RECONSTRUCTING ONTARIO IROQUOIAN VILLAGE ORGANIZATION

by

Gary Arthur Warrick

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Gary Arthur Warrick 1983
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APPROVAL

Name: Gary Arthur Warrick

Degree: Master of Arts

Title of Thesis: Reconstructing Ontario Iroquoian village organization

Examinig Committee:

Chairperson: Knut R. Fladmark

Jack Nance
Senior Supervisor

Brian Hayden
Professor

Arthur Roberts
External Examiner
Professor
Department of Geography
Simon Fraser University

Date approved: April 11, 1983
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Reconstructing Ontario Iroquoian Village Organization

________________________________________

Author:

(signature)

Gary A. Warrick

(name)

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This study presents a model of Ontario Iroquoian village organization, based on fourteen Late Iroquoian (ca. A.D. 1450-1650) village plans, historic documents and comparative data on contemporary swidden communities. It is argued that socio-political factors (village demography, socio-economics and government) were the major determinants of Iroquoian village arrangement.

In light of the socio-political model, changes in longhouse size and village planning, throughout the Ontario Iroquois sequence (A.D. 700-1650), are interpreted as responses to evolutionary trends in Iroquoian demography, warfare patterns and political organization.

In an attempt to test the model, the Fonger site (a protohistoric Neutral village) was partially excavated and the recovered settlement and ceramic data were analyzed. There is clear evidence for a village fire and the longhouses of this village appear to have been arranged in two clusters. Ceramics from each cluster are compared. Nine ceramic attributes were examined, but only two of these showed significant differences between house clusters. These findings indicate that more research is needed concerning ceramic style distributions within Iroquoian settlements.
"One of the really surprising things about the extent of Iroquoian archaeology is the lack of any studies on the total layout of villages" (Heidenreich 1971:143).
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Lastly, I wish to thank Gail to whom this thesis is dedicated.
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Anthropologists have long recognized that studies of prehistoric village organization can provide archaeologists with valuable socio-cultural information (Morgan 1965:105; James 1949:111; Chang 1958, 1962; Trigger 1967, 1968; Fraser 1968). Nevertheless, it has only been in recent years that Ontario Iroquoian archaeologists have focused on village patterns to help them reconstruct and explain important changes in demography, warfare, economics, and social and political organization (Noble 1978; Hayden 1979; Trigger 1979, 1981; Jamieson 1981). Before village patterns can be used to make meaningful inferences about Iroquoian prehistory, however, archaeologists must determine what factors caused those patterns. Except for generalizations concerning demography, socio-politics and settlement patterns (Noble 1968; Hayden 1978; Ramsden 1978; Heidenreich 1971; Trigger 1981), individual village layouts of the Ontario Iroquois are still poorly understood.

The aims of this thesis, therefore, are to identify the determinants of Late Ontario Iroquoian (A.D. 1450-1650) village organization and to develop and test a model which explains the form of such villages.

The study of past community patterns is important for several reasons. First, hidden within prehistoric community layouts are the more intangible aspects of past cultural behaviour (residence patterns, socio-political organization and ceremonial activity (Chang 1958; Sears 1961; Trigger 1968)). Furthermore, because village patterns are less subject to post-occupational disturbance than artifact patterns, they are extremely attractive data
sources for "anthropological archaeologists" (Hill 1970; Longacre 1970).

Secondly, community pattern research can lead to insights about the size and composition of households and communities in past societies (Trigger 1981; Hayden and Cannon 1982), primitive warfare and defense strategies (Trigger 1967; Rowlands 1972), proxemics of extinct groups (Fletcher 1977; Sommer 1969), preindustrial craft learning and division of labour (Trigger 1981; Hayden and Cannon n.d.; Winter 1976), the origin of corporate groups and stratified societies (Hayden and Cannon 1982; Wilk and Rathje 1981) and even the rise of sedentism (Trigger 1968; Tringham 1972a). In short, research about village planning in past societies can provide a common meeting ground for archaeologists, cultural and physical anthropologists, demographers and psychologists.

Lastly, with reference to the study area, Ontario Iroquoian social organization is poorly understood. Unfortunately, the ethnographic record is of limited value because it was written during a time of extensive demographic and social upheaval among the Ontario Iroquois (Trigger 1981:10). Archaeological village patterns, therefore, are perhaps the most valuable data source for reconstructing the nature and complexity of Ontario Iroquoian society prior to the arrival of the Europeans.

Conceptual framework

Over the past two decades, settlement archaeology has become an important branch of archaeological theory (Willey 1953; Sears 1961; Chang 1958, 1962, 1972; Trigger 1965, 1967, 1968; Clarke 1977). Settlement patterns can be analyzed at three levels:

1) the individual structure or dwelling
2) the arrangement of structures within a community and
3) the distribution of communities within a region (Trigger 1968:55).
Although the settlement pattern of any preindustrial society represents a unique compromise between a number of techno-environmental and socio-cultural factors (Trigger 1968:53; Fraser 1968:9), it is generally accepted that socio-cultural factors are the major determinants of dwelling and community layouts and that ecological factors predominate at the regional level (James 1949:96-97; Chang 1958:299-300; Sears 1961:226; Fraser 1968:48; Trigger 1968:54; Smith 1972:413; Hayden 1979:6; Clarke 1977:11).

Since the concern of this thesis is with community layouts, the social determinants of Iroquoian village organization will be emphasized. Social determinants would include economic and political variables as well, because the social, economic and political systems of stateless societies are inextricably intertwined (Dalton 1981:22-24). Also, I would like to make it clear that I am mostly interested in the proximate and not the ultimate causes of variability in house and community patterns. I recognize that infrastructural determinants (climate, subsistence technology and demography (Harris 1979:51-54)) ultimately affect land ownership practices, trade and warfare patterns, political organization, and house and village form, but I am more interested in reconstructing the particular socio-economic and socio-political adjustments which Ontario Iroquoians made to infrastructural pressures, by examining variation and change in their house and village patterns. This does not mean that I will not consider the role of infrastructural factors in Ontario Iroquoian village organization, but
simply that structural determinants, such as warfare, socio-economic and socio-political organization and residence patterns, will be given priority over infrastructural ones as explanations for individual village layouts. Therefore, rather than adopting cultural materialism (Harris 1979) or technoeconomic determinism (Kaplan and Manners 1979:99-101), it was felt that a lower-level theoretical approach was appropriate.

Perhaps one of the most useful theoretical frameