Johnson’s sequential hierarchy. In this case, however, the social group is not a culturally prescribed political category, but a rather more intangible quality of everyday social experience in village life. The spatial system fosters shared activities, surveillance, predictable daily encounters, and rapid communication along a gradient of levels from the local to the global that will tend to produce a parallel gradient of intimacies, confidences, interests, alliances, and factions with varying levels of historical depth, formality, common knowledge, and “legitimacy”. This does not require that a one-to-one correlation between “clan segment” and “house cluster” existed in any regular way. Indeed it is quite possible that spatial sub-networks cross-cut kin-based socio-political groups, in much the way sodalities have been thought to promote social cohesion by cross-cutting lineal ties. The lack of strong boundary formation between spatial sub-networks (and the highly distributed nature of village organization in general) suggests that they were associated with probabilistic interaction networks rather than well defined socio-political units. Further support of this comes from the observation that, although house orientation clustering was found to be associated with axial network clustering, axial foci often incorporated intersecting triadic circuits from distinct angular house clusters. We cannot draw a direct line, then, between longhouse orientation clusters and axial sub-networks. At large sites, axial sub-networks more frequently integrated *multiple* angular house clusters. This suggests that, even if pairs or groups of aligned houses did house clan segments (or some other formalized supra-house social group), axial clusters more properly promoted some level of grouping above these clan segments but below the village as a whole. Given that house clusters at Draper have been convincingly argued to result from the serial coalescence of several independent neighbouring communities, I favour the hypothesis that angular clusters or aligned groups of houses resulted from the formation of supra-longhouse factions or alliances of highly variable formality, interaction intensity, and duration. They are most likely often indicative of individual histories of community fusion and fission, as alliances of varying levels of cohesion and political stability were made, re-oriented, expanded, shifted, or broken.

This alternative view of the relationship between space and social order provides some additional purchase on the thorny issue of causation. Following Fletcher, I argue that the mismatch between material and spatial relations on the one hand, and social structures and
ideologies on the other, is worked out in practice. From this perspective, it is not so much the isomorphism of space and society that is of primary interest, but the imperfection of the recursion between the two. It is this indeterminate reflexivity that is profoundly productive of social change.

The instability of social dynamics in stressful contexts will be exacerbated by certain spatial arrangements. For instance, where competing, suspicious, or blatantly hostile factions occupy a dense, nucleated community, maximizing global spatial integration will bring faction members into direct and regular contact in a manner that has the potential to heighten the tensions, particularly if the ultimate cause is scalar interaction stress. On the other hand, community-level decision-making and social cohesion might erode when spatial depth and disorder dominate. In many ways, the social factions that emerge from stressful contexts are an “un-pacified” version of Johnson’s “organizational units”. The reality of conflict, as much as the promise of social cohesion, is the impetus for factional formation. In the short term, factional disputes may produce violence, and community fission. However, at the same time, the proximate interests of factional group members in maintaining factional cohesion in opposition to some competing external threat means that internal social integration will be promoted. Group decisions may therefore tend to favour the reorganization of spatial arrangements so as to promote integration with allies and segregation from enemies. This spatial – social dynamic between unity and division at various scales is, I believe, ultimately responsible for the emergence of small-world spatial networks in the development of the Iroquoian village.

A lingering question is why village growth, particularly in the form of house and village mergers, occurred at all. If conflict was a condition of nucleated settlement growth, why not avoid it by following a dispersed settlement pattern? Here we must return to the hypothesis presented in Chapter 2, that the progressive extensification of collective social groups in Northern Iroquoian societies was the result of people’s engagement with increasingly delayed-return material practices (house-building, land clearance, horticulture) in a manner that was consistent with (i.e., that appeared not to threaten) longstanding egalitarian social structures and mutualistic economies. In such a context, ownership, wealth, power, and personhood all had to be constituted in terms of collective values and relational identities, and were therefore made possible (and socially legitimate) only through the expansion of collective social groups.
CHAPTER 7
LIVING AS ONE: DUALISTIC TENSIONS IN LONGHOUSE LIFE

...the forms people build, whether in the imagination or on the ground, arise within the current of their involved activity, in the specific relational contexts of their practical engagement with their surroundings. [Ingold 2000: 186]

Introduction

The relationship between dwelling and building is a central problem in the archaeological interpretation of built environments, since building organization is not always (or, in fact, ever) perfectly isomorphic with discrete social categories or activities (Allison 1999; Fletcher 2004). Household archaeology, originally a project of the processual movement (e.g., Wilk and Rathje 1982), has typically focused on a search for the material “correlates” of social categories and system types (Kent 1990; McGuire and Schiffer 1983; Whiting and Ayres 1968). This middle-range enterprise has revealed an interpretive problem, as ethnoarchaeological and ethnographic studies demonstrate a lack of consistent fit between social entities such as the family, and the number, size, or organization of the buildings they inhabit (David 1971; Horne 1982; Jacobs 1979). In spite of the excavation of hundreds of longhouses in southern Ontario over the last quarter-century, the problems associated with relating built form to social life are nowhere more apparent than in this region (e.g., Birch 2008); indeed, especially so, since we cannot complain about the inadequacy of the record, or a lack of relevant ethnohistoric documents.

The problem has its source in the way that the archaeological record has been understood. An enduring essentialism regarding the relationship between built form and culture can be identified across a range of interpretive approaches to domestic life in the region, and results from the pervasiveness of what Ingold has called the “building perspective” (2000: 178). This position is idealist in that it supposes that the physical form of houses reflects a set of preconceived cognitive models of spatial order (see Rapoport 1994). Buildings are themselves epiphenomena; outward “material expressions” of an inward ideational or cultural blueprint. Material variation in architectural form can, from this standpoint, best be explained by differences in cultural blueprints, or the failure to achieve an architectural goal because of material constraints (such as topography, the availability of tools or raw materials). Following Ingold (2000), I argue that this building perspective artificially dichotomizes building from dwelling, architect from inhabitant, and more generally, social life from its material immersion in the world (Latour 2005: 34-35).
In Ontario archaeology, this building perspective is responsible for the frequent equation of the longhouse as a built form with Northern Iroquoian cultural identity, and with a matrilocal-matrilocal kinship and post-marital residence pattern (Birch 2008; Kapches 1990, 1994; Morgan 1965; Noble 1975; Trigger 1976b, 1978). For instance, practitioners of culture-history in the region have identified the longhouse as a “diagnostic trait” of the Ontario Iroquois Tradition (Wright 1966), and as one of several necessary conditions for the classification of a settlement as a “formal” Iroquoian village (Noble 1975).

As an empirical matter, multifamily bark or mat-covered longhouses were common in a broad east-west swath of the eastern woodlands at the time of aboriginal contact with Europeans, across a diverse range of linguistic, economic, social, political and physical landscapes. Longhouse-using groups included Algonquian-speaking chiefdoms of the Middle Atlantic (e.g., the Powhatan confederacy [Barbour 1986]), interior Algonquian-speakers of the Hudson and Delaware river valleys (the Mahican and Delaware [Dunn 1994]), Northern Iroquoian-speakers from the lower Saint Lawrence river valley in the east to Lake Erie in the west, and from the Susquehanna river valley in the south to the edge of the Canadian Shield in the north (Snow 1994; Trigger 1976b), central Algonquian groups of extreme south-western Ontario, northern Ohio and Michigan (Fitting 1970), and further west, the Siouan-speaking Oneota villagers of Illinois, Iowa and Wisconsin (O’Gorman 2001).

Unfortunately, Iroquoian longhouses have to date not been studied within this wider universe of longhouse societies of the Late Woodland, and a thorough review is beyond the scope of the present study. However, both the longhouse and “Iroquoian-style” ceramics have distributions that challenge the essentialist model of Iroquoian ethnic identity that has been applied to a variable record (Chilton 1999). It is interesting in this light to consider Kapches’ statement that, “…longhouses can be interpreted as examples of architecture designed to express cultural messages. The makers were Iroquoians who shared cultural tenets and engineering plans; very specifically, the clearest message was ‘we are Iroquoian’ (1993: 156).” This conclusion is perhaps understandable in the context of Kapches’ study of a limited number of Middle and Late Ontario Iroquoian longhouses. Yet, it reveals a tendency to equate an architectural form with the defining “cultural tenets” of an ethnic category (Iroquoian), even when this makes little sense from a macro-regional perspective. I am not arguing that the longhouse was not an integral part of Iroquoian economic, social, political and symbolic life – indeed, I will argue just the opposite throughout the chapter. Rather, I am proposing that the longhouse must be approached as an historical product of dwelling; that is, as an active material
player in the development of Iroquoian economic, social and political life. As such, it was variable in time and space, within “Iroquoia” and beyond, and was refined and recreated by builders and dwellers in each instance of its construction and use. The longhouse was not, then, an automatic reflection of an institutional matrilineal-matrilocal tribal system that communicated an essential Iroquoianness; rather, it was repeatedly deployed as a material “actor without intent” (Fletcher 2004: 112) in the practices that conditioned social life in a variety of communities.

None of this is to say that ideas and practices related to descent and the maternal line were not closely connected to the concept of the longhouse, its social constitution, and possibly its symbolic and ritual “incorporation” as an institutional body within Iroquoian communities. Ethnohistoric evidence suggests that this was the case at the time of contact with Europeans in the early 17th century. However, this association must have emerged over the course of history. The evidence from neighbouring non-Iroquoian regions tells us that the relationship between the longhouse and the culturally particular arrangement and classification of social groups in Iroquoian societies was unique, and given neither in the exterior form of the house, nor in the economic and environmental conditions of maize horticulture in the Northeast.

A Way Forward

So why study the house if not as a “litmus test” for institutions such as matrilineal kinship, clan segmentation, and tribal affiliation? Birch (2008) has recently dealt cogently with the problems related to correlating material patterns in the archaeological record with Iroquoian kinship as it has been constructed by anthropologists such as Morgan. She argues that the application of generalized models of kinship in archaeological interpretation has tended to suppress evidence for, “…the variable and contingent nature of social relationships as they existed in practice (2008: 194).” I agree, and suggest moreover that we need to recognize that these modeled systems were real only to the extent that they were practiced and imagined in the past. As Pauketat has pointed out, institutions, “…were realities, and not our own impositions, if and only if people in those times and places embodied the institutions, lived the institutions, or acted as if they were real. The embodiment or the action – the practicing of the institutions – was reality, not the institutions themselves (Pauketat 2007: 40).” This position moves analytical emphasis from the mechanical identification of essentialized social categories, to the study of their constitution. The point, then, is to explicate the generative role of material and spatial engagement in the social (Fletcher 2004; Latour 2005; Pauketat and Alt 2005). In adopting a dwelling perspective, the primary aim of this chapter is to identify how the physicality (to adopt
Pauketat and Alt’s phraseology) of the longhouse was variously experienced and employed in the ongoing constitution of Iroquoian systems of social order and identity.

Attending to the physicality of the longhouse means identifying several related elements of its involvement in the scaling and structuring of daily practices, social interactions, and ritual performances. The central analytical approach used in this chapter is the juxtaposition of methods that emphasize the absolute and relative scaling of the basic durable architectural elements of longhouse form (e.g., house length and width, support post arrangement, end-vestibule and side bench dimensions), and methods that emphasize the habitual patterns of space-use, including patterns of reconstruction, behavioural orientation about the central hearth row, and the relational patterns of spatial experience that these engendered. The first of these methods places an emphasis on the physical boundary and the implementation of anticipated requirements for the material shell of the house. The second approach draws attention to *foci*, patterns of repeated emphasis in the “lived dispositions” (to borrow a turn of phrase from Pierre Bourdieu [1977]) of inhabitants accumulated over years of use, remodelling, and abandonment.

Perhaps because of a post-enlightenment tendency to envision social categories such as “individual”, kin, class, or gender as un-problematically bounded cultural givens, and a western architectural canon that materializes these classifications through the ubiquitous use of durable walls and fences, studies of spatial order in non-western contexts have emphasized the significance of boundary formation at the expense of other structuring processes (e.g., Hillier and Hanson 1984; Holl and Levy 1993). From a dwelling perspective, however, planned physical boundaries cannot hold analytic priority over the patterned remains of daily practices if we are to be capable of recognizing historically unique modes of “being-in-the-world” (*sensu* Thomas 2004). I propose the “*focus*” as another way of thinking about how daily activities and social groups were spatially ordered, one that privileges the accumulation of quotidian practices over planned architectural divisions. A *focus* can be defined as a locus of patterned recurrence, of emphasis and reemphasis in the landscape of domestic space. *Foci* are frequently conditioned, though not determined, by the presence of durable features. Unlike spaces defined by walls, however, *foci* are more fluid, permeable, and, importantly, multivalent. As a result, *foci* can act simultaneously as boundaries and centres; points of integration and segregation at different spatial and social scales. The related but distinct characteristics of these two subjects of analysis make interpretation of the variable use and articulation of physical boundaries and *foci* a complementary project. The results of this approach turn out to be particularly useful for
understanding the generation of Iroquoian habitus and related concepts of personhood and community.

**Methods**

To this end, “traditional metric” and distributional methods were applied to a sample of 157 longhouses that was primarily drawn from the village sample explored in the previous two chapters (Table 7.0). Contextual data on human and animal interments were also considered in light of the diachronic patterns. Finally, ethnohistoric sources are drawn upon in an exploration of changing patterns of domestic spatial organization.

*Traditional Metrics*

Traditional metrics of Iroquoian domestic spatial organization involve the measurement of a number of basic elements of longhouse size and shape, including maximum length and width, length and width prior to and after remodelling that included expansions and contractions, and longhouse area, hearth number, and inter-hearth distances (Dodd 1984; Finlayson 1985; Warrick 2008; Warrick 1984; Wright 1974). A number of other metrics involve varying degrees of interpretation, including the measurement of interior spatial elements such as side platforms and end-vestibules (see Table 7.1, Figure 7.0). An effort was made to use measurements comparable with Dodd’s (1984) extensive study of predominantly post-A.D. 1450 longhouses. New measurements made here include the distance between central “post-cluster structures” (or PCS’s) that some have interpreted as sweat-baths (Stopp 1989; Tyyska 1971), and the distance from end hearths to end walls separating corridor from end-vestibule space, where present. Also included where discernable were the relative proportions of bunk, corridor, and end-vestibule space making up a house, in a manner similar to Kapches’ “spatially dynamic” approach to longhouse organization (1990).

Important issues that are addressed using these data relate to changes in the scale of houses and household domestic groups, the first appearance of multi-family houses, the rates of longhouse expansion over time, and the development of architectural regularities and proxemic patterns. Existing hypotheses that will be examined include Kapches’ suggestion that there was a significant increase in the proportion of “organized”, (i.e., functionally-specialized space) in houses after the beginning of the Middle Iroquoian period (1990). I will also assess evidence for an increase in the spacing of hearths in early 15th-century longhouses (Varley and Cannon 1994; Warrick 1994).
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Table 7.0. Longhouse sampling by site in Chapter 7.
Table 7.1. Longhouse hearth area sampling by site in Chapter 7.

Distributional Analysis

The traditional metrics discussed above provide the possibility of identifying important changes in basic well-known aspects of longhouse scale, hearth spacing, and interior spatial subdivision, particularly with respect to historically-documented structural features such as side-platforms, end-vestibules, and central hearths. However, this focus on historically documented features constrains our ability to identify different organizational patterns and structural features that did not survive into, or were simply not recorded, in the contact period (e.g., semi-subterranean lodges). Kapches’ “spatially dynamic” approach is problematic in this respect, since she assesses the relative proportions of “organized” and “disorganized” house space based on the identification and measurement of bunk (side platform), hearth area (vaguely defined), and end storage cubicle zones (1990). Her approach explicitly excludes patterns in what she calls “temporal” features such as pits and small internal posts, as well as support posts that do not
Figure 7.0. Basic metrics of longhouse space measured in this study: a, side platform width; b, inter-hearth distance, measured from hearth midpoint to midpoint; c, end hearth – end wall distance; d, end-vestibule length; c+d, end hearth – house end distance; e, end taper length; f, house width; g, inter-PCS distance, measured from front edge to front edge; h, extension/contraction length; i, minimum house length; h+i, maximum house length.

fall within expected positions defining the “benches” (1990: 51). This methodology ensures that organizational patterns that are contrary to anticipated spatial categories will not be recognized. Her conclusions, then, can only be taken to indicate shifts in the relative proportions of house space allotted to historically-attested “organized” spaces defined by super-structural support members. Moreover, the basic premise that corridor space was more “disorganized” or less specialized than, for instance, end-vestibule space, remains untested. The observation that Early Iroquoian houses had less space devoted to 17th century “organized” categories seems a foregone conclusion given these methods and assumptions. If the corridor were originally defined as a category of organized space, rather than its residual, this would lead to an altogether different interpretation. Indeed, both Dodd’s analysis (1984) and my own (below) indicate that, if anything, corridor space increased relative to side-platform space between the 14th century and the contact period. Part of the problem may be the use of the term “corridor” itself, which
suggests a generalized passageway characterized by a lack of internal functional or activity differentiation. As the results of the distributional analysis of hearth areas show (below), this view of the “corridor” is not supported by evidence for habitual patterns of activities around and between central hearths.

Kernel Density Estimation and Hearth Area Analysis

In order to provide a theoretically more “neutral” comparison of longhouse interior patterning over time, I began with the assumptions that:

1) All feature types and locations are equally important to a holistic assessment of the complexity of interior spatial organization

2) Historically documented spatial categories may not adequately account for prehistoric patterning, and so should not be applied as a template for pattern recognition

In keeping with this, I implemented an analysis of the relative distribution of four basic feature types around central hearths within houses: support posts, non-support posts, pits, and fine posts composing post-cluster structures (PCSs). The aim was to produce a density-distribution map for each feature type around the central hearth so as to permit comparisons between houses and to identify broad synchronic and diachronic patterns of space use. The approach was inspired by Whallon’s method of “unconstrained clustering” for pattern recognition in artifact distributions (Whallon 1984). Feature locations within a defined sample frame were interpolated to a density distribution using kernel density estimation (KDE) in ArcMap. KDE can be thought of as a smoothed histogram of point frequencies across a two-dimensional surface (Baxter 2003: 29). KDE uses a non-parametric probability density function, or “kernel”, to generalize a density surface from a point-pattern. The density value for each cell in the resulting raster is calculated as the sum of the probabilities of all the overlapping density distributions for that point (Baxter 2003: 30-32; Conolly and Lake 2006: 175). Different radii of the kernel (analogous to the bin size of a histogram) will produce more or less smoothed outcomes. A relatively small radius of 0.5m was used here so that sharp lateral changes in support-post distributions could be identified (for instance, indicating the edge of the side-platforms). A Gaussian kernel was used. The virtue of KDE in this context is that it treats the locations of features in space as sample data from which to estimate a population distribution.
This permits the recognition of significant patterns in feature allocation within the sampling area based on the principle that the more frequently a feature occurs at a particular location, the more likely others of the population will fall near that location.

The challenge of applying this method to longhouse space was in defining comparable sampling zones from house to house, such that KDE surfaces could be averaged to produce mean probability maps for entire samples of houses. While individual KDE surfaces could be created for specific house floors, how could they be used to compare house floors from diverse structures with different dimensions? In order to provide a conceptually comparable sample of house space from case to case, I needed to define the sampling area consistently across houses. This was accomplished by positioning each sampling area directly over the centroid of a central hearth. The dimensions of the sampling area could have been determined in numerous, equally valid ways. Given that the sampling frame (and behaviour around the hearth) was automatically constrained in the lateral dimension by house width, house width was used as the determinant of a square sampling area. Thus, a house of 6.9m in width would have a sampling frame of 6.9x6.9m (47.6m$^2$), oriented so that left and right sides aligned to the house side walls, and top and bottom sides bisected the house in the lateral dimension 3.45m in front of and behind the hearth centroid (Figure 7.1). Each sampling area was also oriented so that the “top” was proximate the nearest house end. This effectively defined a comparable zone of floor space around a central hearth that was relativised by house width (Figure 7.1). Although it would have been possible to use an absolute sampling frame of, for instance, 9x9m, such a method would have obscured similarities in the relative distribution of activities around central hearths for houses of differing dimensions and rendered comparison of early and later houses difficult. The drawback of the relative approach is that important absolute distances, for instance between PCSs in the longitudinal dimension, might be obfuscated. The relative approach was preferred here since absolute measures of interior organization were performed in the “traditional metrics” section, and have been made widely in previous longhouse analyses. Also, the strong positive correlations between house width and platform and corridor width observed in the traditional metrics section suggest that important relative distances of internal activity were maintained as houses were scaled-up.

Ideally, artifact and micro-refuse distribution data would also have been included in this analysis. However, virtually all of the houses in the sample were excavated by mechanical (or shovel) stripping of the topsoil, so that provenience data for artifacts not deposited in subsoil pits was lost. Also, some investigators reported typological distinctions between pits (for instance
between “storage”, “ash”, “refuse-filled depression”, “Types 1, 2 and 3”), but these were not consistently defined or applied for all the sites in the sample. As a result, pits were lumped into a generic inclusive category for analysis. It is quite probable that future studies will reveal important distinctions in the distribution patterns of pit types.

**Figure 7.1.** Hearth area sampling square for KDE analysis. The square’s midpoint is located over the hearth centroid and its dimensions are determined by house width. The upper left side is defined as the “front”, as it faces the nearest house end. Note the paired hearth – PCS pattern along the longitudinal axis (Nodwell House 10, redrawn by D.G. Smith and J.L. Creese from Wright 1974).

KDE surfaces were produced for each feature class for a sample of 45 hearth areas, 15 from each chronological period. All hearth areas within the house sample could not be analyzed, both because of time constraints, and because hearths in disturbed or overlapping structures were not suitable for inclusion. Sampling involved a combination of purposive and stratified random components. Hearth areas within superimposed or heavily disturbed structures were eliminated from analysis on the grounds that patterns of interior activity would have been obscured by these disturbances. Heavily disturbed structures were identified as those with extremely weakly identifiable exterior walls and few or no interior features. These characteristics made identification of house width difficult, and suggested that they would add little to the analysis. Hearth areas within structures that had experienced multiple expansion or contraction events and associated “drift” of hearths and activity areas were also excluded. Hearth areas intersected by a
palisade wall were included where the palisade posts were clearly identifiable and could be
deleted from the plan. Sample size for each period was arbitrarily set at 15. Sampling of the
remaining hearth areas was random and stratified by site so as to ensure a diversity of
representation. Table 7.1 lists the number of hearths and sites represented in the samples for
each period. Sampling was occasionally quite uneven between sites because hearth preservation
was also very uneven. Nevertheless, a wide variety of houses from sites across the region are
represented for each period.

The resulting KDE surfaces for each feature class were averaged by period to produce a
mean hearth area probability distribution map representing the average relative frequency
distribution of a feature class around the central hearth in proportion to house width (hw). On
one hand, this procedure is limited by the fact that it produces a “normative” model of spatial
order around the central hearth for a given period. However, it is also a useful test of the degree
to which certain patterns were relatively coherent and homogenous within a period and over
time. The steeper and higher the normative peaks in the average probability distribution of
features, the more convergence in behaviour from hearth area to hearth area (both architecturally
and in terms of daily activities within the house).

Because of the rarity of semi-subterranean lodges (SSLs) and human and animal burials
within houses, these could not be included as unique layers within the distributional analysis.
Instead, a more direct distributional approach was taken to the position and orientation of these
features by recording their positions within side-platform, end-cubicle, or corridor zones, as well
as their associations with other distinctive features.

Results - Traditional Metrics of Longhouse Architecture

Summary statistics of basic longhouse measurements are presented in Table 7.2.

House Length

Important changes in longhouse length and width occurred in the transition between the
Early and Middle Iroquoian periods. Average longhouse length shows evidence of a dramatic
increase, from a mean of 12m in Early Iroquoian to 38m in Middle and initial Late Iroquoian
(Table 7.2; Figure 7.2). This pattern is not surprising, as the expansion in longhouse length from
the beginning of the Early Iroquoian period to the mid-15th century has been previously
documented (Dodd 1984; Warrick 1989, 1996). Dodd’s mean house length for 38 Early
Iroquoian houses dating between A.D. 700 and 1300 was 16.3m (1984). The present sample of
Early Iroquoian houses produced a somewhat lower mean, likely because it is numerically biased towards the earlier half of the period (including 25 houses from the Elliott villages). A scatter plot of mean site house length vs. estimated date of occupation reveals a period of relative stability and low variability between A.D. 900 and 1200 (Figure 7.2). After ca. A.D. 1200, houses began to expand, particularly in the upper range of lengths. The Early Iroquoian to Middle Iroquoian transition between A.D. 1200 and 1300 was marked by a rapid increase in the average and range of house lengths, with a small minority of houses reaching lengths between 60 and 90m (Figure 7.3). Several of these, such as the extremely long House 9 at Myers Road (86m), were statistical outliers. At the same time, houses within the Early Iroquoian length range continued to be built. The mean house length of 38m for this sample of 98 Middle Iroquoian and initial Late Iroquoian houses compares favourably with Dodd’s mean of 35.5m for a sample of 30 houses dating between A.D. 1300 and 1450 (Table 7.2).

Histograms of house length distributions for each period permit the identification of modalities in house length. The Early Iroquoian sample is right-skewed, with the most frequent lengths occurring between 6 and 10m, below the sample mean of 12m (Figure 7.3a). A secondary mode occurs between 11 and 14m. A third cluster occurs from 19-25m. These modes may indicate the approximate doubling and tripling of the primary modal length. For instance, an original house of 7m would double to 14m, and triple to 21m. The structure of the Middle Iroquoian house population is, interestingly, very different (Figure 7.3b). House lengths between

![Figure 7.2.](image)
Figure 7.2. Average house length at 23 Ontario Iroquoian sites dated between A.D. 900 and 1500. Bars are standard error. Standard logistic model used to define best fit line (dashed). Note the rapid growth between A.D. 1200 and 1300.
Figure 7.3. Histograms of house length for the EOI (a), MOI (b), ILOI (c), and entire sample (d).

Figure 7.4. Average house width at 23 Ontario Iroquoian sites dated between A.D. 900 and 1500. Bars are standard error. Note the general increase over time.
Figure 7.5. Histograms of longhouse width for EOI (a), MOI (b), ILOI (c), and entire sample (d).

Figure 7.6. Scatterplot of house width vs. maximum length for a sample of 161 Ontario Iroquoian longhouses dating between A.D. 900 and 1500. Standard logistic model used to define best fit line (dashed). Note the strong positive relationship between length and width for houses below 30m in length.
35 and 40m are by far the most frequent, while houses approximately double this length (between 60 and 80m) form a small secondary grouping (Figure 7.3b). This suggests that there was behavioural significance to the dominant modal length and its doubling. The initial Late Iroquoian distribution was similar in range but had a somewhat higher proportion of houses between 40 and 50m (Figure 7.3c). Taken as a whole, the sample of 157 houses dating from A.D. 900 to 1500 was distinctly multimodal, with peaks at 5-15m, 35-40m, and a small outlier group at 65-90m (Figure 7.3d).

House Width

Like house length, house width shows a general pattern of expansion over time, but within a much narrower range of variation. Mean initial house width (i.e., before expansions or contractions) was 6.18m for EOI, 7.39m for MOI, and 7.51m for initial Late Iroquoian (Table 7.2). Interestingly, sample widths became less variable over time, with the sample standard deviations reducing from 0.91 in Early Iroquoian, to 0.59 and 0.47 for Middle Iroquoian and initial Late Iroquoian, respectively (Table 7.2; Figure 7.4). Minimum and maximum widths also increased over time. The scatter plot of site mean house width vs. estimated occupation date shows an early and linear increase in mean width from the beginning to the end of the study period, with a great deal of synchronic variation (Figure 7.4). Interestingly, while houses at Auda and Elliott showed little difference in mean lengths, mean house width was significantly higher at Elliott (and other 11 to 12th century villages) as compared with the 10th century Auda houses. House widths at Elliott were also quite variable, even within a single occupation phase, and many houses show evidence of remodelling in order to widen them. Turning to the frequency distributions of house widths, the Early Iroquoian distribution is broadly normal, with a modal width of about 6.4m (Figure 7.5a). The distribution is slightly left-skewed, with a lower tail of 10 houses with widths below 5.3m. Modal house width was approximately 7.6m in the Middle Iroquoian and initial Late Iroquoian samples (Figure 7.5b-c).

House width was also generally positively correlated with length (Figure 7.6), although the curve is nonlinear and indicates a significant limit on widths above 8.5m, regardless of length. Houses below 6m in width were exclusively Early Iroquoian in date. The sub-group of Early Iroquoian houses in the 3.3 to 5.3m width range (mentioned above) exhibited lengths from 5 to 9m (mean=7m). Houses above 60m in length, while typically greater than 7m wide, did not exceed the range exhibited by houses below this length. Thus, while the sample contained houses of exceptional length, these houses were not unusually wide by 13th to 15th century
standards. The histogram of house widths for the entire sample is left-skewed, showing a sharp drop-off in widths beyond the modal value of 7.6m (Figure 7.5d). Also noteworthy is the diachronic trend for initial Late Iroquoian houses to be slightly wider on average than the Middle Iroquoian houses. This difference is not statistically significant at the 95% confidence level (p<0.2, Table 7.2).

**House Area**

Unlike several past studies in which house area has been estimated from length and width measurements (e.g., Kapches 1990), house area was here measured directly from the digitized plans in ArcGIS for all houses. Diachronic trends in house area generally mirror the patterns in the expansion of house length. Mean house area increased from $66m^2$ in the Early Iroquoian to $260$ and $270 \ m^2$ in the Middle Iroquoian and initial Late Iroquoian samples respectively (Table 7.2). These values are similar to those obtained from the larger sample of house areas measured in Chapter 5 (Table 5.0).

**Interior Architectural Elements**

The identification and measurement of interior architectural elements, such as end-vestibules and side platforms, involves a greater degree of uncertainty than has usually been acknowledged in print. End walls defining the vestibules at either end of the house are frequently indicated by an ephemeral scatter of posts and sometimes small pits, rather than the strong line of posts that forms the exterior wall of most houses. Side platforms are typically indicated by the location of widely spaced interior support posts, which are not always identified in the field. Central hearths are frequently entirely absent from house plans, perhaps because ploughing or mechanized topsoil stripping is often deep enough to obliterate these features (Warrick 2008). As a result, it is often difficult to determine if an apparent “gap” in hearth spacing results from past behaviour or the contingencies of preservation and recovery. Likewise, a break in side platform posts may represent the absence of the feature in that area, or simply a lack of preservation or identification.

Given these challenges and inherent variation in the use of these features from house to house, measurements were performed where possible for each different type of architectural element. This means that sample sizes vary for these measurements based on the availability of evidence. However, lack of evidence cannot necessarily be interpreted as evidence for the absence of an architectural element.
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<td>SD</td>
<td>SE</td>
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<td>Max</td>
<td>F-value</td>
<td>P-value</td>
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Table 7.2. Descriptive statistics for traditional longhouse metrics organized by culture-historic stage.

Side Platforms

Side platforms, sometimes referred to as benches (Dodd 1984), or bunk-lines, averaged 1.56m in width in Early Iroquoian houses where they were measurable (Table 7.2). However, this sample included just 32 of the 62 Early Iroquoian houses examined (52%). By contrast, side platforms were measurable on all 64 Middle Iroquoian houses, and on 32 of 35 initial Late Iroquoian houses (91%). Most houses at the Early Iroquoian Aud a and Lightfoot sites lacked post or support post lines indicative of side platforms. Nine of the 25 Elliott houses also did not have measurable side platforms. In some of these cases, platforms may have been present but obscured by overlapping structures. However, in most cases, lack of identification was due to a lack of interior posts indicating the feature’s presence. There may be both taphonomic and behavioural explanations for this pattern. Houses lacking side platforms were often small, especially in width. For instance, only two of the 10 Early Iroquoian houses below 5.3m in width had measurable platforms. In these cases (an Aud a and an Elliott house) the platforms were unusually narrow, at 1.21 and 1.25m respectively.

Average side platform width increased during the Middle and Initial Late Iroquoian periods, to 1.62 and 1.67m respectively (Table 7.2, Figure 7.7). This pattern was statistically significant (p<0.01), and mirrors Dodd’s much smaller sample (1984) which produced mean values of 1.2 and 1.5m for north and south benches in A.D. 700 to 1300 houses (n=5), and 1.6 and 1.8m for north and south benches in A.D. 1300 to 1450 houses (n=9). The differences between north and south bench widths in Dodd’s study likely relates to the small sample size, rather than to a typical asymmetry in construction which is not indicated in the present study. Platform width was positively correlated with house width (least squares
Figure 7.7. House mean side platform width over time (bars are standard error).

Figure 7.8. Histograms of side platform width from EOI (a), MOI (b), ILOI (c), and entire sample (d).
Period
EOI  MOI  ILOI
Corridor : House Width Ratio
0.50  0.52  0.54  0.56  0.58
Figure 7.9. Mean corridor to house width ratio over time. Bars are standard error.

regression $r^2 = 0.44$, $p < 0.000$), and so increased over time along with house width. The Early Iroquoian frequency distribution of platform widths was left-skewed (mirroring the house width distribution), such that 75% of houses had platforms wider than 1.5m, to a maximum of 1.8m, in spite of the mean value of 1.56m. Modal platform widths in the Middle Iroquoian and initial Late Iroquoian samples were 1.63 and 1.55 or 1.75m (Figure 7.8a-c). Standard deviation in platform width was 0.12 to 0.15m (Table 7.2).

While platform width ranged narrowly between approximately 1.2 and 2m, the data exhibit several traits that do not support Kapches’ argument that bench width was determined by a standard Iroquoian measuring unit of ca. 1.5m (1993). In all periods, a range of widths were present, even at a single site, and were constructed in general proportion to absolute house width (see distribution analysis below). Modal platform widths exceeded 1.5m in all periods, including the Early Iroquoian (Figure 7.8). If a “fuzzy” standard platform width measure was in use, it must have been closer to 1.65m. The diachronic trends instead suggest that platform width was sensitive to the general increases in house length and width that were occurring up to the mid-15th century. Interestingly, Dodd documents a significant decline in platform widths after A.D. 1450, to 1.1m in the early contact period (1984:273), even while average house width remained high. This parallels a reduction in house length that also occurred over this period, to an average of 19.8m for the contact period (Dodd 1984). These trends do not provide support for a standard
bench width of 1.5m, but they do indicate that like house width, variability in platform width was constrained from house to house.

**Corridor Width**

Corridor width was measured as the remainder of house width between the two side platforms, and so reflects the relationship between house width and platform width. Corridor width expanded from 3.5m in the Early Iroquoian, to 4.2m in Middle Iroquoian and initial Late Iroquoian samples (Table 7.2). This increase was slightly disproportionate to the general increase in house width over the period, so that corridor width increased as a proportion of house width from 0.53 to 0.56 (Figure 7.9). This increase in proportional allocation of space to the corridor, while slight, was quite statistically significant ($p<0.001$, Table 7.2). Such a trend seems to have accelerated in the late pre-contact and contact periods, as platform width decreased in favour of corridor space (Dodd 1984). Using Dodd’s mean house width of 7m and bench width of 1.1m, we can estimate that corridor width increased to approximately 69% of house width by the early 17th century. Dodd’s larger sample of corridor width measurements provides a more conservative estimate of 60% (1984:273). Taken together, these data indicate a significant shift in the relative allocation of space from side platforms to corridor area beginning in the Middle Iroquoian period, and culminating in the relatively short longhouses of the contact period. Interestingly, before A.D. 1500, the “extra” corridor space came from increases in house width, with no impact on absolute platform width. After that time, if Dodd’s data are correct, increasing proportions of corridor space required absolute reductions in platform width.

**End-Vestibules**

Vestibules were generally identifiable at both ends of Middle and Initial Late Iroquoian houses. My use of the term “end-vestibule” equates to Dodd’s “storage cubicle”, and does not refer to less formal un-walled porch or veranda spaces that were occasional additions to the ends of houses. Also, end-vestibules sometimes show evidence for various kinds of internal segmentation, but in these cases, the vestibule was considered to constitute the maximum area contained between an interior end wall and the exterior house end (Figure 7.0). In many cases, end-vestibules were indicated by a lack of evidence for activities (posts and pits) in the area of the house that tapers toward the exterior end wall, but were not definitely delineated by an interior end wall separating the corridor region from the vestibule. In order to deal with this, longhouse end taper length was also measured for a larger sample of houses (Figure 7.0).
End-vestibules and taper areas were much smaller and less common in Early Iroquoian houses. Vestibule length more than doubled, from 2.1 to 5.3m in the Middle Iroquoian, and then reduced slightly in the initial Late Iroquoian to 5m (Table 7.2). End taper lengths followed a similar pattern. This translates to a tripling in vestibule area, from 10.5m$^2$ in Early Iroquoian houses to 33m$^2$ in Middle Iroquoian, and 30m$^2$ in initial Late Iroquoian houses (Table 7.2). End-vestibule dimensions did not expand gradually over time, but show a distinct jump in length and area at the end of the 13$^{th}$ century (Figure 7.10). As was the case for house length, the range in scale considerably expanded at this time as well, from an Early Iroquoian maximum of 18m$^2$ to 54m$^2$ in Middle Iroquoian. In spite of these increases, vestibule area was not maintained in proportion to house area. House area and vestibule area were only weakly positively correlated in the Middle Iroquoian and initial Late Iroquoian, and longhouses beyond 40m in length show no tendency toward greater vestibule space (Figure 7.11). Houses below 40m in length, on the other hand, show a positive correlation between house and vestibule area. Considered from the perspective of storage, larger houses would have had considerably less vestibule storage space per capita than smaller houses.

![Figure 7.10](image-url)  
**Figure 7.10.** Average house end-vestibule length at 21 Ontario Iroquoian sites dated between A.D. 900 and 1500 (sampled Auda and DeWaele houses did not have measurable end-vestibules). Note the rapid growth between A.D. 1250 and 1300.
Observed Central Hearth Number

Given the historically documented relationship between central hearths and family areas within the house, one would expect house length or area to be roughly proportional to hearth number. However, the vagaries of preservation and field identification and recovery appear to have a large impact on observed hearth counts. In all periods, histograms of hearth counts do not resemble the (relatively) normal frequency distributions of house lengths, but instead appear to follow a Poisson-like distribution (Figure 7.12). This suggests that the probability of finding a hearth feature in a house follows the expected form of the probability distribution of observing a random event per unit space or time (Banning 2000:125). This makes sense from a sampling perspective and indicates that hearth identification was not directly determined by house area. The frequency distributions of estimated hearth numbers are more normal, and mirror the distribution of house lengths for each period (see below).

In all periods, about 30% of houses had no recorded hearths. Fifty-two percent of Early Iroquoian houses had 1 to 2 hearths, with the remaining 18% having three or more. Forty percent of Middle Iroquoian houses had 1 to 2 hearths, with 29% having three or more. Finally, just 34% of initial Late Iroquoian houses had 1 to 2 hearths, while another 34% had three or more (Table 7.3). Given that all houses are expected to have contained at least one hearth originally, the stable proportion of 30% of houses with no surviving hearths might indicate that taphonomic
and recovery-related constraints were similar across houses from all periods. If this is so, then the shift in the balance of houses with three or more hearths over time can be taken as evidence that hearth numbers did increase in consort with house length and area.

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<th>MOI</th>
<th>ILOI</th>
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Table 7.3. Summary of recovered hearth frequencies per house organized by culture-historic stage. Note that in all periods, approximately 30% of houses lacked hearths entirely.

Figure 7.12. Histograms of observed (a) and estimated (b) number of central hearths per house in entire sample. For (b), the secondary mode at 5 central hearths corresponds to the 35-40m modal peak in the house length histograms (Figure 7.3, above).
**Estimated Hearth Number**

The original number of hearths within a house was estimated by taking inter-hearth distance means calculated for the site and dividing house corridor length by this value. Thus, a house with central corridor of 21m and a site mean inter-hearth distance of 5.3m would produce an estimated 3.96 (i.e., 4) hearths. Values were rounded to the nearest hearth. Where site means for inter-hearth distances were not available, period means were used. This method obviously artificially homogenizes the actual variability in hearth densities by assuming standard spacing, and is meant only to provide general estimates of hearth numbers per house over time.

Mean estimated hearth number for Early Iroquoian houses was 2.4, with a period mode of 2 (39% of cases), followed by 5.3 and 4.9 for Middle Iroquoian and initial Late Iroquoian samples (Table 7.2). The modal Middle Iroquoian hearth number was 5 (25% of cases), while modal values were evenly split between 4 and 5 in initial Late Iroquoian (23% each). The slight reduction in average hearth number in initial Late Iroquoian houses reflects a reduction in hearth density and an increase in inter-hearth spacing (see below). Using these estimates of hearth number, average house area per hearth increased significantly over time, from 32m$^2$ for Early Iroquoian houses, to 57 and 63m$^2$ in Middle Iroquoian and initial Late Iroquoian respectively.

**Inter-Hearth Distance**

The typical distance between central hearths has been hypothesized to have varied considerably over time in Iroquoian longhouses (Varley and Cannon 1994). The issue is complicated greatly by the frequency of missing hearths, as well as hearth “drift”. The latter problem is particularly evident with longhouse extensions and attendant redistribution of interior space along the longitudinal dimension. For these reasons, measurements of mean inter-hearth spacing may not provide an accurate picture of typical inter-hearth spacing at a given point in time. Both mean and modal patterns are explored here.

Average central hearth spacing increased significantly from an Early Iroquoian mean of 2.9m, to 5.3 and 6.3m in Middle Iroquoian and initial Late Iroquoian (Figure 7.13; Table 7.2). This diachronic trend mirrors that recorded by Dodd (1984:274), who reported an increase from 1.9m for A.D. 700 to 1300 houses to 5.3m for A.D. 1300 to 1450 houses. It also lends support to Varley and Cannon’s hypothesis that longhouses of the early 15th century had particularly widely spaced hearths. Given that these higher mean distances might result from extreme values in longer houses that lack sufficient preservation of hearths, as suggested by Warrick (1994), it is important to consider the frequency distributions of recorded distances in each period. The
histogram of inter-hearth distances for the entire sample is distinctly multi-modal, with modal clusters from 1.5 to 2.5 m, 4.5 to 7.5 m and 10 to 13 m (Figure 7.14d). The Early Iroquoian distribution is significantly right skewed, with a distinct mode at 1.7 to 2.2 m, and relatively few cases ranging from 4 to 7 m (Figure 7.14a). In contrast, the Middle Iroquoian distribution is bimodal, with modes at 2 to 3 m, and 5.7 m (Figure 7.14b). The initial Late Iroquoian distribution resembles the Middle Iroquoian distribution, but its central mode peaks at 8.7 m and is left skewed (Figure 7.14c). All three periods had modes that overlap in the 2 to 3 m range, with the majority of Early Iroquoian cases falling in this range. A secondary mode between 4.5 and 6.5 m is predominantly constituted by Middle Iroquoian cases, while a mode from 8 to 9 m is dominated by initial Late Iroquoian cases (Figure 7.14d).

One of the interesting aspects of this distribution is the fact that while all three distributions correspond in the spacing of the first interval (ca. 2 m) and a low-frequency trough at ca. 4 m, the spacing of the second interval shifts from the Middle to Initial Late Iroquoian samples. It might seem reasonable to interpret the correspondence of all three distributions at the 2 m interval as evidence that this was the predominant inter-hearth spacing in all periods, with subsequent modal intervals (5.7, 8.7, and 10 to 13 m) resulting from missing hearths. However, if this were the case, we should expect that random “deletion” of hearths from such a pattern would lead to a secondary modal interval around 4 m (due to the frequent measurement between two hearths that had once had a hearth between them), but this is precisely the interval that is least common across all periods. The Middle Iroquoian-dominated interval of 5.7 m is approximately 3 times the primary interval, while the initial Late Iroquoian-dominated interval of 8.7 m is approximately 4.5 times the primary interval. It is difficult to imagine how these modes might emerge through a process of taphonomic disturbance. As the distributional analysis (see below) shows, these modal intervals most likely represent actual patterns in hearth spacing that existed in the past. On the other hand, the few cases scattered between 10 and 15 m may represent legitimate instances of incorrect measurements due to missing hearths.

**Inter-Post Cluster Structure Distance**

This inference about hearth spacing is supported by data on the longitudinal spacing of post-cluster structures (PCSs). These features first appear in Middle Iroquoian houses, and become ubiquitous in the Initial LOI. They seem to have been typical components of a hearth zone, and so their spacing may correlate well with the spacing of hearths, and by inference, the scale of redundant family spaces, or “cubicles” within the house. Mean inter-PCS
Figure 7.13. Average inter-hearth distance in houses at 23 Ontario Iroquoian sites dated between A.D. 900 and 1500. Bars are standard error. Note the general increase after A.D. 1200.

Figure 7.14. Histograms of inter-hearth distances for EOI (a), MOI (b), ILOI (c), and entire sample (d).
distances agree closely with average hearth spacing in the Middle Iroquoian and initial Late Iroquoian samples, at 5.1 and 5.9m, respectively (Table 7.2). However, the range of PCS intervals is much narrower than that of central hearths (3 to 7.5m), and is left-skewed. The Middle Iroquoian sample is bimodal, with a small mode in the 2 to 3m range, and a second mode at 6.3m. The initial Late Iroquoian sample is unimodal and ranges from 4 to 7.5m with a mode of 6.3m. The 1-sigma range of the combined sample (n=35) is 4.3 to 6.8. This places inter-PCS distance squarely within the second modal interval of inter-hearth distance noted above (Figure 7.15).

![Histogram of Inter-PCS Distances](image)

**Figure 7.15.** Inter-PCS distances in combined MOI-ILOI sample. Note that the distribution corresponds primarily to the second mode in the inter-hearth distance distribution, between 4 and 8m (Figure 7.16, above).

**End-Hearth to House-End Distance**

In keeping with the expansion of longhouse taper lengths and end-vestibules, the distance from end hearths to the nearest house end along the longitudinal dimension expanded from the Early to Middle Iroquoian periods. End hearth-to-house end distance rose from 3.51(±1.0)m for Early Iroquoian houses, to 7.48 (±1.8) and 7.03(±1.7)m for Middle Iroquoian and initial Late Iroquoian houses, respectively. These data parallel a trend also documented by Dodd (1984), but the difference between Early and Middle Iroquoian samples is more pronounced in the present sample. Dodd provides a mean of 4.6(±3.3) for north end to north hearth distance, and 3.1(±1.5) for south end to south hearth distance for A.D. 700 to 1300 (n=25, 24). For A.D. 1300 to 1450 she reports 5.5(±1.9)m for north end, and 5.8(±2.2)m for south end distance (n=15,12) (1984). Given the present sample size of 53 houses for the A.D. 1300 to 1500 period, it is likely that the increase in distance was greater than that documented by Dodd.
End-Wall to End-Hearth Distance

A variable not directly measured by Dodd was the longitudinal distance between the end wall (separating the end-vestibule from the central corridor) and the nearest end hearth (Figure 7.0). This distance was remarkably stable over time, increasing slightly but not significantly in the Middle Iroquoian sample, from an Early Iroquoian mean of 2.2(±0.73) m to 2.39(±0.91)m in the Middle Iroquoian, and back down to 1.95(±0.53)m in the initial Late Iroquoian. This seems surprising in light of the other increases in longitudinal spacing generally observed across this period.

House Area per SSL and Estimated Hearths per SSL

The distribution of semi-subterranean lodges (SSLs) across regions of the house will be discussed in the distributional analysis section below. Here I will address the patterns of SSL allocation by house area and estimated hearth number. Since only one Early Iroquoian house in the sample contained an SSL (Praying Mantis House 2), only Middle Iroquoian and initial Late Iroquoian samples were compared statistically.

The distribution of SSLs among houses was not even, nor proportional to house area or hearth number. Table 7.4 shows the relative frequency of SSL counts among houses for each

<table>
<thead>
<tr>
<th>SSLs per House</th>
<th>EOI</th>
<th>MOI</th>
<th>ILOI</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>61</td>
<td>34</td>
<td>24</td>
<td>119</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>9</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>10</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 7.4. Summary of the frequency of semi-subterranean lodges per longhouse organized according to culture-historic stage.
period. Fifty-three percent of Middle Iroquoian houses, and 69% of initial Late Iroquoian houses lacked SSLs entirely. In both Middle Iroquoian and initial Late Iroquoian samples, about 14% of houses contained a single SSL. However, in the Middle Iroquoian sample, a much greater proportion of houses had 2 to 3 SSLs (25%) as compared to the initial Late Iroquoian sample (6%). Similar low proportions of houses with 4 or more SSLs occurred in both samples (8% and 11%, for Middle Iroquoian and initial Late Iroquoian respectively). An obvious question is how this distribution of SSLs was related to house area and hearth number. Were the houses with 4+ SSLs those in the extra-long 60 to 80m category? As it turns out, there is no evidence for even a slight correlation between house area or estimated hearth number with number of SSLs. Because SSLs are large complex features that were typically excavated well into subsoil, this pattern is not likely to reflect processes of disturbance or lack of identification in the field. On average, house area per SSL in houses with these features was $172m^2 (±132)$. There was no significant decrease in SSL density in initial Late Iroquoian houses with these features, although fewer initial Late Iroquoian houses contained them. Likewise, the average number of estimated central hearths per SSL was $3.2 (±2.3)$ for the combined sample, with a range of 13.

The histogram of estimated hearth number per SSL (Figure 7.16) illustrates that in close to 35% of cases the number of estimated hearths per SSL was 2. Sixty-four percent of houses with SSLs had 3 or less estimated hearths per SSL. Another 33% had from 4 to 6 estimated hearths per SSL. The scatter plot of longhouse length vs. SSL number indicates that among houses with SSLs, those with the most SSLs fall at the middle part of the size range (Figure 7.17).

![Figure 7.16. Frequency distribution of the number of estimated central hearths per SSL within the sample of houses with SSLs.](image)
Figure 7.17. Scatterplot of house length vs. the number of SSLs it contains. Note the lack of positive correlation, and the clustering of SSLs within houses between 25 and 50m.

Longhouse Extensions and Contractions

Although the majority of longhouse remodelling activity seems to have involved extensions, necessary data were often not available to definitively distinguish between extensions and contractions. Here, extensions and contractions were pooled in a single extension/contraction variable (Figure 7.0).

<table>
<thead>
<tr>
<th>House Extensions/Contractions</th>
<th>N</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>EOI</td>
<td>52</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>84%</td>
<td>16%</td>
</tr>
<tr>
<td>MOI</td>
<td>35</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>55%</td>
<td>45%</td>
</tr>
<tr>
<td>ILOI</td>
<td>14</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>40%</td>
<td>60%</td>
</tr>
<tr>
<td>ALL</td>
<td>101</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>63%</td>
<td>37%</td>
</tr>
</tbody>
</table>

Table 7.8. Frequency of longhouse extension/contraction events according to culture-historic stage.
House remodelling appears to have become more frequent and substantial over time in the sample (Table 7.8). Only 16% of Early Iroquoian houses showed evidence for extensions/contractions ($n=62$). Meanwhile, 45% of Middle Iroquoian houses, and fully 60% of initial Late Iroquoian houses, had evidence for at least one extension or contraction episode. Of the houses with remodelling, 10% ($1/9$) of Early Iroquoian, 14% ($4/29$) of Middle Iroquoian, and 38% ($8/21$) of initial Late Iroquoian houses had experienced more than one remodelling episode. The scale of remodelling events also increased, particularly during the Middle Iroquoian period. Average extension/contraction length increased from 3.3m ($\pm 2.1$) for Early Iroquoian houses, to 10m ($\pm 8$) and 6.3m ($\pm 5.2$) for Middle Iroquoian and initial Late Iroquoian houses, respectively (Table 7.2; Figure 7.38).

**Results - Distributional Analysis**

The distributional analysis of pits, posts, support posts, and post-cluster structures (PCSs) around central hearth areas provided a new perspective on the construction, organization, and use of house space. Important aspects of continuity and change can be identified across the diachronic samples. The EOI, MOI, and ILOI mean KDE surfaces for each type of feature will be discussed in turn. As discussed above, each individual hearth sample area was scaled to house width so as to identify regularities in the *relative position* of architectural elements and
features. In keeping with this, all relative measurements within the hearth area will be presented here as proportions of house width \((hw)\). The more similar the relative arrangement of features from one hearth area to the next, the higher and steeper the probability peaks in the mean KDE surface, producing a “sharply” defined image. The more variable the arrangement of features from one hearth area to the next, the broader and lower the probability peaks, producing a “fuzzy” image. Each hearth area map is oriented such that the nearest house end is located at the top of the image while left and right sides correspond to the outside walls of the house. Profile plots of the KDE surfaces in the lateral and longitudinal dimensions also serve as helpful summaries of the patterns, and permit the precise identification of peaks in the distribution curves that can be compared from one period to the next (Table 7.5).

*Early Ontario Iroquoian Hearth Areas*

A strong pattern was evident in the distributions of support posts, non-support posts, and pits in the sample of EOI hearth areas \((n=15)\). An approximately rectangular central zone of high activity was apparent in the plans of each feature type (Figures 7.20-7.22). Relative distance measurements of modal peaks in the frequency distributions discussed in this section are provided in Table 7.5.

**Support Posts**

The plan of the EOI support post distribution indicates the presence of four or five longitudinal rows of support posts running the length of the hearth area. This pattern is particularly evident in the profile plot of the kernel density distribution in the lateral dimension (Figure 7.18, top). The distribution is approximately bilaterally symmetrical, with two peaks on either side of the house (labelled 1, 2, 4 and 5 in Figure 7.18), and a smaller peak along the midline (labelled 3 in Figure 7.18). In the longitudinal dimension (Figure 7.18, left), four distinct peaks are evident (labelled a-d in Figure 7.18), and appear to correspond to lines of support posts that cross-cut the house in the lateral dimension. A small row corresponding to a peak at the front of the hearth area (a) is followed by a distinct gap in support posts. A high frequency zone is delimited on the front by peak b, and at the back by peaks c-d. A dip in frequency is evident at the central hearth in this dimension. Measurements of the frequency peaks are reported in Table 7.5 in ratios of house width \((hw)\).
<table>
<thead>
<tr>
<th>Longitudinal Support Post Distribution</th>
<th>EOI</th>
<th>MOI</th>
<th>ILOI</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak A (from back)</td>
<td>0.89</td>
<td>na</td>
<td>0.87</td>
<td>0.88</td>
</tr>
<tr>
<td>Trough A (from back)</td>
<td>0.80</td>
<td>na</td>
<td>0.80</td>
<td>0.80</td>
</tr>
<tr>
<td>Peak B (from back)</td>
<td>0.68</td>
<td>0.71</td>
<td>0.66</td>
<td>0.68</td>
</tr>
<tr>
<td>Trough B (from back)</td>
<td>0.46</td>
<td>0.60</td>
<td>0.52</td>
<td>0.53</td>
</tr>
<tr>
<td>Peak C (from back)</td>
<td>0.28</td>
<td>0.11</td>
<td>0.16</td>
<td>0.18</td>
</tr>
</tbody>
</table>

**Lateral Support Post Distribution**

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak 1 (from left)</td>
<td>0.24</td>
<td>0.22</td>
<td>0.22</td>
<td>0.23</td>
</tr>
<tr>
<td>Peak 2 (from left)</td>
<td>0.35</td>
<td>0.35</td>
<td>0.31</td>
<td>0.34</td>
</tr>
<tr>
<td>Peak 3 Central (from left)</td>
<td>0.49</td>
<td>0.49</td>
<td>0.51</td>
<td>0.50</td>
</tr>
<tr>
<td>Peak 4 (from right)</td>
<td>0.35</td>
<td>0.33</td>
<td>0.31</td>
<td>0.33</td>
</tr>
<tr>
<td>Peak 5 (from right)</td>
<td>0.22</td>
<td>0.23</td>
<td>0.23</td>
<td>0.23</td>
</tr>
</tbody>
</table>

**Longitudinal Regular Post Distribution**

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Peak A (from back)</td>
<td>0.85</td>
<td>na</td>
<td>0.96</td>
<td>0.91</td>
</tr>
<tr>
<td>Trough A (from back)</td>
<td>0.80</td>
<td>na</td>
<td>0.91</td>
<td>0.86</td>
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<tr>
<td>Peak B (from back)</td>
<td>0.67</td>
<td>0.70</td>
<td>0.67</td>
<td>0.68</td>
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<tr>
<td>Trough B (from back)</td>
<td>0.46</td>
<td>0.59</td>
<td>0.56</td>
<td>0.54</td>
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<tr>
<td>Peak C (from back)</td>
<td>0.29</td>
<td>0.35</td>
<td>0.45</td>
<td>0.36</td>
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</tbody>
</table>

**Lateral Regular Post Distribution**

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak 1 (from left)</td>
<td>0.24</td>
<td>0.21</td>
<td>0.22</td>
<td>0.22</td>
</tr>
<tr>
<td>Peak 2 (from left)</td>
<td>0.42</td>
<td>0.45</td>
<td>0.38</td>
<td>0.41</td>
</tr>
<tr>
<td>Peak 3 Central (from left)</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>Peak 4 (from right)</td>
<td>0.41</td>
<td>0.43</td>
<td>0.41</td>
<td>0.42</td>
</tr>
<tr>
<td>Peak 5 (from right)</td>
<td>0.22</td>
<td>0.21</td>
<td>0.22</td>
<td>0.22</td>
</tr>
</tbody>
</table>

**Longitudinal Pit Distribution**

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak A (from back)</td>
<td>0.95</td>
<td>na</td>
<td>0.96</td>
<td>0.96</td>
</tr>
<tr>
<td>Trough A (from back)</td>
<td>0.89</td>
<td>na</td>
<td>0.81</td>
<td>0.85</td>
</tr>
<tr>
<td>Peak B (from back)</td>
<td>0.67</td>
<td>0.63</td>
<td>0.66</td>
<td>0.65</td>
</tr>
<tr>
<td>Trough B (from back)</td>
<td>0.45</td>
<td>0.51</td>
<td>0.48</td>
<td>0.48</td>
</tr>
<tr>
<td>Peak C (from back)</td>
<td>0.20</td>
<td>0.22</td>
<td>0.22</td>
<td>0.21</td>
</tr>
</tbody>
</table>

**Lateral Pit Distribution**

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak 1 (from left)</td>
<td>0.13</td>
<td>0.24</td>
<td>0.23</td>
<td>0.20</td>
</tr>
<tr>
<td>Peak 2 (from left)</td>
<td>0.46</td>
<td>0.32</td>
<td>0.43</td>
<td>0.40</td>
</tr>
<tr>
<td>Peak 3 Central (from left)</td>
<td>na</td>
<td>0.49</td>
<td>na</td>
<td>0.49</td>
</tr>
<tr>
<td>Peak 4 (from right)</td>
<td>0.43</td>
<td>0.37</td>
<td>0.41</td>
<td>0.40</td>
</tr>
<tr>
<td>Peak 5 (from right)</td>
<td>0.18</td>
<td>0.28</td>
<td>0.32</td>
<td>0.26</td>
</tr>
</tbody>
</table>

**Table 7.5a.** Summary of relative positions of modal peaks and troughs in the distributions of features across hearth areas in lateral and longitudinal dimensions.
### Relative Zone Dimensions

<table>
<thead>
<tr>
<th>Relative Zone Dimensions</th>
<th>EOI</th>
<th>MOI</th>
<th>ILOI</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longitudinal Zone A Length</td>
<td>0.20</td>
<td>0.06</td>
<td>0.20</td>
<td>0.15</td>
</tr>
<tr>
<td>Longitudinal Zone B Length</td>
<td>0.12</td>
<td>0.08</td>
<td>0.14</td>
<td>0.11</td>
</tr>
<tr>
<td>Longitudinal Zone C Length</td>
<td>0.18</td>
<td>0.21</td>
<td>0.16</td>
<td>0.18</td>
</tr>
<tr>
<td>Longitudinal Zone D Length</td>
<td>0.22</td>
<td>0.39</td>
<td>0.34</td>
<td>0.32</td>
</tr>
<tr>
<td>Longitudinal Zone E Length</td>
<td>0.28</td>
<td>0.11</td>
<td>0.16</td>
<td>0.18</td>
</tr>
<tr>
<td>Lateral Zone 1 Width</td>
<td>0.23</td>
<td>0.23</td>
<td>0.23</td>
<td>0.23</td>
</tr>
<tr>
<td>Lateral Zone 2 Width</td>
<td>0.12</td>
<td>0.11</td>
<td>0.09</td>
<td>0.11</td>
</tr>
<tr>
<td>Lateral Zone 3 Width</td>
<td>0.15</td>
<td>0.16</td>
<td>0.19</td>
<td>0.16</td>
</tr>
</tbody>
</table>

### Inferred Behavioural Dimensions

- **Inter-PCS Distance**: na | 0.72 | 0.86 | 0.79
- **Estimated Module Length (Conservative = Zones C-D)**: 0.40 | 0.60 | 0.50 | 0.50
- **Estimated Module Length (Liberal = Zones B-E)**: 0.52 | 0.79 | 0.80 | 0.70
- **Proportion Module Length in Front of Hearth**: 0.58 | 0.37 | 0.38 | 0.44
- **Proportion Module Length Behind Hearth**: 0.42 | 0.63 | 0.63 | 0.56
- **Estimated Corridor Width**: 0.54 | 0.55 | 0.55 | 0.55
- **Estimated Platform Width**: 0.23 | 0.23 | 0.23 | 0.23

### Behavioural Dimensions Estimated From Period Mean House Width (m)

- **Inter-PCS Distance**: na | 5.3 | 6.5 | 5.9
- **Estimated Module Length (Conservative = Zones C-D)**: 2.5 | 4.4 | 3.8 | 3.6
- **Estimated Module Length (Liberal = Zones B-E)**: 3.2 | 5.8 | 6.6 | 5.0
- **Module Length in Front of Hearth**: 1.9 | 2.1 | 2.3 | 2.1
- **Module Length Behind Hearth**: 1.4 | 3.7 | 3.8 | 2.9
- **Estimated Corridor Width**: 3.3 | 4.0 | 4.1 | 3.8
- **Estimated Platform Width**: 1.4 | 1.7 | 1.7 | 1.6

**Table 7.5b.** Relative dimensions of inferred organizational/activity zones within analyzed hearth areas.

### Pits

The distribution of pits across the hearth area was also roughly bilaterally symmetrical, but more uneven than the support post distribution. Two primary peaks occur near the central axis of the house (3 and 4 in Figure 7.19), with a general decline towards the right and left hand peripheries. In the longitudinal dimension, the distribution pattern is very similar to that of the support posts, with a small peak at the very front of the hearth area (a), followed by a dip, and a sharp increase to peak b (Figure 7.19). This corresponds to a high frequency zone of pits running across the hearth area directly in front of the central hearth. This is followed by a low frequency zone adjacent the hearth and another high frequency zone which peaks from c-d (Figure 7.19, Table 7.5).

### Non-support Posts

The distribution of non-support posts is moderately bilaterally symmetrical in the lateral dimension (Figure 7.20), with four broad frequency peaks (1-4, Figure 7.20). The longitudinal
pattern is similar to that of the support posts, with a distinct high frequency plateau from b-c (Figure 7.20, Table 7.5).

Feature Comparisons

The similarities and differences in the distribution patterns of the three feature types can be readily identified in profile plots showing pits, posts and support posts in the lateral (Figure 7.21) and longitudinal (Figure 7.22) dimensions. In the lateral dimension, the support post frequency peaks on the far left and right hand sides (P1 and P5, Figure 7.21) correspond closely across all three feature types (Figure 7.21). This position is approximately 0.23 \( hw \) from left and right sides (Table 7.5). In contrast, the interior frequency peaks of regular posts and pits are shifted inward toward the centre-line relative to the second set of support post peaks (P2 and P4, Figure 7.22).

**Figure 7.18.** Composite plan and profiles of mean kernel density distribution of support posts for a sample of 15 Early Ontario Iroquoian hearth areas \((hw \times hw)\). Grey lines indicate the position of probability peaks in the lateral and longitudinal dimensions.
Figure 7.19. Composite plan and profiles of mean kernel density distribution of pits for a sample of 15 Early Ontario Iroquoian hearth areas ($hw \times hw$). Grey lines indicate the position of probability peaks in the lateral and longitudinal dimensions.

Figure 7.20. Composite plan and profiles of mean kernel density distribution of non-support posts for a sample of 15 Early Ontario Iroquoian hearth areas ($hw \times hw$). Grey lines indicate the position of probability peaks in the lateral and longitudinal dimensions.
Figure 7.21. Profile plot of mean normalized KDE values for three feature types in the lateral dimension for a sample of 15 EOI hearth areas.

Figure 7.22. Profile plot of mean normalized KDE values for three feature types in the longitudinal dimension for a sample of 15 EOI hearth areas. Note the low density trough (TA) at 0.8 \( hw \), followed by converging distribution peaks at 0.7 \( hw \) across all feature types, low points about 0.4-0.5 \( hw \) associated with the central hearth, and a second high density region between 0.4 and 0.1 \( hw \).

Figure 7.21). In this central zone between P2 and P4, the frequency of support posts appears to trade-off with pits and posts.

In the longitudinal dimension, all three distributions peak in the same position (PB in Figures 7.24) directly in front of the hearth (at 0.68 \( hw \) from the back of the hearth area; Figure
The support and non-support post distributions coincide in the position of Peak C (0.27 \( hw \) from the back of the hearth area), defining the inner limit of the high frequency zone (Figure 7.22). However, the modal peak of pits is shifted behind the peak for posts and support posts (Figure 7.22; Table 7.5).

**Middle Ontario Iroquoian Hearth Areas**

**Support Posts**

The MOI support post distribution is similar to the EOI pattern in several respects. The arrangement is approximately bilaterally symmetrical in the lateral dimension (Figure 7.23), with two pairs of probability peaks on either side of the centre line (labelled 1-4 in Figure 7.23). In the plan view, these appear to form a pair of outer (1 and 4), and inner (2 and 3) rows of support posts. There is some indication of the presence of support posts along the central axis, but this pattern is less prominent than it was in the EOI hearth area plan. In the longitudinal dimension, a surprising pattern of well-defined and sharp “peaks” in the probability distribution is present. At the front of the hearth area, the distribution slope rises to two closely spaced peaks (labelled a and b in Figure 7.23). Beyond this, three major peaks (labelled c, d, and e) appear at almost perfectly even intervals of 0.19 \( hw \) (Figure 7.23).

**Pits**

The MOI pit distribution pattern was quite different from the EOI pattern (Figure 7.24). Rather than forming two broad lateral concentrations in front of and behind the hearth, pits were located directly on either side of the hearth as well as behind it, with relatively few located in front (Figure 7.24). In the lateral dimension, the pattern closely resembles the distribution of support posts, but with an additional central peak (labelled 3 in Figure 7.24). This central peak might be associated with large support posts that were incorrectly classified as pits. In the longitudinal dimension, the pattern is distinctly asymmetrical about the hearth, with a preferential distribution of pits behind the hearth (Figure 7.24). As in the MOI support post distribution, the peaks behind the front peak (labelled a in Figure 7.24) are spaced at intervals of approximately 0.19 \( hw \) (a-b, b-d, d-e).

**Non-support Posts**

The non-support post distribution appears to delineate a well-defined rectangular zone (Figure 7.25). Like the EOI distribution, the outer peaks in the lateral dimension (Figure 7.25,
labelled 1 and 4) correspond with the outer support post rows, while the inner peaks (labelled 2 and 3) are shifted inward from the interior support peaks. The longitudinal pattern is somewhat asymmetrical with a tendency for posts to occur behind the hearth in the central zone (Figure 7.25). This high density zone corresponds to the typical location of PCSs (see below) and indicates that some PCS posts may have been misclassified as regular posts in this region of the hearth area (note the circular pattern in the plan map).

Post Cluster Structures

The kernel density distribution of fine central zone posts comprising post-cluster structures (PCSs) is illustrated in Figure 7.26. These features were not identified in the Early Iroquoian hearth areas, but appear to have become commonplace at some MOI villages. They were particularly ubiquitous in houses of the Barrie cluster including Wellington, Holly, Wiacek, Hubbert and Dunsmore. The distribution indicates the typical presence of two structures occurring along the house central axis; one in front of and one behind the hearth (Figure 7.26). The circular form of these structures is evident in the plan view. In the lateral dimension, the approximate boundaries of the feature are marked by dotted lines 1 and 3, while the central frequency peak, located somewhat to the right of the house centre-line, is marked by the solid line, 2 (Figure 7.26). The steep slopes of the distribution indicate the strong lateral limits within which these features occur. In the longitudinal dimension, it is evident that the central hearth is not located equidistantly between the two structures. Comparing the longitudinal distance of the hearth centroid to the interior edge of the “front” PCS zone (labelled c) with its distance to the outside edge of the “back” PCS zone (labelled d), the hearth is positioned more closely to the back (interior) PCS (Figure 7.26). Not coincidentally the position of the inner frequency peak of the front PCS (labelled b in Figure 7.26) corresponds to the frequency peaks at the front of the support post and regular post distributions (labelled a in Figures 7.25 and 7.27).

Feature Comparisons

The pattern in the lateral dimension has much in common with the EOI distribution (Figure 7.27). The hearth area can be divided into distinct zones according to the correlated changes in feature distribution (Figure 7.27). On far left and right sides, all feature types except PCS posts rapidly rise to peak between 0.21 and 0.25 hw (P1 and P5, Figure 7.27). The pit distribution peaks slightly towards the centre-line relative to the support and regular posts. The
Figure 7.23. Composite plan and profiles of mean kernel density distribution of support posts for a sample of Middle Ontario Iroquoian hearth areas (hw x hw). Grey lines indicate the position of probability peaks in the lateral and longitudinal dimensions.

Figure 7.24. Composite plan and profiles of mean kernel density distribution of pits for a sample of Middle Ontario Iroquoian hearth areas (hw x hw). Grey lines indicate the position of probability peaks in the lateral and longitudinal dimensions.
Figure 7.25. Composite plan and profiles of mean kernel density distribution of posts for a sample of Middle Ontario Iroquoian hearth areas ($hw \times hw$). Grey lines indicate the position of probability peaks in the lateral and longitudinal dimensions.

Figure 7.26. Composite plan and profiles of mean kernel density distribution of PCS posts for a sample of Middle Ontario Iroquoian hearth areas ($hw \times hw$). Solid grey lines indicate the position of probability peaks in the lateral and longitudinal dimensions. Dotted grey lines indicate approximate boundaries of the PCS features in these dimensions.
Figure 7.27. Profile plot of mean normalized KDE values for four feature types in the lateral dimension for a sample of 15 MOI hearth areas.

Figure 7.28. Profile plot of mean normalized KDE values for four feature types in the longitudinal dimension for a sample of 15 MOI hearth areas.

second peak in support posts, between 0.3-0.35 $hw$ (P2 and P4) marks another threshold beyond which the probability of support posts and pits drops, while that of regular and PCS posts rises toward the central axis (Figure 7.27).

As mentioned above, the interior peak of the front PCS signature in the longitudinal dimension corresponds with peaks in the support and regular post patterns at the same position (Figure 7.28, PA). The MOI distribution lacks the pronounced “trough” observed in the EOI and
ILOI feature distributions about 0.8 $hw$ from the back of the sample area (Figure 7.28), but like the others, a major peak across all feature distributions occurs at 0.7 $hw$ (PB, Figure 7.28). Behind the hearth all feature classes exhibit generally increasing frequencies toward the back of the hearth sample area. The support post distribution reaches its highest peak at 0.11 $hw$ from the back of the sample area (PC, Figure 7.28; Table 7.5).

*Initial Late Ontario Iroquoian Hearth Areas*

**Support Posts**

The ILOI distribution pattern of support posts is very similar to that of the MOI (Figure 7.29), with twin frequency modes on either side of the central axis in the lateral dimension, and an asymmetrical pattern of sharp peaks in the longitudinal dimension. The highest two peaks in this longitudinal dimension occur at positions c and f (Figure 7.29). If these positions indicate the characteristic structural limits of a behavioural zone associated with the central hearth (what might be termed a “compartment” for lack of a better word), we may observe that in keeping with the pattern across the earlier two periods, the hearth is significantly closer to the front limit (c), than to the back limit (f). This is coherent with the asymmetrical position of the hearth relative to the PCS zones in this dimension (see below).

**Pits**

Unlike the pattern of support posts, the pattern of pits is somewhat diffuse for this sample (Figure 7.30). It shows a general concentration towards a central, roughly rectangular area in plan view (Figure 7.30). In the lateral dimension, pits evince a generally centralized distribution, more like the EOI than MOI pattern, with bilateral limits correlated with the outside row of support posts, and occasional pits beneath side platforms. In the longitudinal dimension, few pits occur at the very front of the hearth area. A high density zone is defined by front peak (c), and back peak (f). These limits correlate well with those of the support posts, regular posts, and PCSs. In the central hearth zone (defined in the lateral dimension by peaks 2 and 3), there is a marked asymmetry in pits, with a low frequency in front of the hearth, and a high frequency behind (Figure 7.30). This parallels a similar but stronger pattern in the MOI pit distribution.

**Non-support Posts**

The ILOI regular post distribution is very similar to the MOI distribution (Figure 7.31), including a distinct narrowing of the lateral limits of the higher frequency zone at the front of the
plan (Figure 7.31, from point a-b). A major difference involves the virtual absence of regular posts in the central zone directly behind the hearth. This is most likely an artifact of the ubiquity of PCSs in this position in the sample. Because of the palimpsest of posts comprising PCSs that were constructed and reconstructed in the same place many times over, the identification of posts that were independent of these structures was generally impossible. This produced an unrealistically “empty” gap in the distribution of regular posts. Aside from an increased intensity of PCS construction that inhibited the identification of unrelated posts, the distribution of regular posts in the ILOI sample differed little from that of the MOI.

Post Cluster Structures

The ILOI PCS pattern in plan view is extremely distinct, and exaggerates the tendencies noted in the MOI PCS pattern (Figure 7.32). The features are confined to a narrow zone centered over the house mid-line in the lateral dimension (Figure 7.32). The outer limits of this zone (labelled 1 and 4, Figure 7.32) correspond to the inner peaks of the support post distribution. A high probability PCS zone occurs directly behind the hearth to the back of the hearth area, while another small high probability peak appears at the very front of the hearth area (Figure 7.32). This front zone is much too small to represent an entire PCS, and instead indicates the truncated back edge of another PCS zone, likely paired with the hearth area in front of and largely outside the sample zone.

Feature Comparisons

The feature distribution pattern in the lateral dimension has much in common with those of the earlier two periods (see Figure 7.33). Support posts, pits, and regular posts all correspond at outer frequency peaks between 0.21 to 0.23 hw from left and right walls (P1 and P5, Figure 7.33). This is the same relative position as was observed for the EOI and MOI samples (Table 7.5). A second inner set of frequency peaks in the support post distribution occurs at 0.31 hw from left and right sides (P2 and P4, Figure 7.33). This correlates with peaks in the pit distribution and the outer limits of the PCS zone (Figure 7.33).

The longitudinal pattern (Figure 7.34) shows an important convergence between the inner drop-off of the front PCS distribution and a peak in support posts and pits (PA, Figure 7.34). Directly behind this, support posts and pits appear to trade off with regular posts (TA, Figure 7.34). All three feature types then rise in frequency to converge at a peak at
Figure 7.29. Composite plan and profiles of mean kernel density distribution of support posts for a sample of Initial Late Ontario Iroquoian hearth areas ($hw \times hw$). Grey lines indicate the position of probability peaks in the lateral and longitudinal dimensions.

Figure 7.30. Composite plan and profiles of mean kernel density distribution of pits for a sample of Initial Late Ontario Iroquoian hearth areas ($hw \times hw$). Grey lines indicate the position of probability peaks in the lateral and longitudinal dimensions.
Figure 7.31. Composite plan and profiles of mean kernel density distribution of regular posts for a sample of Initial Late Ontario Iroquoian hearth areas (hw x hw). Grey lines indicate the position of probability peaks in the lateral and longitudinal dimensions.

Figure 7.32. Composite plan and profiles of mean kernel density distribution of PCS posts for a sample of Initial Late Ontario Iroquoian hearth areas (hw x hw). Grey lines indicate the position of probability peaks in the lateral and longitudinal dimensions.
approximately 0.66 \( hw \) from the back of the hearth sample area (PB, Figure 7.34). Behind the hearth, the second PCS zone begins, and is correlated with a general increase in support post and pit probabilities towards the back of the hearth area. As in the MOI case, the pit distribution peaks just in front of the support post distribution (Figure 7.34; Table 7.5).
**Hearth Area Generalizations**

The distribution of features in the lateral dimension shows surprising stability over time. In all periods, the arrangement of support posts in this dimension seems to define a series of parallel zones in which differing activities took place. Three different zones are repeated on either side of the house centre axis (see Figure 7.35; Table 7.5):

**Figure 7.35.** Model of activity zones around the central hearth within the $hw \times hw$ sample area. Numbered longitudinal zones and lettered lateral zones correspond to those described in the text. Dotted circles represent the position of PCSs.

Zone 1 is defined by the house wall on one side and the outside peak in the support post distribution (P1 and P5 in Figures 7.23, 7.29, and 7.35; Table 7.5) on the other. In all periods, the width of this zone was 0.22 to 0.23 $hw$ (Table 7.5). Using the period mean house widths, this provides an estimated width of 1.42m for the average EOI house, 1.66m for MOI, and 1.7m for ILOI houses (Table 7.5). These values fall near the mean and modal widths of side platforms discussed above (Table 7.2), and suggest that Zone 1 was principally defined by the presence of side platforms. The broader distribution of support posts in the EOI sample indicates a greater degree of variability around this norm than in the later periods. Zone 1 is characterized by low frequencies of all feature types. Small peaks in the pit distributions in this zone indicate the presence of sub-platform pits.

Zone 2 (Figure 7.35) falls between this outer peak in support posts, and an inner peak (i.e., between P1/P5 and P2/P4, Figures 7.23, 7.29, 7.35; Table 7.5). The position of this inner peak is more variable over time, and shifts from 0.35 and 0.34 $hw$ from the house walls in the
EOI and MOI cases, to 0.31 \( hw \) in the ILOI case (Table 7.5). This indicates a slight reduction in the relative width of Zone 2 from 0.12 \( hw \) in EOI, to 0.11 and 0.085 \( hw \) in MOI and ILOI respectively. Two explanations can be offered to account for this second interior peak in support posts. It could either indicate that houses were typically constructed with both an outer and an inner row of support posts on both sides of the hearth, or that two construction patterns co-existed, with houses that had platforms at 22 to 23% of house width from the outer walls, or 31 to 35% of house width. The latter cause would be expected to produce a bimodal distribution of corridor : house width ratios in the sample of house metrics discussed above. These modes should correspond to corridor : house width ratios of 0.54 and 0.34, and should be evident across all three periods. Figure 7.36 is the histogram of corridor : house width ratio measurements for the combined sample (n=120). While the pattern is broadly normal, three modal peaks can be identified at 0.49, 0.55, and 0.58. No values come close to the 0.34 range in any house across all periods. The 0.49 mode is associated primarily with EOI houses of ca. 6m in width, while the 0.55 mode is associated with houses of all periods and the 0.58 mode is dominated by MOI and ILOI houses (Figure 7.36). The difference in the latter two modes (0.58-0.55) is 0.03. Divided by two, this indicates a difference of 0.015 as a ratio of house width between the two modes on one side of the house. For the average MOI house width (7.39m), this translates into an average metric distance of 11cm. By contrast the two support post peaks defining Zone 2 in the distributional analysis range from 0.085 to 0.12 \( hw \) which equates to an estimated metric distance of 81cm for the average MOI house.

There is, therefore, no indication in the distribution of corridor : width ratios that a subset of houses had platforms at about 0.33 \( hw \). By taking a closer look at the original house plans, it is in fact possible to verify the coexistence of outer and inner rows of support posts in many houses of all periods (Figure 7.37a-d). This pattern is frequently obscured in plan drawings where small posts and pits overlie the central corridor zone, and likely explains why current models of longhouse construction have not identified a second set of support post rows (Kapches 1993; Wright 1995; Wrigley 2004). Kapches makes reference to “isolated” interior support posts (1993). These results indicate that such posts were not placed as haphazardly as has often been assumed, and instead were organized components of the architectural plan.

Zone 2 is characterized by significantly higher probabilities of pits and regular posts than Zone 1. In the EOI and ILOI patterns, the pit distribution rises through Zone 2 and peaks in the central Zone 3, while in the MOI case, pits are most frequent in Zone 2.
Figure 7.36. Histograms of corridor to house-width ratio for EOI (a), MOI (b), ILOI (c), and entire (d) samples.

Figure 7.37a. Berkholder 2 (ILOI), House 4, showing double rows of support posts (dashed lines) on both sides of the central axis. Arrows point to large central support posts.
Zone 3 falls between the inner peaks in the support post distribution (P2/P4, Figure 7.35; Table 7.5) and the house central axis. The width of this zone increased proportionally to the decrease in the width of Zone 2, from 0.15 *hw* in the EOI, to 0.16 and 0.19 *hw* in the MOI and ILOI samples respectively (Table 7.5). This produces metric estimates for Zone 3 width of 0.93m, 1.2m, and 1.4m for average EOI, MOI and ILOI house widths. Zone 3 is characterized by centrally placed hearths and PCSs, and relatively high densities of regular posts and pits, and moderate frequencies of support posts.

Feature distribution patterns in the longitudinal dimension were more variable over time. However, key commonalities in the relative position of modal peaks and troughs (PA-PC,
Figures 7.24, 7.30, and 7.36; Table 7.5) can be summarized in terms of a series of five zones (Zones A-E, Figure 7.35). In general, feature distributions do not show bilateral symmetry between front and back sides of the hearth in this dimension. At the front of the hearth areas (Zone A), feature frequencies were generally low, showing low peaks (PA) between the front of the sample area and 0.9 \( hw \) from the back of the sample area (Table 7.5). This region also corresponds to the front high probability PCS zone in the MOI and ILOI samples. Inward from this 0.9 \( hw \) limit, frequencies of support posts, regular posts and pits typically drop to a low point (TA) about 0.8 \( hw \) and rise rapidly to converge at a peak at about 0.68 \( hw \) (PB). The position of this peak was remarkably consistent across all periods and between feature types (Table 7.5). PB was always the highest probability peak of a feature class in front of the hearth. Support post frequencies peaked most closely across the three samples, at 0.68, 0.71, and 0.66 \( hw \) from the back of the sample area for EOI, MOI and ILOI respectively (Table 7.5). Frequency peaks in regular posts converged in the same location (0.67, 0.70, and 0.67 \( hw \) for EOI, MOI and ILOI samples respectively; Table 7.5). The pit frequency distributions peaked just inside this limit (at 0.67, 0.66, and 0.65 \( hw \) for EOI, MOI and ILOI respectively; Table 7.5). Identification of this threshold permits us to define a Zone A between the front of the sample area and the first major trough (TA) corresponding to the low pit and post peaks and high probability PCS zone, and a Zone B between the trough and the PB 0.68 \( hw \) threshold (Figure 7.35).

A third zone, C, can be defined between this threshold and the central hearth. This zone, as defined by the support post frequency peaks for each period, was 0.18, 0.21, and 0.16 \( hw \) in relative length for EOI, MOI and ILOI samples respectively. Zone C was generally characterized by high probabilities of pits just inside the front threshold, sharply declining frequencies of support and regular posts towards the hearth, forming a second trough (TB, Figures 7.24, 7.30, 7.36), and a lack of PCS posts (Figure 7.35).

A fourth zone, D, was defined as the space between the central hearth and the highest peak in the support post distribution behind the hearth (PC, Figures 7.24, 7.30, 7.36). Frequencies of pits, support posts, and regular posts all rose behind the hearth, to peak in similar though not identical positions by feature type. For instance, maximum probability peaks for regular posts occur just behind the hearth, followed by pits and support posts closer to the back of the sampling area (Figures 7.24, 7.30, 7.36). The maximum probability peaks for EOI, MOI and ILOI regular posts occurred 0.29, 0.35, and 0.45 \( hw \) from the back of the sample area, respectively. Support post maximum probabilities peaked further back, at 0.28, 0.11, and 0.16 \( hw \) from the central hearth for EOI, MOI and ILOI respectively. Finally, pit maximum
probabilities peaked at 0.20, 0.22, and 0.22 \( hw \) behind the hearth (Table 7.5). It is noteworthy that while pits reached their maximum frequency peaks in front of support posts in the MOI and ILOI samples, the opposite was true in the EOI case. Near the back of the hearth sampling area, feature distributions show secondary peaks between 0.2 and 0.05 \( hw \), before dropping off. Zone E encompasses this region, being defined as the area between PC and the back of the hearth sample area (Figure 7.35).

It is somewhat difficult to interpret these longitudinal patterns in terms of precise measures of the relative length of “compartments” or hearth modules. Nevertheless, the similarity in the positions of probability Peaks B and C across all periods and feature types indicates that these were determined by significant proxemic regularities in the spacing of activities along the house. An interesting conclusion is evident: hearths were not typically located at the longitudinal centre of activity foci, or “modules”, but were shifted in the direction of the nearest house end (i.e., to the “front” of the associated activity area). Because this is a claim that runs counter to present assumptions about the arrangement of family space around central hearths (see Kapches 1990; 1993), it is worthy of special discussion. Unlike the pattern of bilateral symmetry in the lateral dimension, we find an uneven relative distribution of structural members and activities about the hearth in the longitudinal dimension. The relative spacing of PCS zones vis-à-vis the hearth in the MOI and ILOI samples makes it apparent that Zone A represents part of the “back” of the next hearth zone or module in front of the hearth zone at the centre of the sampling area (Figure 7.35). This is consistent with the low frequency of other features in Zone A, and the strong convergence of probability peaks at the Zone B-Zone C boundary discussed above. This suggests that Zones B and C in front of the hearth, and Zones D and E behind the hearth, together comprise the primary longitudinal dimensions of the typical hearth module or pair of family compartments. In all periods, Zone C (directly in front of the hearth) was significantly shorter than Zone D relative to house width (Table 7.5). Moreover, activities including PCS construction and use, and the use of pits and posts were all relatively more frequent behind the hearth (i.e., in Zones D-E), particularly in the MOI and ILOI cases (Figure 7.35).

**Semi-subterranean Lodges**

Semi-subterranean lodges (SSLs) were not sufficiently frequent components of hearth areas to be included in the distributional analysis above. As a result, the distribution and positioning of these features was explored independently. The location of all SSLs was recorded
with respect to the basic categories of internal space. SSLs could occur in end-vestibules, the central corridor, beneath the side platforms, or appended to the exterior with access from beneath a side platform. SSL orientation with respect to the long axis of the house was also recorded. Table 7.6 provides the results of this analysis.

The majority of SSLs were located beneath the side platforms (57%), followed by 23% which were appended to the exterior but accessible from beneath the side platforms. Fifteen percent were located in the central corridor zone, and the remaining 5% were found in end-vestibules. This distribution indicates that while no locations were completely “out of bounds”, fully 80% of SSLs were only accessible from beneath side platforms. Interestingly, the distribution of orientations was evenly split between those parallel (49%) and perpendicular (51%) to the long axis of the house.

Discussion – Part 1: A History of Longhouse Development

The foregoing results provide additional support for diachronic trends in longhouse development that have been noted elsewhere (Dodd 1984; Warrick 1984, 1996, 2008; Kapches 1990, 1994), and reveal several important new ones. In the following sections, these trends will be considered in terms of the enduring but flexible relationships between boundaries and foci, what the latter reveal about people’s everyday dispositions within the house, and finally how those dispositions were related to an evolving sense of identity and community in Iroquoian societies between the 10\textsuperscript{th} and 15\textsuperscript{th} centuries A.D.

The Earliest Longhouses (A.D. 900 to 1000)

Houses in the earliest Early Iroquoian settlements in southern Ontario may have differed little from those of the preceding Middle Woodland. In particular, the relatively narrow (3-
5.5m), poorly-defined ellipsoidal to rectangular structures at Auda are consistent in dimensions and character with remnants of structures found at spring macro-band encampments such as Donaldson (Wright and Anderson 1963), as well as with contemporary late Princess Point intra-site settlement patterns at sites such as Holmedale. These houses were lightly constructed, and lacked the bilateral rows of interior support posts that became widespread after A.D. 1000. An apparent exception to this is House 1 at Porteous, which had a number of interior refinements common to later houses, including side platforms associated with bilateral rows of interior support posts (Noble and Kenyon 1972). Given growing evidence from other Early Iroquoian villages of complex occupation histories spanning more than a century (e.g., Timmins 1997), it may be that this house post-dates the dated occupations at the site. Alternatively, it represents an early example of an architectural pattern that later became widespread in the region.

In general, houses dating from A.D. 900 to 1000 were under 10m in length and 6m in width and seem to have lacked a common approach to supporting the superstructure. In spite of this, they were sometimes large enough to have housed small extended families. Moreover, the presence of 2 to 3 closely spaced central hearths in a number of these structures suggests that they sometimes served to house multiple families (a pattern evident at Auda and Lightfoot). Importantly, houses at this time were not always the primary context for storage and refuse pits within the settlement. Deep (often cylindrical) pits with volumes greater than 100 litres were likely used for storage prior to refuse disposal, and have been widely documented at “transitional woodland” sites (Fox 1976; Lennox 1982; Murphy and Ferris 1990; Pihl 1999; Timmins 1997). These pits are commonly found in what were most-likely outdoor locations at Holmedale, although a few may have been located inside structures (Pihl 1999: 18). Houses at this time also developed relatively few shallow irregular pits or ash pits specifically associated with central hearths. Timmins’ research at the 12 to 13th century Calvert site indicates that these small pits likely represent refuse-filled depressions in the house floor, and were not always associated with specific functions. If his conclusions can be generalized, they suggest that earlier structures were more temporary, seasonally occupied, and/or involved other practices that limited the formation of these features.

Developments in Interior Organization and Size (A.D. 1000 to 1280)

Over the next 280 years, houses grew both in length and width. As reported above, growth in width began earlier than that in length. Width expansion between ca. A.D. 1000 and 1200 seems to have been correlated with the development and widespread adoption of a
superstructure support system involving a set of one or two rows of interior support posts on both sides of the central long axis of the house. Twelfth century houses show little indication of having been longer on average, or of having more hearths, than earlier houses. By contrast, however, they were significantly wider, and house reconstructions involving widening were more common at this time.

By the end of the 12th century, average house length began to increase alongside house width. The multimodality of the Early Iroquoian house length histogram indicates that house expansions clustered around particular values rather than exhibiting continuous variation. The pattern indicates an approximate doubling and perhaps tripling of the first mode, suggesting that growth involved the addition of modular sections of 5 to 9m in length. On the other hand, the average extension/contraction length for 11 observed cases was just 3.3m (ranging from 0.97-7.69m). This disparity is significant in that the latter value is very close to the mean inter-hearth distance for the Early Iroquoian sample (2.95m), suggesting that individual house extensions may have most often involved adding single central hearths to a house. The two patterns can be reconciled, however, by the hypothesis that two types of growth were occurring at different time scales: (a) extensions during the life-history of the building that were most often designed to accommodate one additional hearth area, and (b) the merger or fusion of existing multi-hearth houses, involving the construction of an entirely new longhouse, perhaps most often upon village relocation. At the same time, the longitudinal distances between central hearths and the average amount of house area per hearth were also in flux and generally increasing. Increases in house width and length added to the available house area per hearth.

It is possible, then, to discern two separate scalar developments in the longhouse during the Early Iroquoian period, involving increases in width and length. Increases in house width went hand-in-hand with the establishment of basic architectural patterns that show continuity into the 15th century and beyond. Increases in house length were associated with adjustments in the longitudinal spacing of central hearths and associated activity foci. Importantly, the process of width expansion and associated interior reorganization began prior to significant increases in mean house length and hearth number. This development involved technological changes in the architecture of the house including the use of more substantial or deeply set wall posts, and interior support posts arranged in bilateral rows. House shape also became more regular, and small end-vestibule spaces and side platforms were increasingly common elements of interior organization. At the Elliott villages in particular, width expansions were observed to correlate with the establishment of these basic interior organizational patterns. Also, storage and other
small pit features became regular components of interior space associated with central hearth areas during this transition, although deep storage pits continued to be common in outdoor space (e.g., at Calvert, Praying Mantis, and Elliott).

Early Ontario Iroquoian longhouse interiors have often been characterized as disorganized, much like their village plans in general (Kapches 1990; Warrick 1984). The distributional analysis of Early Iroquoian hearth areas conducted here suggests that between the 11th and early 13th centuries, a surprisingly coherent pattern of super-structural support and activity organization about central hearths emerged. In spite of differences in absolute house width and length, the relative proxemics of interior zones of activity became quite predictable.

The most enduring pattern was the bilateral zonation of house space into longitudinal regions of similar use vis-à-vis the central hearth. Not only was the general bilateral pattern of 3 zones on either side of the hearth similar to that documented here for 14 to 15th century houses, but the relative lateral position of the support posts that defined them was nearly identical to the later pattern, albeit with greater variability around the modal peaks. The modal position of the exterior set of support post rows was by far the most conservative element of interior boundary formation, at 0.23 hw from the outer walls across all three periods. Thus, while Early Iroquoian houses were significantly narrower than later structures, key relative dimensions of the support-post system had been established that served in the subsequent scaling-up of longhouses.

Evidence from the distribution patterns of small posts and pits suggests that this structural innovation was coordinated with a set of characteristic practices in everyday behaviour around the hearth.

Few models of Early Iroquoian hearth area organization have been put forward. Kapches has argued that Early Iroquoian houses contained proportionally more unorganized space than later houses, and used this to infer the emergence of a fully developed matrilineal-matrilocal social system with the onset of the Middle Iroquoian period (1990). One of the problems with her analysis is that only three types of house space were defined as “organized”: side benches, a central hearth row, and end-cubicles (or end-vestibules in my nomenclature). The majority of corridor space between the side benches and the central hearth row was deemed “unorganized”. The results of the present study indicate that the area between the two side-platforms was in fact divided by a second set of support posts into two general zones of distinct activity on both sides of the hearth area, and further, that relative positions in front, behind, or adjacent to the hearth within the corridor were characterized by divergent frequencies of pits and posts that were part of regular patterns in spatial arrangement of apparently “open” corridor space. I find little to
support the idea that Early Iroquoian hearth areas after A.D. 1100 were significantly less organized than those of later periods, although increasing regularity in relative proxemics from house to house seems to have continued in the following centuries.

In his analysis of the Calvert site, Timmins suggested a simple radial model for activity zones around the central hearth, with small (“Type 2”) pits immediately surrounding it, and a relatively empty zone containing occasional deep storage/refuse (“Type 1 and 3”) pits on the periphery to either side (1997). The present analysis permits us to refine this model.

The focus of small pit and post activity was on the central longitudinal zone of the house (Figure 7.21). This activity was not evenly distributed around the hearth in a radial fashion, however. Instead, pits tended to occur in a broad lateral zone in front of, and behind the hearth, but not directly on either side. The limits of a general high-activity region were also quite distinct in both dimensions, forming a rectangular, rather than circular, shape. Large pits were occasional components of the side-platform zones on either side of the corridor, and typically fell within the front and back pit-dominated regions. Finally, the longitudinal position of the hearth was not at the centre of the resulting activity focus, but slightly closer to the nearest house end, or “front”, than to the back of the activity area. This pattern was particularly noticeable with respect to the asymmetrical position of the hearth relative to the “front” and “back” pit concentrations (Figure 7.22).

This refined model of Early Iroquoian hearth area arrangement challenges assumptions about disorganization in Early Iroquoian houses, and demonstrates important continuities in the form and relative scaling of zones with patterns identified for subsequent periods. The developmental history of this pattern is, at present, difficult to discern owing to the small sample of hearth areas used in the distributional analysis, and the tendency for early, narrow houses (i.e., <5.5m in width) to lack interior features, support posts, end-vestibules, and often, hearths. However, this negative evidence itself suggests that as houses were widened, their occupants also “opted-in” to an organized pattern of dwelling that included architectural innovations that permitted the construction of wider and taller structures and an implicit bilateral zonation of domestic practices within. This pattern was not uniformly adopted at all times and places after A.D. 1000; it was present in some houses and not others, for instance, at Porteous, the Elliott villages, Calvert, Boys and DeWaele. However, by the mid-13th century, in association with significant increases in average house length, it became the dominant pattern.
The end of the 13th century has been characterized as a period of dramatic cultural change in which the “classical” elements of Iroquoian culture emerged (Dodd, et al. 1990; Kapches 1994). Growth in average house length throughout the 13th century seems to have culminated in a 14th century pattern in which house lengths of 35 to 40m, with an estimated 5 to 6 central hearths, were most common. At the same time, houses of late Early Iroquoian size continued to be built, while some approximately double the modal length appeared for the first time. These extremely long houses were not late developments in the Middle Iroquoian, but appear in conjunction with a number of other hallmarks of Middle Iroquoian settlement patterns, ceramic styles, and mortuary patterns at sites dating to the late 13th century. Significantly longer house taper-ends, and associated end-vestibule lengths appeared relatively suddenly at this time as well. It is clear from Figure 7.10, that, like the emergence of houses greater than 50m in length, end-vestibules did not grow incrementally along with average house length during the preceding century, but shifted in size quite abruptly at the end of the 13th century. Vestibules also show no major length increases after the Early Iroquoian to Middle Iroquoian transition.

Average inter-hearth distances also increased significantly over this transition, from 2.9 to 5.3m. As discussed earlier, this pattern likely reflects a real shift in the modal inter-hearth distances within houses of these two periods, an interpretation that is corroborated by mean inter-PCS distances, and the estimates of module length relative to house width generated by the distributional analysis (Table 7.5). This increased hearth spacing translated to an estimated expansion in average house area per hearth from 32 to 57m², or a near-doubling. The histogram of inter-hearth distances for the sample indicates that, like the changes in modal house length at the end of the 13th century, this shift was somewhat abrupt rather than incremental, since few inter-hearth distances were observed in the range between the 2 to 3m and 5 to 8m modes. Side platforms were ubiquitous by the 14th century, and mean house width (at 7.39m) was slightly (but not statistically significantly) lower than in the early 15th century. These data indicate that basic limits on house width were reached early in the Middle Iroquoian, and that coordinated shifts in typical end-vestibule lengths and inter-hearth spacing occurred together with the appearance of extra-long houses at many settlements.

While growth in the longhouse has often been interpreted as a reflection of the endogenous population growth of resident lineage segments, this hypothesis cannot account for the rapidity of longhouse growth in the late 13th century and for the appearance of extra-long houses. As studies of regional settlement systems have shown, the formation of Middle
Iroquoian villages involved the coalescence of local clusters of small Early Iroquoian settlements (MacDonald 2002; Pearce 1984; Warrick 2000; Williamson and Pfeiffer 2003). In Chapter 5, I noted that in the sample of villages analyzed, all of the growth in average total roofed-over area between Early Iroquoian and Middle Iroquoian villages was accomplished by increases in house size, rather than number. This indicates that village coalescence typically entailed the coincident fusion of houses into significantly longer structures. Warrick’s study of regional demography in south-central Ontario indicates that a major population explosion occurred after ca. A.D. 1330, that is, following the fusions of Early Iroquoian villages and emergence of 30 to 80m houses between A.D. 1280 and 1330 (2008).

Taken together, these studies strongly suggest that rapid longhouse growth by the fusion of two or more previously distinct co-residential groups in the late 13th and early 14th centuries was fundamental to the process of settlement coalescence and community reorganization that was occurring at that time. This, in turn, suggests that longhouse growth at the turn of the 14th century can be best understood as an inherently political process rather than a narrowly demographic one. The alliance-building that was necessary to bring about the coalescence of autonomous mid-13th century villages was not an exclusively extra-household development, a rarefied domain of men, politics, and public space that was opposed to one of women, kinship, and domestic space. Domestic space became political space, as inter-village politics were mediated through developments within the house itself. Moreover, the longhouse growth pattern indicates that the social, economic, and political reorganizations that accompanied longhouse expansion and village fusion were involved in permitting or promoting the subsequent period of rapid population growth, rather than the reverse.

The longhouse, then, was the primary context for social negotiations and alliances that permitted the coalescence of late 13th century communities. This inference is also supported by the increasing frequency and scale of house extensions that have been documented for the Middle Iroquoian. Several villages, including some not analyzed here because of their incomplete plans, show evidence for very large longhouse extensions that occurred near the turn of the 14th century (including houses at Myers Road, Reid, and Dorchester). At Myers Road, House 9 appears to have been the product of the merger of two former houses that were built end-to-end in the same location. This leads to two hypothetical scenarios for coalescence:

Scenario 1: The houses within antecedent Early Iroquoian villages merged “endogenously” to form one or two large longhouses at the new settlement.
Scenario 2: Each house made its own alliances with those of other villages, leading to a new community with houses containing occupants from multiple antecedent communities; that is, house mergers were “exogenous”.

If we assume for a moment that 14th century longhouses were associated primarily with a single maternal lineage segment, Scenario 1 would imply that Early Iroquoian villages were dominated by one lineage, and that exogamous marriage was practiced between Early Iroquoian settlements in a local cluster. Scenario 2 would imply that Early Iroquoian villages contained multiple lineage segments and may have been endogamous. Currently, there is little evidence to support one of these scenarios over the other. These two models undoubtedly oversimplify the process. The large range in house lengths at Middle Iroquoian villages seems to suggest that the process of house coalescence (and fission) was not at all uniform from one domestic group to another within the same settlement. Most likely, both endogenous fusions within villages and exogenous fusions between houses in neighbouring villages were involved in the process. Considering the importance of kin ties in small-scale societies, it seems reasonable to suggest that fictive and actual links between lineage segments in different villages were drawn upon to legitimate house fusions during the process of village coalescence. Whatever the role of kinship here, the scale, timing and context of longhouse expansion during the Early Iroquoian to Middle Iroquoian transition indicate that community mergers were effected via domestic alliances as the house became the primary vector for community growth. In turn, this suggests that the domestic sphere became politicized as the longhouse was mobilized as the appropriate context for the absorption of local populations.

The feature distribution patterns around hearth foci in Middle Iroquoian houses are indicative of significant continuity with the Early Iroquoian pattern, particularly in the lateral dimension. Changes in the longitudinal spacing of hearths were reflected in the increased relative length of the high density/occupation zone in this dimension, as well as the relative spacing of PCSs. Rather than evidencing a radical reorganization of a previously simple or disorganized use of space, the distributional patterns of this period indicate a heightened regularity and exaggeration of patterns that were already present in Early Iroquoian houses. In particular, the relative proxemics of the support-post system was remarkably coherent from one hearth area to the next. This was reflected in the sharpness and steepness of the modal frequency peaks in the kernel density profile plots. By contrast, however, the distribution of pits changed
significantly from the Early Iroquoian pattern, shifting from two broad high-frequency areas in front and behind the hearth, to a u-shaped distribution of high frequency directly to either side of and behind the hearth, but not in front. During this period, all feature types were more frequent behind the hearth, suggesting an increasing asymmetry between practices occurring in the longitudinal dimension. This pattern indicates that as houses became significantly longer, semi-fixed features and related daily practices were increasingly differentiated along the longitudinal dimension of the hearth focus. This development suggests an increasing concern with interactions between outside and inside, guests and hosts.

Other important developments in interior space at this time were the incorporation of PCSs and SSLs into the compliment of domestic features and activities. The PCS distribution appears to have fit into the existing pattern of lateral zones, and further, contributed to the development of asymmetry in the scale and content of the areas in front of and behind the hearth in the longitudinal dimension. Unlike PCSs, SSLs were not common components of a hearth area, or even of a house. Their preferential placement beneath side platforms or appended to the house exterior indicates that access to these structures was often meant to be controllable and segregated from the areas of high foot traffic and activity in the central corridor. The significance of the appearance and use of PCSs and SSLs will be discussed in more detail below.

Considering the house at large, the development of long taper-ends, distinct interior end-walls and associated end-vestibules, as well as fences, walls, or windbreaks associated with end doors all indicate a substantial expansion and elaboration of transition spaces between the longhouse exterior and interior living area. In some houses, the end-vestibules show evidence for further subdivision. Thus, upon entering a house from an end door, one might have been obliged to move through an exterior transition space defined by a wall or porch, a primary threshold into an interior vestibule between 5 and 10 meters in length that was occasionally partitioned into outer and inner rooms, to a second, interior threshold, and finally into the central corridor of the house.

In part, the development of large end-vestibules may relate to changes in storage practices at the onset of the Middle Iroquoian. Early Iroquoian villages, at least in the west, such as Calvert, Elliott and Praying Mantis, commonly had large and deep flat-bottomed pits that were most-likely used initially for storage of maize during the cold season (Timmins 1997). These “Type 1” pits (in Timmins’ typology) were most frequent in outdoor space at Calvert, but were also common along the interior side-walls at Calvert and Elliott. The use of large cylindrical pits for storage outside houses virtually disappeared at Middle Iroquoian villages, although the
transition may have had regional differences in timing. For instance, deep storage pits continued in importance at the Dorchester villages, early Middle Iroquoian settlement(s) located near Calvert (Martelle pers. com.). In general, however, the disappearance of subterranean storage under side-platforms in houses, or in exterior village space might relate to the function of end-vestibules. Ethnohistoric sources indicate that they were used for the communal storage of maize in large bark casks, and firewood in 17th century Huron houses. Thus, there may have been a trade-off between the use of storage pits and the expansion of end-vestibule space at this time. If this is so, it suggests that an important change in the social control and collective scale of food storage occurred. Archaeologically, there are few indicators of the function of end-vestibules. They typically lack features of any kind, but were the occasional context for SSLs, hearths, and even human and animal burials.

While Middle Iroquoian end-vestibules probably had storage functions, as transition spaces, they likely also served important social ones. Transition spaces have been identified as playing an important role in the creation of privacy or intimacy gradients between social domains (Alexander, et al. 1977; Chermayeff and Alexander 1963; Hall 1969; Lawrence 1984). In light of the increased social scale of the 14th century longhouse, and village as a whole, and correlated distinctions between a “front”, and “back” region of hearth foci, the elaboration of transition spaces at this time suggests a developing concern for mediating the interactions between longhouse residents and guests. The presence of SSLs and burials within these spaces, while rare, indicate that associated rituals may have been important in marking the social significance of the transitions associated with entering the longhouse.

Initial Late Iroquoian Developments (A.D. 1420 to 1500)

The basic patterns of longhouse size and relative scale and organization of internal features show strong continuity into early 15th century houses. Average inter-hearth and inter-PCS distances continued to climb, corroborating the hypothesis that hearth “modules” reached their historical peak in size or spacing at this time. Meanwhile, the ubiquity of PCSs and intensity of their use/reconstruction continued to rise, while SSLs waned in frequency, or were abandoned altogether at some sites (e.g., Draper). A small but significant reduction in the relative distance of both inner and outer rows of support posts from the outer walls in the lateral dimension suggests that increases in house width were preferentially allocated to central corridor and “Zone 3” area. Dodd’s data on post-A.D. 1450 houses indicates that relative corridor space continued to climb at the expense of side-platform width into the contact period (1984). This
trend is difficult to explain. One possibility is a reduction in actual or anticipated family size, leading to a reduction in platform space requirements. This explanation is not completely satisfying, however, since the trend seems to have started when inter-hearth spacing and house area per hearth were at their historical peaks. The apparent disappearance of SSLs from houses by the 16th century, and continued importance of centrally-located PCSs, may be related to this shift in proportional allocation of “sides” to “centre”. If so, it suggests that ritual activities focused on the house centre-line may have gained in significance over those occurring on or beneath side platforms during the late pre-contact period.

Discussion – Part 2: Household Social Integration

This review leads to several important inferences regarding longhouse development between A.D. 900 and 1500:

A) Shifts in the scale of the longhouse in lateral and longitudinal dimensions, that is, in its outer boundaries, were associated with distinctive architectural innovations and refinements in the superstructural support system, the establishment of enduring zones of daily practice about central hearths, shifting proxemics between hearth foci, the elaboration of transition spaces, and the incorporation or rejection of specialized features with ritual associations (SSLs and PCSs).

B) These internal scalar and organizational shifts were not gradually evolving patterns driven primarily by endogenous domestic population growth, but involved punctuated changes at particular historical junctures associated with regional community reorganizations. Such events involved political alliance-building and village coalescence. The longhouse was central to these emerging socio-political processes at the village level and beyond.

Given A and B, the association of the Middle Iroquoian longhouse with a “fully developed” matrilineal/matrilocal Iroquoian cultural pattern is perhaps misleading, since it obfuscates the changing position of the house and its residential group within rapidly reconfigured communities. Rather than opposing “disorganized” Early Iroquoian domestic spaces with “organized” Middle Iroquoian ones in order to suit an evolutionary model of cultural development, our next step should be to ask how specific organizational patterns served in the reproduction of social life during these periods of significant upheaval.
The Social Dimensions of Household Space

In Chapter 6, I discussed the hypothesis that the spatial patterns of village growth were consonant with the development of a multi-level sequential hierarchy. I suggested that the configuration of outdoor spatial networks at large Late Iroquoian villages such as Draper and Ball had characteristics of emerging small-world networks, the nature of which would have been conducive to local-to-global interactions and sequential patterns of communication and decision-making. I also argued that patterns of increasing local axial integration of longhouses were the proximate result of factional group dynamics within Middle and Initial Late Ontario Iroquoian villages.

Much of this interpretation rests on the role of the longhouse itself. To what extent were longhouse occupants integrated into political interest-groups? If the longhouse behaved like a modern urban apartment building, with private family compartments linked via a common corridor or hall to the outside, we would be wise to question the idea that it served an important locally-integrative function. The distribution analysis results, however, support the idea that the row of central hearths formed a critical integrative focus for village life. On the other hand, more radical kinds of spatial integration could be envisioned that, for instance, disintegrated the elementary family unit and its associated space in favour of a fully communal domestic economy (e.g., via segregation of interior space by tasks, age-grades or gender). In order to understand the foundations of longhouse social production, then, it is important to examine how specific material practices of dwelling invoked and entrenched integration at some scales and segregation and boundary formation at others.

Unlike the more murky issue of matrilocality, ethnohistoric sources for Northern Iroquoians in the 17th and 18th centuries were consistent about the basic arrangement of “families” or “households” within the longhouse. 17th century French sources state that Huron central hearths were shared by two (probably nuclear) families, each occupying a space on either side of it (Biggar 1929; Sagard 1939). This pattern is also indirectly indicated by the population, hearth, and house counts of the Jesuit census of the Huron in 1640 (Thwaites 1896-1901: 19: 127). This census produced an estimate of 12,000 persons occupying some 2000 fires in 700 houses, for an average of 3 hearths per house. A separate estimate of three or four-hundred households (“ménages”) in “fifty, sixty, or one hundred cabins (Thwaites 1896-1901: 10: 211)” is consistent with two households per hearth at the three hearths per cabin average. Jesuit writers apparently used the terms “familles” and “ménages” somewhat interchangeably to refer to social
units that normally shared a central hearth. The French-Huron (or FH, ca. 1675) and French-
Huron-Onondaga (FHO, ca. 1655) dictionaries of the Jesuits provide corroborative evidence to
these accounts. The Wendat phrase “te onatsanhiaj” is translated in the FHO as, “nous sommes
au mesme feu vis a vis l’un de l’autre...[we are of the same fire, opposite one another]” (Steckley
1987, 2007). The Wendat noun for hearth is “tsanh”. As Steckley reports, the dualic verb form
used here (“kai,i”) literally means “to cut in two”. So a more exact translation of “te
on,itsenhia,i” would be, “we cut the hearth in two” (1987: 26). Interestingly, the FH dictionary
translates the same phrase (“te on,itsenhia,i”) as simply, “nous sommes vis a vis l’un de l’autre
[we are opposite one another] (Steckley 1987: 26).” This connotation suggests an intimate and
taken for granted connection between the sharing of a hearth, and a position of opposition.

Evidently, the central hearth both symbolized and actualized a division of the interior
space of the longhouse into two opposing sides. The symbolic importance of the hearth as
defining the dividing line between groups is reflected in political ritual among the Five Nations
Iroquois (Fenton 1998), and the Wyandot in the early 20th century (Steckley 1987: 27) wherein
paired moieties or phratries sat on opposite sides of a central fire during councils and at
calendrical ceremonies such as those of midwinter (Tooker 1970). The same principle appears to
have been at work in the “wood’s edge” rite of the condolence ritual, when a fire was kindled on
the path where the “clearminded” and “bereaved” parties met (Fenton 1998). A French copy of
an Iroquois (probably Seneca) pictograph dating to about A.D. 1666 also illustrates this motif.
The image, representing the bear and turtle clans in council, shows a bear and turtle standing in
profile, facing each other across a hearth (Richter 1992: 21).

These sources indicate that the dual position of families across the central hearth had
deep cultural roots, not only in the characteristic arrangement of domestic space, but in a variety
of religious and political contexts. As discussed above, bilateral symmetry in the subdivision of
activities on either side of the hearth was the most conservative aspect of longhouse hearth area
organization, showing strong continuity from at least the middle of the Early Iroquoian period.
Edward Hall’s insights about the development of culturally coherent systems of social distances,
or proxemics are relevant here (Hall 1969). Unlike the longitudinal distances between hearths
and associated activity areas, which varied considerably over time (and even within the same
house), the proxemics involved in the formation of activity zones in the lateral dimension, once
established, were remarkably stable. It seems likely that the widening of houses into the 6 to 8m
range and concomitant establishment of bilateral zones of interior activity were associated with
the emergence of the dual-family hearth pattern. The social distance required by two families

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sharing the same hearth involved the development of a gradient of privacy or intimacy from the sides to the centre. The central hearth consequently came to act simultaneously as boundary and focus. Precisely because it marked the division between two equivalent halves and their associated occupants, the hearth was also the integrative heart of the house, drawing the two together in common domestic practices.

Cross-cutting this division between family “sides” were several other sets of superimposed divisions. One of these was related to the three zones of differentiated activity between the outer wall and the hearth (Figure 7.35). The low pit and post frequency zone (“Zone 1”) between the outer wall and 0.23 \( hw \) has been identified with side-platform spaces that were also documented historically. The Wendat word for this platform was “andichons” (Thwaites 1896-1901). The space above and below this platform (when present) was historically used for the storage of utensils, firewood, the placement of mats for sleeping, and seating during large gatherings (Steckley 1987: 25). This space was also the preferred location for the construction of SSLs (MacDonald 1988; MacDonald and Williamson 2001; Stopp 1989), but never PCSs. The basic spatial division between these side areas and the central high-activity zone in between caught the attention of many commentators. In 1535, Cartier noted at Hochelaga that, “…inside these houses are many rooms and chambers; and in the middle is a large space without a floor, where they light their fire and live together in common. Afterwards the men retire to the above-mentioned quarters with their wives and children (Biggar 1924).” Cartier’s description of the use of longhouse space appears tailored to his European audience here. Nevertheless, it seems reasonable, when other evidence is also taken into account, to accept that the corridor: andichons division represented something akin to a public-private dichotomy.

The linguistic evidence suggests that the andichons were used for storage, at least in the Huron context (Steckley 1987: 26), while Sagard, (after Champlain) describes these as a sleeping place in summer, “to escape the importunity of the fleas” (1929: 93-94). Apparently, sleeping mats were usually placed on the ground below the andichons. Steckley has suggested that the Huron noun “ndat” (mat, bed, or place) connoted an individual’s personal space or “spot” in the house (Steckley 1987: 26). From this sense came several metaphorical phrases. “On,endata8e.indi”, literally, “they close up my mat”, had the implication of ostracism from one’s house, while the Mohawk version of the noun, combined with the verb “to wash”, gave the expression “gannaktohare”, or “to wash the mat” (Steckley 1987). This was one of the “words” spoken at the condolence rites, and referred to a symbolic washing of the bloody mat of a murder victim (Hale 1962 [1882]). These metaphors indicate the existence of a strong identification of
the mat with its individual owner and his or her entitlement to longhouse space. So while the
centre of the lodge was where people “lived together in common”, the peripheral space adjacent
to each wall was the place of the individual’s mat, a relatively private space where household
members retired to sleep and property was stored.

A second region (“Zone 2”), the area between the andichons and a possible second
interior row of support posts has no specific ethnohistoric referents or counterparts (Figure 7.35).
It seems that aside from the support posts themselves, this space was continuous with that of the
central hearth area (“Zone 3”). Nevertheless, it seems to have been characterized by a distinctive
complement of activities (particularly in the Middle Iroquoian sample) including a high
frequency of pit features and support posts. The central hearth area, “Zone 3”, was the exclusive
location of PCSs, and a variety of activities involving small posts and pits located on or near the
house centre-line. Given that the centre of Zone 3 would have been routinely blocked to
through-traffic at intervals by cooking utensils and apparatus, hearths, and PCSs, it is likely that
movement between hearth areas or modules must have occurred near the outside margins of
Zone 3. In fact, this position of longitudinal foot traffic might account for the pattern of activity
at the interface of Zones 2 and 3. The high frequency of small pits in Zone 2 may represent the
by-product of frequent sweeping of debris away from the areas of high activity and foot traffic in
Zone 3 and its resulting accumulation in depressions in Zone 2 (and at the centre of Zone 3). It
is also likely that intentionally-dug pits were placed between or adjacent to support posts in Zone
2 so as to be out of the way of foot traffic that would otherwise disturb them.

Longitudinal asymmetry in the relative scale and content of hearth module space at the
front and back of the hearth strongly suggests that the hearth marked another division of sides in
this dimension (Figure 7.35). Once again, ethnohistoric references to interior organization are
too vague to provide information about this distinction. Unlike the division between lateral
sides, the hearth marked a boundary between qualitatively different social classes in the
longitudinal dimension. This was the dimension of movement into and out-of a household living
space. It was the dimension along which hosts and guests, insiders and outsiders were obliged to
meet. That the hearth was often positioned closer to the front “edge” of a typical hearth area was
indicated in the distributional analysis. Also, the average distance between end-hearths and end-
walls was significantly less than half the average inter-hearth distance for the Middle Iroquoian
and initial Late Iroquoian samples (between 45 and 33% of inter-hearth and inter-PCS distance).
Not only were the relative sizes of the areas in front of and behind the hearth different, but their
feature contents were qualitatively and quantitatively distinct. PCSs normally occurred on the
interior side of the hearth. In Middle Iroquoian and initial Late Iroquoian houses, pits and posts were relatively infrequent in Zone 3 directly in front of the hearth, but were abundant behind it.

A final boundary between spaces within the house involved a division between paired-family “compartments” or “modules”. Ethnohistorically, several architectural features serving to divide the house across its breadth have been cited, from Cartier’s (embellished?) “many rooms and chambers” at Hochelaga, to Lafitau’s description of Mohawk platforms as being closed in on all sides but that of the fire (Fenton and Moore 1974-1977). Snow has argued for a distinction between “compartment” and “cubicle”. The former was the entire space occupied by two nuclear families, while the latter was the “stall” referred to ethnohistorically (Snow 1994: 43, Dodd 1984: 318-319). The Huron term “.Andhok8enda”, which is derived from the same noun as is the word for door, is translated in the French-Huron-Onondaga dictionary as “partition inside the house” and as “the headboard of their beds” (Steckley 1987: 24). Mohawk doors were described by Lafitau as movable sheets of bark hung from above (Fenton and Moore 1974-1977). If interior partitions were constructed in a manner similar to doors, this could explain why structural evidence for cubicles is not obvious archaeologically. Nonetheless, the modularity of archaeological residues within houses is enough to demonstrate that, with or without durable architectural divisions, behaviour within the house typically involved these practical divisions of space. It is also significant that partitions may have been used historically to divide the andichons. The distributional analysis indicated that regular and support posts typically occurred with high probability about 0.2 \( n \) in front of the hearth across all periods, while pits peaked in frequency just inside this limit (“PB”, described above). In front of this, frequencies of all feature types were generally quite low. This pattern indicates that the boundary between modules was characterized by a buffer zone, followed normally by a set of support posts marking the threshold of the next hearth area (Figure 7.35). Neither the original archaeological plans, nor the distributional analyses indicate that these modules were commonly divided fully by walls that were similar to those of the house exterior. Instead, the position of existing superstructural support members was apparently an important visual cue for ordinary practices that involved boundary formation, perhaps including the use of bark screens to delimit family sections along the andichons.

**Identity, Community, and the Politicization of the House**

“It is the principle of categorization that underlines the ordering of houses and domestic life (Lawrence 1984)”
How do the categories of longhouse space discussed above relate to the production and reproduction of late prehistoric Iroquoian society and world-view? In order to answer this question, we must grasp these patterns as the tangible, if fragmentary, residue of *habitus*, of daily performances executed with the burden of past meanings and individual perceptions and motivations consciously or unconsciously in mind (Bourdieu 1977). This, in turn, requires a wider examination of Northern Iroquoian social and ideational structuration. When the dominant concerns and tensions within historic Iroquoian societies are understood, the way that late prehistoric daily practice was deployed to negotiate similar tensions becomes evident.

Historic Northern Iroquoian socio-political structure is an instructive point of departure. In general, this structure can be understood to derive from several root principles, or themes. One is a tension between the whole and its constituent parts, that is, between integration and factionalism, compound and atom. A second and related issue is the relative prestige, power, or influence of atoms within the whole, that is, the strength of egalitarianism within and between social units (be these individuals, households, lineages, villages, nations or confederacies). An important corollary of these root principles is that those places and times where these tensions were highest tend to have been marked by performances and ritual elaborations that served, somewhat paradoxically, to mitigate and reproduce these tensions. This, I suggest, was no less true for the precontact residential longhouse as for the ritualized atmosphere of historic confederacy councils, or the midwinter ceremonials of the “longhouse” religion.

Iroquoian Individual and Community Identities

In the introduction to a paper entitled, “Order and Freedom in Huron Society”, Bruce Trigger wrote that:

> An essential aspect of human society is conflict between the interests of the individual and those of the society or social grouping of which he is a member (Trigger 1963: 151).

Although this statement brings to mind, somewhat problematically, Rousseau’s social contract, Trigger was right to frame his argument about Huron social order in this way, in the sense that a discussion of community formation and identity must inevitably run up against two other critical factors: 1) the constitution of various agencies, beginning at the smallest scale with the “self” or “person”, and 2) the power dynamics defining their relationships. In short, *community* must be
studied as the ongoing synthesis of an interaction between identity and power at various scales. What Trigger did not question, however, was the idea of Huron individuals as rational free agents in the sense given by western methodological individualism. In light of a growing critique of the modern concept of individuality and its problematic associations with “agency” (Kirk 2006; Knapp and van Dommelen 2008; Meskell 2001; Thomas 2004a), it seems appropriate to ask just what it meant to be a Huron individual. Northern Iroquoian personhood, I argue, while sharing values such as autonomy and personal freedom with the ideal of western individualism, is more properly seen as dual, embodying a structural opposition between part and whole that was pervasive in Iroquoian culture. Moreover, Iroquoian personhood was not a fixed, “natural” entity against which community and power were constrained to adapt. Rather, viewed in a relational context of dwelling, (Ingold 2000), it appears that Iroquoian personhood and family identity became increasingly clearly defined and formally articulated at precisely the same time that large longhouses emerged to structure the village community as a whole, beginning around the late 13th century AD.

Power has been strongly linked to both the construction of personhood as well as to community, institution, and authority. For instance, the modern western individual is typically endowed with free will, rationality, and agency. Agency, as the power to act, is directly invested in the natural state of the human individual. The power of institutions is, as a corollary, a secondary, cultural product – the result of the ceding of naturally given individual agency through a social contract, to return to Rousseau. Of course, this ideology of power and the individual does not actually reflect practice, as Foucault’s writings on discipline amply illustrate. But Foucault’s perspective on the encompassing, coercive mechanisms of institutionalized power, in turn, leaves little room for the constitution of agency at the personal level, at least, for it to be convincingly applicable to more egalitarian societies.

Indeed, both views tend to locate the origins of power in essentialized social constructs of “individual” and “state” rather than in the material and spatial practices from which the latter emerge, to varying degrees, as apparently singular entities. However, if personhood is more rightly seen as relational, sensu Thomas (2004), and ultimately emerges within a network of unique social and material practices, then power, too, should be seen as culturally and historically contingent, not merely in terms of its concentration or symmetry of distribution, but in terms of how agency and authority are contextually made meaningful – a different type of personhood calls for a different type of power. This might appear obvious, but in practice archaeologists, thinking of power either in terms of the constructs of western individualism or in
terms of abstract and dematerialized bureaucracies, have tended to assume that power is a non-issue in egalitarian societies. But power is, as Adam T. Smith has put it, “…not just the ability of one (individual, class, regime, [or] polity) to realize its interests at the expense of another but, more profoundly, the capacity to constitute interests and determine their significance within the management of existing conditions (2003: 108).” In any society, even an egalitarian one, decisions must be made and collective actions taken. The study of how collective interests are formed, managed, and manipulated by various agencies is no less interesting in cases where coercive power is absent or purposefully resisted, as it was in Northern Iroquoian societies (Trigger 1990). Rather, we are challenged to conceive of different configurations of power and its role in the mutually constitutive relations between persons and wider social categories.

Ethnohistoric sources suggest that in the Iroquoian societies at contact, personhood and community were two sides of the same coin (Druke 1980). Any social category, from the person, to the longhouse group, clan, moiety, or nation, was seen to consist of the alliance of linked parts. And while scholars have emphasized the freedom and autonomy exercised by Iroquoian individuals (e.g., Trigger 1990), this dualism of part and whole was not really as similar to Rousseau’s social contract as it might at first appear. This is because social atoms like the person were never prior to the communal. Personhood was, in contrast to the western sense of the individual – dual. Persons were believed to have two souls, one that inhered in the skeleton, and another that was liberated at death until such time that it might be reincarnated into the same maternal lineage (Hewitt 1894; Hall 1997). This duality of personhood meant that any self was an alliance of parts. Equally, these parts, the souls, were not unique to the self, but equally the locally incarnated part of an eternal whole, the matrilineage. Power, rather than being a natural property of the “free man”, or the product of accumulated economic capital, was foremost a spiritual force (orenda [Hewitt 1928; Steckley 2007: 214-221]) that issued from the many reciprocal bonds that joined together two or more entities into social wholes. Remarkably, the related Huron-Wyandot verb atren, meaning literally “to ritually invoke (and be the recipient of) spiritual force (Steckley 2007: 215)” was translated by Potier for the Wyandot as implying membership within a dance society, or more generally, “…to be a participant in something, for there to be a share, to be party, league, faction; to be consenting, to be colluding with, to be of the number of the band (1920: 203),” indicating the close conceptual connections in Huron between spiritual power and collective group formation (see Richter 1987). The potent reciprocal interchange of allied social agencies pervaded everything from a person’s relationship
with his or her guardian spirit (or *oki*), to calendrical ceremonies, rituals of inter-village political protocol, mortuary practices, and, I argue, the organization of domestic space within longhouses.

In the 17th and 18th centuries, Iroquoian social and political integration was achieved through a process of linking atomic constituents. These social units were hierarchically arranged in a nested series, from the individual to the inter-tribal confederacy. While it has been convenient to ignore the social importance of personhood from an archaeological perspective, the ethnohistoric record leaves little doubt about the strength of individual autonomy in Iroquoian societies. No individual or larger social or political unit, except perhaps the elder matrons of the extended family, held the power to coerce individuals into a particular course of action. To publicly shame another person was considered the highest form of insult (Thwaites 1896-1901). This principle of autonomy was instilled early in life. The Jesuits and other European observers were uniformly dismayed that Huron parents did not employ corporal punishment to discipline their children. Champlain reported that children, “…did not obey their parents and were not punished for any fault. Everyone lived in complete freedom and did what he thought fit. Parents failed to correct their children and often suffered wrongdoing at their hands…” (Tooker 1964).” Apparently, the humiliation stemming from public correction was feared to provoke suicide (Thwaites 1896-1901:37). The goal of Iroquoian diplomacy was therefore one of consensus (Druke 1987). Coercion was not abided, and collective decisions could not be enforced by the village majority, or by those holding hereditary positions of authority (Richter 1992).

On the other hand, this principle of autonomy was not unbridled. Individual prestige was to be gained not through the accumulation of personal wealth, but through acts of generosity. Gifts and feasts were the primary means to effect these goals. The capture of enemies for adoption and ritual execution was another way to achieve status (Snyderman 1948), but like the giving of feasts, these acts were justifiable because they were understood to bring spiritual benefits not only to the individual responsible, but to some larger social group such as the lineage segment (Richter 1992: 22; Williamson 2007). Richter has commented that this redistributive power system, “…encouraged rivalries between headmen and would-be headmen, matrons, and younger women, yet channelled those rivalries into benefits for kin groups and the community as a whole (1992: 22).” Along with the prestige associated with positions of authority came a burden of responsibility to facilitate consensus and alliance for the benefit of those spoken for.
Twin values of individual autonomy and collective strength ran deeply through the various scales and structures of 17th and 18th century Iroquoian socio-political order. As one moves “up the scale” of social units, from individual, to nuclear family, maternal lineage segment, clan, village, nation and inter-tribal alliance, each smaller unit stands in the same relation to the larger units, as atom to whole, and the same principle of balanced tension between atom and group interests pervades the routine interactions of these entities. Each larger social formation was constructed socially and symbolically as a unity through duality. Mary Druke has pointed out that the structure of Five Nations Iroquois diplomacy in the early contact era was based on leader-follower relationships within individual villages (1987). Leaders’ authority depended on their ability to successfully represent the interests of a group of followers. “Selfishness” on the part of these leaders was not to be tolerated, and if it was suspected, “…they would grow mean in the Opinion of their Country-men and would consequently lose their Authority (Colden 1755).” Larger political unions were produced through the alliances of similar leader-follower coalitions. Druke points out that members of such alliances, “…maintained independence while also identifying with the extended relationship, for there was in Iroquois culture a sense of identity of self within the group (1987: 31-32).”

Reciprocity characterized the interactions of friendly individuals (Trigger 1976), be these human or other-than-human in nature (Druke 1987; Richter 1992) and formed the principal substance and symbol of alliances of all sorts. Reciprocity took the form of informal gifts between friends, ritualized gifts upon the death of individuals of another moiety or nation (Fenton 1998; Steckley 2007), and exchanges of words and wampum at village, tribal and inter-tribal councils (Druke 1987). That interactions between the constituent social units forming various alliances ought to be balanced appears to have been fundamental to alliance-building, as is evident in the structure of council protocol (Fenton 1998; Foster 1984).

More broadly, an ideology of balance between autonomous and potentially opposing forces appears to have pervaded Iroquoian thought at the time of contact. From the conflict between the “good” and “evil” twins of the creation story (Richter 1992), to the reciprocal adoption and sacrifice characteristic of the “mourning war” (Richter 1992; Snyderman 1948; Williamson 2007), to the condolence rites carried out by opposing moieties or political factions at historic councils (Fenton 1998), a stance of balanced opposition is in evidence. As I have suggested above, a notion of spiritual power was at the core of this ideology. Richter has pointed out that any relationship of friendship or alliance was thought to bring mutual benefits of spiritual strength. This was one of the principal motivations for the “mourning war” complex.
The spiritual strength of the lineage corresponded to its size. As individuals died or were taken in war, a lineage segment suffered a corresponding weakness and imbalance in power. To right this balance, captives taken in raids against traditional enemies could be adopted and “resuscitated” under the name of some family member who had died. These adoptees might also subsequently be sacrificed to the “upholder of the heavens” (Williamson 2007; Richter 1992). The ritual cannibalism which followed this sacrifice imbued the consuming persons with spiritual power and rectified the imbalance that had resulted from the deaths of loved ones (Thwaites 1896-1901: 13: 37-79).

Health and healing were also related to this power concept. Contests between opposing teams were involved in curing ceremonies. Lacrosse and games of chance were prescribed by shamans as a remedy (Thwaites 1896), indicating that the contest of power embodied in these games was thought to rectify the power imbalance underlying illness. Elsewhere (Creese 2005) I have discussed the probable relationship between the sort of reciprocity involved in healing by games of contest, and the healing reciprocity of rituals of “peace and power” which were the basis for diplomatic relationships between Five Nations Iroquois villages and nations from at least the mid-17th century (Richter 1992; Fenton 1998). Reciprocal duties between moieties (groupings of clans into opposing “sides”) in these rituals (including games of lacrosse, and the “bowl game” at midwinter ceremonies [Tooker 1970]), were transposed to groupings of nations at the confederacy level (Fenton 1998). Similarly, a ritual of sexual intercourse conducted in the name of an ill person (called “enda’k8andet” in Wendat) was involved in curing disease among the 17th century Huron (Sagard 1939; Thwaites 17: 147, 179; Potier 1920: 287; Steckley 2007: 190-191). This ceremony was, in Sagard’s account, presided over by two chiefs or masters of ceremony who chanted at each end of the house for the duration of the night (Sagard 1939: 120), further conveying a sense of potent duality. Even the bilateral sleeping position of the sky woman’s parents on opposite sides of the fire in their celestial house was, in some versions of the creation myth, associated with her miraculous conception. The sky woman, too, miraculously conceived a daughter in the same way (Richter 1992: 9). These examples indicate the importance of gendered or sexual pairings in the generation of healing and procreative forces.

This ontology of power in duality was most evident in the ritual events marking those points in time and space where tensions between atom and alliance, or between atoms within an alliance, came to a head. This occurred at the spatial and temporal points of intersection between social atoms. These intersection points were the focus for symbolic constructions affirming the principles of balance and reciprocity over imbalance and acquisitiveness. A more detailed look
at the rituals associated with political alliance-building is illustrative of this point. Councils that brought together politically autonomous factions (for instance, village councils composed of leader-follower coalitions from various longhouses, or tribal councils composed of emissaries from a number of villages, and so on) were the principal locus for tensions related to collective strength vs. factionalism, egalitarianism vs. prestige. These tensions were eased through rituals that maintained an appearance of balance between these forces. Throughout the 17th and 18th centuries, condolence rituals typically marked the beginning of village and confederacy council meetings among the five nations Iroquois. Members of one tribal moiety, or in the case of intertribal relations, the invited party, took the role of the “clearminded”. Their job was to perform the rites of condolence and requickening for the opposite party, the “bereaved”. Of particular note is that upon the arrival of the invited party at the outskirts of the village of their hosts, they were welcomed by the “bereaved” in a ceremony called “at the wood’s edge”. There a fire was kindled and words of condolence were spoken to the hosts by the “clearminded”. Fenton has pointed out the many historical variations in these rites, as well as the consistencies across Northern Iroquoian societies (1998: 180). Important elements were the “three bare words” referring to wiping away the tears, and unstopping the ears and throats of the mourners. Also significant were references to “wiping the bloody mat” and “twenty, penalty for murder”. These words and the mnemonic wampum strings “spoken upon” made reference to customs related to ritual exchanges between parties at the death of an individual. To “wash the bloody mat” referred to the custom giving gifts of wampum to families who had lost a relative. “Twenty, penalty for murder” referred to the traditional reparation payment of twenty strings of wampum upon an individual’s murder by the family of the aggressor (Snow 1994). In this ritual context the moieties metaphorically took the positions of feuding lineages, and gifts and words were spoken to right the spiritual imbalance between the parties. These rituals are very similar to those described by the Jesuits for the Huron “resuscitation” of family-owned names or titles (Thwaites 1896-1901).

When the business of the council began, the themes of reciprocity and balance were strictly maintained. The parties were seated on opposite sides or ends of the fire in the council house (Fenton 1998). The structure governing who spoke at what time in council has been investigated by Foster (1984). Four basic rules appear to have structured these interchanges. The first was that the hosts delivered the ceremonial welcome. Second, the visitors answered the ceremonial welcome. Third, the petitioners “kindled the fire” by stating the first proposals. Fourth, and finally, the respondents answered all proposals of the petitioners before introducing
their own business (Foster 1984: 201-202). With each proposal, a wampum string or some other gift was given to the opposing party. With the response to each of the original proposals, the respondents first gave a summary repetition of these proposals (1984: 197). If the proposal was rejected, the gift would be returned; if accepted, the gift would be kept and some other comparable gift given in return (Druke 1987: 37). These rituals emphasized balance and alliance over controversy and competition. Much of the “real” politics appears to have been carried out at breaks in the formalities, when factions could consult with each other “in the bushes” (Richter 1987).

Village government itself was divided into dual branches of “peace” and “war”. Among the historic Huron, the names and titles associated with these branches were normally inherited through the maternal line (Thwaites 1896-1901), and the business associated with them was apparently conducted in the longhouses of the headmen that held these titles. These houses were named according to their role as civil or military structures (Thwaites 1896-1901: 13; Williamson 2007).

Canonical Communication and Dwelling

This review indicates that an important homology existed between the interior arrangement of longhouse space and the historic construction of Iroquoian personhood vis-a-vis wider collective social bodies, and the legitimization of power in a largely egalitarian context. The relationship between boundaries (explicit and implicit) and foci within the longhouse produced a series of overlapping axes of similarity and difference. The axes corresponded to pervasive distinctions in daily practice between centre: periphery, left side: right side, front: back, and outside: inside. In this way, nested social categories were ordered so as to simultaneously affirm their autonomy at one level, and unity at another. The fundamental pattern of unity-in-duality was established by the pairing of nuclear families on either side of the central hearth. The longitudinal support post-system and andichons formed a division between a shared living space oriented towards the hearth midline, and a (relatively private), family space where people slept, and firewood and other supplies and personal belongings were kept handy. However, the degree to which activities on either side mirrored each other suggests that each nuclear family, while integrated with its partner through shared activities focused on the hearth itself, reproduced on its own side the basic compliment of activities practiced within the hearth area. This indicates that the actual degree of organic integration of domestic tasks between the two families was perhaps lower than might be expected. Meanwhile, in contrast to the scalar,
qualitative, and quantitative symmetries between activities on lateral sides of the hearth, front-to-back asymmetries in the longitudinal dimension, as well as the elaboration of transition spaces, enacted a qualitative distinction between residents and outsiders, hosts and guests.

It is significant that most of these boundaries were not produced through the construction of high-inertia architecture. Indeed, the presence of durable walls would have precisely defeated the multiple overlapping taxonomic functions of longhouse space as it emerged through the process of dwelling. The hearth was both integrating and segregating, a focus of shared activity, and a boundary marking out the balanced opposition of allied but distinct family units on either side, and the unbalanced relation between residents and outsiders.

On one level, this homology between longhouse spatial order and the characteristic structuration of historic Northern Iroquoian personhood and community can be understood as a communicative process involved in social reproduction. Following Rapoport (1990), Richard Blanton has suggested that the ordered arrangement of space within vernacular architecture in traditional societies often plays an important role in the communication of deeply-held aspects of world-view (Blanton 1994). In this perspective, essential elements of ontology are gradually inculcated through primarily non-discursive practices that communicate the structures of similarity and difference that underlie it.

The limit of this approach is that it tends to minimize the role of materiality in the generation of social life. We might be left with the impression that the organization of house space “encoded” a wider concept of personhood, power, and community in Iroquoian culture that pre-existed its “materialization” in domestic space. However, the developmental history of longhouse organization suggests that this was not the case. Bilateral pairing of families seems to have begun at a time when the social world of early villagers was radically different from that of the contact period. These early longhouses rarely had more than two or three central hearths, and the total population of the average village was similar to that of the macro-bands of preceding centuries (Trigger 1976; Williamson 1985). Tribal and confederacy formation would not begin for some three-hundred years. Villages may have been largely depopulated for seasonal foraging expeditions, and considerable reliance on nut mast and other wild resources continued from Middle Woodland subsistence patterns (Williamson 1985).

It was not until the 13th century that increasing house lengths apparently coincided with the elaboration of certain aspects of the earlier pattern, including increasing consistency in the relative spacing of structural support posts vis-à-vis central hearths, increasing longitudinal asymmetry in front-to-back activities, the expansion and increased complexity of transition
spaces, and the widespread adoption of specialized features such as PCSs and SSLs within characteristic zones of interior space. All this suggests that events of the late 13th century involved an emphasis on refining, regularizing, and elaborating the broad patterns of domestic organization that had already been established in the preceding centuries.

Ritual Performance and Politics

These historical trends lead to several important questions. What type of wider social unit did the longhouse serve to reproduce and integrate? How did this change with the onset of the Middle Iroquoian period? As discussed above, it seems that the growth of longhouses at the end of the 13th century was closely connected to the processes of village coalescence. The fusion of villages to form new communities occurred rapidly, and virtually all of this growth was accommodated by the expansion of longhouses. As much as this was potentially achieved through assertions of kinship or clan identity, it is important to recognize that the process could not have been experienced as a simple scalar expansion of houses and resident families. Alliance-building between previously separate villages was, at root, a political process, and the challenge must have been to achieve community cohesion in the face of the tripling and quadrupling of village (and house) populations. Because community cohesion depended to such an extent on longhouse cohesion, the ordinary practices of longhouse construction and habitation became increasingly formulaic and “compartmentalized” (Rogers 1995). The compartmentalization of house space had begun centuries earlier, but appears to have taken on increasing significance in the context of the inevitable social tensions associated with the politics of house and village fusion.

In particular, ritual performances that emphasized the basic dichotomies of longhouse spatial order were enhanced through its politicization (cf. Pauketat 2000). The rituals of domestic space were not only limited to overt practices such as those related to human/animal burial – semi-subterranean lodge associations (MacDonald and Williamson 2001), but more fundamentally, to an entire disposition towards dwelling that can be called performative. Pfaffenberger has applied this concept of performance to the construction of the bwayma, or yam storage building of the Trobriand Islanders (1999). He discusses how this technology (as both a process and a product) generates intersubjective meanings not only through overt communicative symbolism (Blanton’s indexical and canonical communication), but through the very actions that are entailed in its construction and use. The imposing size and shape of the bwayma is understood as symbolic of the power of the chief who owns the structure and is wealthy enough
to fill it. However, the actual production of the structure is arguably more important in building its meanings. Pfaffenberger writes of the construction process as triggering a pre-energized social template, “…embedded in a tightly connected series of technical and magical operations (1999: 150),” and it is these operations that enact the relationships of deference, authority and cooperation undergirding chiefly power. In essence, technology becomes a performance that is inseparable from the process of enrolling and transforming members of society (1999: 153).

This idea of performance is closely connected to that of ritualization in its widest sense. The stereotypical distinction between “ritual” and “practical” life can be viewed as one of degree, rather than kind. Bradley has commented that, “Once we reject the idea that the only function of ritual is to communicate religious beliefs, it becomes unnecessary to separate this kind of activity from the patterns of everyday life (2003: 12).” Ritual lies in the performance of these everyday patterns, in the placement of a “special emphasis” on habitual behaviour (Bradley 2003). Formalized political and religious rituals are often performances in which many of the conflicting meanings of daily practice are invoked, harmonized, deconstructed and reformulated (Turner 1986). From this perspective, domestic ritualization can be related to the negotiation of potentially conflicting experiences produced in everyday life.

A sense of the performance of Middle Iroquoian house life began with the construction of the longhouse itself. Heightened regularity in the relative proxemics of longhouse structural elements was established at this stage. Practically speaking, this required communication and cooperation on the part of the builders on an altogether new scale. This, in turn, carried with it material indexes of the cooperative building project as well as physical constraints that influenced the subsequent arrangement of daily activities within.

This raises the question of the function of specialized features that were incorporated into house space at this time: post-cluster structures (PCSs) and semi-subterranean lodges (SSLs). While controversial, the predominant interpretation for both structure types is that they functioned as sweat lodges (MacDonald 1992; MacDonald 1988, 1991; MacDonald and Williamson 2001). The use of sweat lodges constructed of slender bent poles covered with bark and skins is well-documented for the Huron and other Northeastern aboriginal groups in the 17th century. Sweating was associated with purification, health and healing, ritual preparations for hunting and warfare, predicting the future, and general good luck. Linguistic evidence suggests that the Huron may have explicitly distinguished between sacred and profane sweats (Steckley 2007), although such a distinction might have been drawn historically by Huron eager to avoid
the disapproval of the Jesuits, who vehemently opposed the “superstitions” associated with the practice.

SSLs did not survive into the historic period, and the reasons for their abandonment are not known. The sweat lodges constructed historically were apparently not subterranean structures, but circular ones built in the centre of the house. They also seem to have been erected when needed, rather than being permanent features of indoor space. Sagard described the construction of temporary circular structures “in the middle of the lodge”. Poles were planted into the ground and bent over at the top. Within, red hot stones were placed in a pile, and the pole frame was covered with bark and skins. These characteristics led Tyyska (1971), MacDonald (1988), and others (Finlayson 1985, MacDonald and Williamson 2001) to hypothesize that PCSs, which are found within houses at 17th century sites (e.g., Warminster), were above-ground sweat lodges directly analogous to those described by Sagard (1939: 197-198). The interpretive step between the recognition that sweat lodges were constructed historically, and their identification with specific archaeological features, has been a source of strong criticism for this theory (Stopp 1989). Unfortunately, owing to the lack of preserved (or recorded) living floors and associated artifacts, there is little specific evidence to tie these structures to the practice of sweating other than their small circular or octagonal shape, and location within the central hearth area adjacent to hearths and in the middle of the house. The interpretive dilemma is based on the potential equifinality between the residues of sweat lodges and any other circular post-structures that might have been used within the lodge (drying racks, spits, animal cages, granaries, and so on).

Whatever their function, however, it is noteworthy that these structures were highly formulaic in construction techniques and repeated placement within the house. Rather than first insisting on a specific functional interpretation, it is worth examining in greater detail the nature of PCSs as they appear archaeologically. As Tyyska (1971) and Bursey (Bursey 1989) have also observed, posts are frequently organized into “a circular arrangement of six to eight evenly spaced circular mini-clusters (Bursey 1989: 21).” Bursey also notes a pattern of four linear clusters or rows running parallel to the house medial line, with the central rows slightly longer than those on the outside (1989: 21-23). These patterns are widely in evidence at Draper (Finlayson 1985), Hubbert (MacDonald and Williamson 2001) and Baumann (Stopp 1985). From an examination of PCSs in the present sample, it is possible to point out several additional interesting qualities of these structures. First, although the “circular” (most often octagonal or cruciform) post cluster structure may occur individually, two are very often found immediately
adjacent to each other, forming a structure reminiscent of a “figure-of-eight” situated directly behind the hearth. Secondly, these structures can be observed with widely varying densities of posts from one house to the next, as well as between hearth modules within a single house. This suggests that the structures were built, torn down, and rebuilt on a repetitive basis in almost exactly the same location. The linear pattern sometimes observed is congruent with longitudinal drifting of these features as they were rebuilt over time (Bursey 1989: 23). All this indicates that the placement of posts was not haphazard. A specific octagonal arrangement was normally maintained, even through extensive repairs or cyclical patterns of reconstruction. This characteristic prompted Tyyska to suggest that a mnemonic device may have been used to permit the consistency in placement (1971). Since PCSs were oriented along the house midline, this structured pattern of post placement maintained the bilateral symmetry of the house, and also reproduced it within the PCS itself. Second, the predominance of the “figure-of-eight” configuration suggests that two contemporaneous and adjacent structures were frequently linked to form a single double-chambered structure. Whatever the specific function of these structures, their formal spatial properties conform nicely with the principles of “unity-in-duality” and bilateral symmetry documented for the house in general. The evident concern for a repetitious, formulaic placement of posts, moreover, is commensurate with the thesis that the construction and use of PCSs was ritualized in the sense advocated by Bradley (2003).

The excavation of semi-subterranean lodges, by contrast, has provided much more information about their use and abandonment. Detailed reviews of these structures can be found in MacDonald (1988, 1991, 1992), and MacDonald and Williamson (2001). The main chamber was normally rectangular, 2x3m, and excavated some 60cm into the subsoil, with a ramped entranceway at one end. Somewhat irregularly spaced posts typically ring these structures, indicating the presence of a superstructure. Supporting posts are also frequently found in the centre. Living floors composed of greasy black organic soils mottled with charcoal normally formed at the base of the chamber, indicating a period of intensive primary use. This is overlain by more or less complex stratigraphy indicating stages of backfilling with refuse and/or sterile top-soil/sub-soil matrix.

MacDonald has argued that these were sweat-lodges, analogous to semi-subterranean sweat lodges recorded ethnographically for many North American aboriginal cultures (though not for Northern Iroquoians). Other functional hypotheses have included storage (Fitzgerald 1991) and menstrual seclusion huts (MacDonald and Williamson 2001). Setting aside once again the issue of specific function, it is evident that these features were associated with ritual
depositions and human and animal burials. Importantly, a number of SSLs have been found to contain fragmentary human remains, and sometimes partially exhumed or complete primary burials. Human interments occurred within SSLs at Bennett, Uren, Crawford Lake, Alexandra, Dunsmore and Parsons, sites spanning the entire temporal range in which SSLs are found (MacDonald and Williamson 2001). Moreover, close spatial associations of human burials with SSLs were present at Myers Road in Houses 1, 4, and 7, and at Praying Mantis House 2. The association of SSLs with mortuary practices is also indicated by the presence of two facing SSLs in an open area at the Hutchinson Site. Robertson argues that this site had a special mortuary processing function, likely in preparation for ossuary reburial nearby (Robertson 2004).

Associations with animal burials or intentionally deposited faunal elements on the living floors of SSLs are also widely documented. Deer crania were found in SSLs at Bennett and Grandview, a black bear cranium was recovered from an SSL at Wiacek, and a great horned owl wing was found in an SSL at Myers Road (MacDonald and Williamson 2001). The presence of animal burials inside or adjacent SSLs was documented at Holly, Praying Mantis and Myers Road. In the latter two cases, human interments were adjacent or opposite an SSL and the animal depositions. At Myers Road, the latter consisted of a bundle burial of a black bear, similar to one found along a side platform of House 8 at the Nodwell site.

The placement of SSLs within houses is also indicative of ritualized performances related to the division of “sides” within the house, as well as to the opposition of the andichons to the central corridor/hearth row. More than 80 percent of SSLs within the houses analyzed here were accessed from below the side platforms. Also, a number of distinct cases of cross-midline pairing of SSLs on either side of the central hearth row indicates that these activities were sometimes intentionally coordinated by the occupants of either side. This pairing is evident at sites such as Day (Dodd and Riddell 1993), Myers Road, Hubbert, Dunsmore, Alexandra, Alderson Farm, and Holly. At Hubbert and Dunsmore, the sense that this pairing carried important symbolic significance is strengthened by the apparently coordinated reconstruction and realignment of paired SSLs from facing lateral to longitudinal orientations. Similarly, the construction of two parallel SSLs facing south on either side of a large hearth at the centre of House 9 at Myers Road is suggestive given the nature of this structure. House 9 was an extra-long house (86m), the longest at the site, and appears to have resulted from the fusion of two previous structures that were built end-to-end. The paired SSLs and central hearth occurred in the space where these two earlier houses were joined within the new longhouse (Williamson 1998).
In spite of the predominant interpretation that PCSs and SSLs both functioned as sweat baths, it is clear that they involved quite different sets of associated practices, expectations for privacy or control, associations with hearth modules, labour investments, and ritual associations. Many of the characteristics of these features can in fact be seen as antithetical, or in terms of structured oppositions. Table 7.7 lists these oppositional traits. One of the most interesting aspects of this opposition is that while PCSs occur in the most integrative and accessible area of the house, they were common to most hearth modules, and were small enough that, if used as sweat lodges, they could have held relatively few bathers at a time. SSLs on the other hand were much larger and involved significantly more labour to build. They were also distributed unevenly and thinly, such that, even at their height of popularity, each would have normally served more than two central hearths (MacDonald 1988; MacDonald and Williamson 2001). Oddly, in spite of this evidence that they must have been shared by larger social groups, SSLs were syntactically the “deepest” spaces within the house. This is particularly true for SSLs that were appended to the exterior and only accessible from beneath a side platform. These structures were highly controllable by the resident family. Thus, the accessibility of PCSs and SSLs seems to be inversely related to the size and heterogeneity of the social groups that would have used them. This, however, might make sense from the perspective of domestic ritualization. SSLs unified occupants across hearth areas and likely even between houses, but did so in a way that affirmed a strong connection with the hosting family and its control over its own ritual space and side of the hearth (rendered particularly evident in mortuary rites associated with that family). PCSs, occurring directly on the house mid-line, involved regular practices normally limited, perhaps, to members of a family dyad, but did so in an open and accessible setting that affirmed their commitment to integration with the wider collective body of the house (Table 7.7). Both structures, then, appear to compliment each other, both spatially and practically, in their inverted reifications of the “side : centre”, “duality : unity”, and “autonomy : collectivity” oppositions.

Interestingly, at Draper, which had a conspicuous lack of SSLs, human and dog burials occurred uniformly adjacent-to, or beneath PCSs (Finlayson 1985). The rejection of SSLs at Draper, and the distinct association of interments with PCSs further supports the possibility of a meaningful ritual connection between PCSs and SSLs. Perhaps PCSs took on the mortuary connotations of SSLs at this site as SSLs were abandoned.

It is worth pointing out at this juncture that primary burial itself was part of a two-part mortuary system that also involved secondary ossuary burial. This mortuary program emerged as the predominant system in southern Ontario in the Middle Iroquoian period from a more
Table 7.7. Structural oppositions of post-cluster structures and semi-subterranean lodges.

heterogeneous set of Early Iroquoian practices (Spence 1994; Williamson and Steiss 2003). Like
the organization of interior space, existing Early Iroquoian burial treatments (including primary
inhumation, bundling, and ossuary reburial) were regularized into a widespread dualistic pattern.
The primary stage of burial seems to have occasionally involved interment within the house,
although primary interment in a village cemetery was the dominant mode (Robertson 2004;
Williamson and Steiss 2003). Ossuary reburial occurred on a larger, village or inter-village
collective scale. The strong associations of the initial stages of mourning and primary interment
with the immediate or extended family, as well as with the house, are indicated in the
ethnohistoric record of Huron and Neutral mortuary practices. The Neutral kept the dead inside
their houses as long as possible, to the extent that the Jesuits found the smell insupportable
(Thwaites 1896-1901). In preparation for the feast of the dead, families exhumed their loved
ones and brought them back, once more, into their houses for careful and reverent cleaning,
bundling and adornment. The feast of the dead itself was an important opportunity for families
to give presents in honour of the dead, and to display accumulated wealth to the village or
villages that were in attendance (Thwaites 1896-1901: 10). The final ossuary interment,
however, involved the co-mingling or even intentional mixing of the bones of the deceased. In
this way, the extended ritual structure of the entire mortuary pattern involved a pervasive duality
of family/lineage identity vs. community/collective identity, or, in Turner’s terminology, the

The associations of the house with primary burial, family identity, and economic
productivity bring us back to the question of the social composition of the house. The prevailing
theory is that it represented the dwelling of a matrilineal/matrilocal lineage segment (Trigger 1976; Kapches 1990; Warrick 2008; Snow 1994). The historic record for Ontario Iroquoian matrilocality is quite weak, however. Historic descriptions of post-marital residence patterns are perhaps indicative of chiefly avunculocal residence (Trigger 1976), but they also suggest that residence patterns were highly flexible. This is not surprising in view of the relative ease and frequency of divorce and remarriage in Northern Iroquoian societies. Rather than chasing after the “sophisticated delusion” of a strict post-marital residence rule (cf. Harris 1968: 360) in an idealized Iroquoian prehistory, I think it is helpful to consider what clues we do have about how the longhouse acted as a unity. Why was it important to emphasize the balanced opposition of household autonomy and collective identity within the Middle Iroquoian house?

For one thing, the house as unity seems to have appropriated individual household and village-level storage features at the onset of the Middle Iroquoian. This economic reorganization may be related to the subsequent period of rapid population growth. The historic Huron pejorative expression onnonchayon, (“it is an empty house” [Steckley 2007: 151]), implied poverty or weakness, suggesting that economic competition between houses was important.

The historic longhouse was also a social unity associated with linked families. Huron families held a set of names and associated titles, including war and peace captaincies, in the maternal line (Thwaites 1896-1901: 38: 263). That these positions were associated with specific physical structures is indicated by references to the “house of cut off heads”, and the “council house” of these captains (Thwaites 1896-1901: 13: 37-79). The names of houses themselves had social and spiritual connotations. Like the souls of family members that were “resuscitated” in naming ceremonies, the soul of the house seems to have been reincarnated in an analogous ritual upon its reconstruction (Steckley 2007: 152). Historic Huron and Iroquois houses also featured painted figures or crests that may have been totemic in nature, although no detailed descriptions of the content or meaning of these images are available. This suggests that the house was not only a spatial and economic unity, but also an imagined one related to the idea of lineage continuity through the ongoing rebirth of souls.

Archaeological evidence for a symbolic concern with longhouse continuity over episodes of reconstruction is difficult to come by, since the identification of the same domestic group within a new village is beyond our current abilities to detect (except, perhaps, by DNA testing of burials within and between houses). However, house reconstructions and re-orientations within the same village have occasionally revealed important efforts at maintaining the spatial continuity of the house with features such as burials and SSLs. This has been documented for a
burial at Antrex (Robertson 2004), and for SSLs at Grandview, Alexandra, and perhaps Norton (MacDonald and Williamson 2001), all dating between A.D. 1300 and 1450. There are also cases of human and animal burials beneath house walls (e.g., at Crawford Lake), or at the base of large support posts (e.g., at Crawford Lake, Holly, and Uren). In these cases, the interments must have occurred at or shortly before the construction of the house, and seem to be indicative of dedicatory rituals. The elaboration of transition space in this period can also be interpreted as evidence for an increased concern over the classification and mediation of longhouse residents vis-à-vis outsiders.

This suggests that the sense of the house as unity, as collective identity, was accomplished in part through an increasingly performative experience of dwelling that defined and enrolled its residents within a habitus of ritual and quotidian oppositions between autonomy and alliance at a variety of scales. That the ritualization occurred within the house itself argues against the idea that the co-residential group was rather automatically determined by descent. Tensions between structure and communitas seem to have pervaded the social experience of domestic life, indicating that conflicting constructions of identity existed within the house group. Hayden’s characterization of the longhouse as an alliance-based corporate group akin to the “house societies” of the Northwest coast may be overdrawn (1976), but he rightly points out the weaknesses in the view of the longhouse as a unilocal/unilineal descent group. Indeed, the importance of prestige-based activities such as feasting and gift-giving in Iroquoian society has been woefully understudied by archaeologists.

Instead of taking sides in the longstanding anthropological debate between the proponents of descent or alliance theory (Fortes 1953, Lévi-Strauss 1982), it is worth heeding the recent advice of Watanabe (2004). He points out that there is a serious danger for archaeologists in applying reified “total-system’ models of society (2004: 159),” and that the differences between lineage-based and “house” societies are relative rather than absolute. With this in mind, it is possible to interpret the spatial organization of Middle and Late Iroquoian houses as integral to the “social work” required to mediate opposing forces of descent and alliance that emerged in the political processes of community expansion and coalescence. The history of this development indicates that, far from “materializing” a set of pre-existing socio-political and ideational orders that were ultimately non-spatial, the longhouse was inextricably involved in the emergence of Northern Iroquoian experiences of personhood, power, and community.
CHAPTER 8

“AT THE WOOD’S EDGE”: ONTARIO IROQUOIAN VILLAGE ORIGINS

This dissertation has focused an analysis of Ontario Iroquoian social change on the distinctive spatial patterns of village organization as they emerged historically, and explained these, first and foremost, as the material residues of people’s practical engagement in projects of community reproduction. This interpretive process has produced a number of important conclusions, discussed below.

The Early Iroquoian Village and “Place-making”

In keeping with Timmins’ conclusions about the Calvert site (1997), Early Iroquoian community plans were not particularly disorganized or spatially disintegrated, even when compared to those of the following Middle Iroquoian stage, but neither were they rigidly globally ordered or controlled. What we see in the emergence of Early Iroquoian villages is a new investment in both village and house. This was the culmination of a long development during the preceding millennium (Chapdelaine 1993; Ferris 2003; Smith and Crawford 1997), but nevertheless marked an important change in the way that village space was constituted as the primary focus of personal, family, lineage, and community identities. Lightly constructed palisades, for instance, became widespread at Early Iroquoian villages. These may have served as snow fences, wind breaks, or to keep out wild animals, but certainly also were involved in defining the community as an integrated social whole (Ferris 2003; Ramsden 1990); they were involved in a new kind of material engagement that I have called “place-making”. As discussed in Chapter 3, a large pit feature at the Elliott site was associated with cyclical feasting events and mortuary ritual depositions. Notably, this pit did not occur within a house, but at the periphery of the site just inside the palisade and perhaps at the contemporary entrance to the settlement (Fox and Salzer 1999). Community-wide ritual, in this case, appears to have been involved in defining or emphasizing the boundary of the settlement, and thereby, the social identity of its residents.

The impression of “disorder” in these early villages (Warrick 1984) is related primarily to two factors. For one thing, they were sometimes the focus for repeated settlement over decades. Over that time, houses were rebuilt and realigned, abandoned, and reoccupied (Timmins 1997; Fox 1976; Williamson 1990), sometimes with different seasonal and economic orientations. This has by now been widely acknowledged thanks to Timmins’ pioneering work at Calvert.
(1997), and is certainly also in evidence at sites such as Elliott (Fox 1986). Another factor is that, unlike the circular, plaza-oriented Late Woodland settlements to the southwest (e.g., those of the Monongahela tradition), formal global architectural order and associated cosmographic implications were not manifest in village layout. The lack of circular or grid-like global control of house configuration did not, however, render these settlements especially visually or syntactically disintegrated when compared with those of later times. This indicates, along with the shifting of house positions and alignments, the emergence of a generative principle of order that emphasized contingent alliances and relationships within and between co-residential groups. It was this principle that increasingly structured village order in the following centuries.

Within the house, this alliance principle was established early in the Early Iroquoian by the pairing of households at central hearths. Temporary extended and multi-family houses most likely had Middle Woodland antecedents in the region (Finlayson 1977). However, the first two centuries of village life in southern Ontario were characterized by the coexistence of probable single-family and multi-family residences. During this time, it was house width and an associated superstructural support system that were initially adapted to the spatial needs of paired family dyads. In the process, interior behavioural organization about the central hearth became structured in predictable ways that enacted and symbolized the characteristic relationships between family autonomy and social alliance that were part of the daily experience of house and village life. The emphasis on matrilocality in explaining the emergence of the longhouse seems to have caused archaeologists to overlook the balanced elements of family autonomy and social alliance that were emerging within these structures even before they became “long”. If matrifocality and its associations with lineal continuity were a predominant factor in this process, it nevertheless required the significant work of spatial integration and mechanical solidarity, with an emphasis on balance and reciprocity between defined social atoms, to be brought about. It was only once this dual family pattern was widely established that the house began to be rapidly expanded in the length dimension.

In considering the early development of Iroquoian villages, a comparison with the Mississippian-influenced Monongahela and Fort Ancient tradition villages of Ohio and southwestern Pennsylvania is revealing. The latter settlements show a striking inversion of the Early Iroquoian organizational pattern. There, spatial order proceeded globally-to-locally, so that the ordinary practices of what, in the Early Iroquoian case, increasingly constituted interior domestic life, were subsumed by and experienced across community space and were thereby subject to collective social control and surveillance. Global order was established by the construction of
circular or semi-circular arrangements of small houses around a plaza, the centre of which was often marked by a central ceremonial pole (Means 2001, 2007). In Monongahela villages, relatively few pits, hearths or burials were associated with the inside of the small domestic structures. Instead, the majority of these kinds of activities took place outdoors, in front of and between the circular huts that formed the village ring (Means 2007). At the Fort Ancient Sun Watch village, pits and hearths related to everyday domestic tasks were located in a ring just inward from the houses, while human burials were located in a ring beyond this domestic area and closer to the centre of the plaza (Heilman and Hoefer 1981; Means 2007). This concentric order distributed activities such as sleeping, cooking, crafting, storage, and mortuary ritual so as to be globally coherent with a wider cosmology and with the practices of other members of the community, but locally specialized across space and, therefore, disruptive to domestic investment in the house. In this way, Fort Ancient domestic space was, from an Iroquoian perspective, appropriated by and rendered unto the communal in a “top-down” fashion.

Already in the Early Iroquoian village, spatial order and associated social and physical investments flowed in the opposite, “bottom-up”, direction. The most formally structured and regularized aspects of dwelling occurred first within the house. This was the appropriate setting for the majority of village interments, and a focus for activities that promoted inter-family mutuality (Howie-Langs 1998). Global order in this case was emergent and variable, evident in parallel or angular pairings of specific structures at specific settlements, and always contingent and secondary to interior domestic order. From a syntactic perspective, outdoor visual and axial integration remained high since the absolute number of houses in a village remained low.

Not surprisingly, growth of the Monongahela village required either a breakdown in formal global order, or a major collective effort at reconstructing the house ring to incorporate new individual houses. Both processes are attested at sites such as Fort Hill (Means 2002). There, new houses were initially added at the margins of the existing house ring, leading to a degradation of formal global order. This was followed by the complete reconstruction of the house ring at a new scale to incorporate all structures (Means 2002, 2007). By contrast, the pre-eminence of a “local-to-global” order meant that growth in the Early Iroquoian village came to be increasingly concentrated internally, based on linking family pairs within the house. As long as growth was directed locally, global spatial integration at a familiar level was ensured since the complexity of outdoor space was limited.
The Middle Iroquoian Rise of the Longhouse

The rapid growth of longhouses in the latter half of the 13th century was closely connected to a regional reorganization of communities that involved the coalescence of villages and actual houses. Within the house, this process involved the regularization of basic organizational patterns that had developed in the preceding centuries, and their elaboration through the ritualization of domestic practices in an indoor space that was increasingly symbolically charged (MacDonald 1988). Such practices were involved in articulating and reifying broadly emerging senses of personal and group identities based on nested atom : whole dualisms. The coincident spread of a two-stage mortuary programme that associated initial burial with the immediate family, the lineage, SSL ritual, and house space, and secondary reburial with a collective social whole that transcended the house (e.g., Williamson and Pfeiffer 2003), is also indicative of this developing dualistic construction of personhood and community.

Throughout this process, village growth continued to be directed internally. On average, house lengths increased within Middle Iroquoian villages, while house numbers did not. Moreover, Middle Iroquoian village exterior organization was extremely variable. Potential increases in visual and axial entropy and decreases in integration within Middle Iroquoian villages appear to have been mitigated primarily by maintaining low structure numbers, and by reducing structure density with increasing size, rather than through the imposition of a widespread global organizational pattern reflecting formalized architectonics. It appears that the high-density and clustered parallel layout of houses at Uren cannot be generalized to most settlements of the period. Fourteenth-century settlements show a surprising range in built density, angular clustering and dispersion, formality of layout, and occupation complexity. Many settlements of the period, including large ones such as Robb, Alexandra, and Tillsonburg, lacked palisades entirely (Timmins 2009). At others, houses were sometimes excluded from the palisaded area or pre-or post-dated it (e.g., Myers Road, Serena, Nodwell). Some houses at Myers Road may have been abandoned for several years and subsequently rebuilt, expanded and reoccupied (Williamson 1998).

While these patterns indicate considerable fluidity and contingency in the organization of 14th century village space, the end result was not random or chaotic. Instead, my analysis shows that the local axial integration of house ends was considerably higher on average in villages after A.D. 1280. The formation of angular house clusters was involved in generating specific local relationships between houses, which in turn helped to conserve global integration at the village scale. In higher density villages, more investment in the coordination of house layout was
required to maintain local and global integration. In low density villages, houses were more widely spaced, and less investment in layout is evident. The appearance of a number of unusually-low-density settlements in the Middle Iroquoian period suggests that those communities were unable or unwilling to coordinate construction in a manner needed to maintain integration at higher density (Timmins 2009).

An important increase in the scale of longhouse end-vestibules also occurred at the onset of the Middle Iroquoian period (see also Dodd 1984). While it is likely that these served an important collective storage function for longhouse co-residential groups, the size of end-vestibules was not directly correlated with house area, estimated hearth number, or presumably house population; even small 14th to 15th century houses had relatively large end-vestibules. I suggest that these vestibules, along with the expanded use of external porches, enclosure walls, and fences, were involved in a deliberate elaboration of the scale and complexity of the transition space between exterior and interior areas. Distancing between the co-residential domestic group and the community at large signals a concern over the potential social tensions that could arise at such an interface. More generally, it indicates the increased economic and political power of co-residential groups that resulted from house expansions and mergers. In many ways, then, 14th century village political cohesion appears to have been weakened as often as it was strengthened by village fusion and the formation of large longhouses. Social, economic, ritual, and political power were primarily invested in the longhouse, which was both mediator and medium for political alliances involving coalescence.

Subsistence Economy, Population Growth, and Domestic Ritualization

Recent studies of demography and subsistence indicate that late 13th and early 14th century socio-political developments were causally linked with agricultural intensification that was followed quickly by regional population explosion (Warrick 2008). Early Middle Iroquoian villages may have experienced some of the highest levels of pre-contact dependence on maize yet documented (van der Merwe, et al. 2003), although this must have varied from one community to another depending on local conditions. It may be that the initial merger of villages temporarily placed higher demands on agricultural resources (van der Merwe, et al. 2003). Warrick has postulated that this new dependence on maize relaxed existing limits on fecundity and infant mortality leading to an estimated regional population growth rate of about 1% per annum between A.D. 1330 and 1400 in south-central Ontario (2008). There is thus good evidence that political and economic reorganizations associated with Middle Iroquoian village
fusions and longhouse expansion were involved in promoting a new level of dependence on maize as a dietary staple, and permitting the subsequent period of rapid population growth. This is particularly interesting since it reveals that the expansion and politicization of the longhouse at the beginning of this period was not so much a response to regional population pressure, endogenous demographic growth, warfare, or the demands of intensified agriculture, as it was instrumental in promoting them.

This may be an appropriate case for seeking an internal “pull” towards village fusion and nucleation, rather than an external “push”. What this “pull” was is not clear. However, it is useful to consider the possible connections between economic and political power in these communities. In a swidden system based on maize horticulture in the temperate eastern woodlands, affluence was not tied to specific land resources that could be inherited, but to social groups capable of marshalling the cooperative labour required to produce a commendably “full house” (Steckley 2007). This cooperative labour traditionally involved female work in planting, tending, harvesting, and processing maize and other crops, as well as pottery production and firewood collecting, but also men’s work in clearing fields, building, maintaining and repairing longhouses and palisades, procuring and working tool-stone, adze-making, hunting and fishing (to name a few). Short of the development of new agricultural technologies or techniques (such as the chert hoes used at Mississippian settlements), horticultural intensification in such a context required harnessing the human power of cooperative labour through economies of scale. The notion that this kind of labour extensification was achieved through the expansion of longhouses seems to be borne out by associated changes in storage facilities, maize dependence, and demographic growth.

Nonetheless, we cannot automatically conclude from this that surplus production and “affluence” were the primary proximate goals of agents that drove the process of longhouse expansion and village growth. Historically, the generation of wealth through the fur trade does not seem to have been considered an end in itself in northern Iroquoian societies, but rather as the means by which individuals and groups could secure and maintain strategic social and political alliances at a variety of scales. Strong levelling mechanisms prevented the development of significant disparities in the ownership or consumption of resources by individuals, and economic inequality seems to have been purposefully resisted (Trigger 1990). So perhaps a more culturally relevant hypothesis is that social alliance-building itself was the more fundamental goal, one from which benefits of collective spiritual and economic power were
expected to flow, much as blessings were seen to result from the maintenance of a moral reciprocity between humans and the spirit world (Engelbrecht 2003).

This does not resolve the question of why rapid cultural changes occurred in the 13th century. We can, however, refine our understanding of how this process unfolded. The long-term pattern of village growth between the 10th and 15th centuries was generally spatially coherent with the development and expansion of a multi-level sequential hierarchy. I have suggested in Chapter 6 that this coherence was not likely the direct result of the establishment of institutional, de jure sequential hierarchy in village governance. The basic “local-to-global” generative principle of social alliance building was already present in relatively small Early Iroquoian villages, likely long before the establishment of hereditary positions of leadership and “tribal” formation (Trigger 1981). This diachronic perspective permits us to recognize that the role of spatial organization in village development was not therefore simply reflective, but also generative, of the long-term development of northern Iroquoian socio-political structures. Feedback between built space and social tensions within increasingly sedentary Early Iroquoian communities was not peripheral, but central to driving factional group formation and competition. Under this dynamic, existing spatial orders were drawn upon and manipulated in ways that tended to promote relatively informal sequential communication and decision-making within contingent leader-follower coalitions. This inherently unstable process produced the wide spectrum of 14th century village forms discussed above, and may be implicated in the rise of endemic patterns of warfare by the 15th century. Because the house was the foundation of this sequential pattern, the extension of social alliances beyond the house depended, much like a house of cards, on the strength of social cohesion at the basal level (i.e., within the house). This, I believe, helps to explain why, specifically, domestic space was ritualized during periods of village fusion and growth.

Perhaps counter-intuitively, these factional dynamics did not result in sharply defined local distinctions in pottery forms and decorative styles. To the contrary, the Middle Ontario Iroquoian period was initially defined based on the observation of a widespread macro-regional horizon of shared decorative traits. With the rejection of Wright’s conquest hypothesis, this development has been interpreted as an index of increased interaction among the larger Middle Iroquoian communities (e.g., Ferris 2003). While increased regional interaction was most certainly occurring, that fact alone is not sufficient to explain the pattern of stylistic homogenization. A recent study of chert acquisition in south-western Ontario suggests that direct acquisition of Kettle Point chert by autonomous Early Iroquoian communities gave way to
controlled down-the-line trade from west to east during the 14th century (Keron 2003). This indicates that the political power of reorganized Middle Iroquoian communities was sufficient to prevent direct access to Kettle Point quarries by easterly communities. If so, increased economic interdependence came at the cost of traditional patterns of mobility and use rights. Under such circumstances, we might expect ceramic styles to reflect these emerging political distinctions. But rather than marking out ethnic or political differences, stylistic homogenization seems to have involved the establishment of a broadly recognizable set of social values associated with pottery and domestic life. This symbolic process was socially and spatially extensive, even as communities consolidated in such a way as to form competitive interests.

Wonderley (2002) has investigated the social significance of pottery decoration with respect to Northern Iroquoian foodways, hospitality, and religion (Wonderley 2002). His analysis indicates the close symbolic connections between cooking vessels and positive values associated with domestic well-being. From this perspective, we can suggest that pottery decoration may have been regularized in relation to its meaningful role in the emerging performative quality of longhouse life. The correlated homogenization of both domestic spaces and things might thus have served in promoting a widely recognizable ideology of domestic value and collective welfare that accompanied house expansion and consolidation. The central hearth and its associated cooking pot, after all, were intimately connected with experiences of food preparation, hospitality, and feasting that were the sine qua non of social alliance-building in Northern Iroquoian societies (Thwaites 1896-1901).

**Fifteenth-Century Village Coalescence and the Rise of Towns**

For the most part, villages of the initial LOI were not radically different from those of the preceding century. However, a second wave of village coalescence was beginning to take place, and for the first time, village growth was overwhelmingly accomplished by adding houses rather than expanding their size. Within the study sample, even relatively small unpalisaded sites of this period (such as Baker and Grandview) experienced built densities that were at the higher end of the Middle Iroquoian range. Instead of reducing built density in the face of increasing house numbers and potential spatial entropy, initial Late Iroquoian villages exhibited significant angular clustering of houses and preferentially high local axial integration of house ends. These practices permitted the expansion of villages at high densities with relatively low impacts (either positively or negatively) on global visual and axial integration. At some large coalescent villages such as Draper, village growth proceeded so as to promote a kind of spatial “small
world” network in which local axial clustering was promoted, while system depth remained low. The early 17th century Huron Ball site, in spite of its apparently more “griddy” arrangement (Knight 1987), was also characterized by local clustering and relatively high integration for its considerable scale. Average house length continued to be high in the early 15th century, and interior hearths were particularly widely spaced. Semi-subterranean lodges waned in popularity, and seem to have disappeared by the 16th century, while post-cluster structures became ubiquitous, and were intensively used at sites such as Draper.

Further analysis of the layout of other large coalescent LOI villages will be important to gain a better understanding of the dynamic processes involved in their formation. For instance, the recently excavated Mantle site, the possible successor village of Draper, appears (impressionistically) to have had a much more unified and globally integrated plan (Birch 2008, 2010). Nonetheless, small-world spatial organization, particularly in “first generation” LOI towns like Draper, may have been critical to the promotion of emerging political systems that were based on the formalization of pre-existing sequential patterns of communication and decision-making.

Conclusions and Future Directions

This study has sought to ground an understanding of social change during the first six centuries of village life in southern Ontario on a broad study of village and longhouse spatial configuration. Above all, the results of this project emphasize the role of the built environment in reproducing and altering the conditions of the world in which people lived and understood themselves. The initial material engagement of Early Iroquoians with place-making and house life seems to have established a foundation for social experience that materially influenced subsequent historical trajectories of culture change in Northern Iroquoian communities. In other words, spatial order was a dynamic, active factor in the emergence and development of village life.

This conclusion has important implications for future study. The historical contingency of Iroquoian village organization indicates that the typological approach to describing settlement forms should be abandoned. Each village site tells a unique story that is overlooked when archaeologists assume that settlement order represents the interchangeable expression of a type. Because of the regional and long-term approach taken in this dissertation, many of these local community histories remain to be explored in detail. This sort of research will considerably deepen our understanding of the relationships between the general spatial trends noted here, and
specific social dynamics within particular villages and regional clusters. Furthermore, the integration of artifact distribution and site-formation studies with the kind of configurational analyses undertaken in Chapters 6 and 7 will provide much-needed contextual data on how village space was used and experienced over time.

Finally, I hope that this dissertation has shown that a social archaeology of Iroquoian village life is indeed possible, and that it will contribute to a new understanding of long-term developments such as sedentism, as well as to the elucidation of enduring anthropological problems such as the reflexive articulation of power and personhood during periods of dynamic social change.
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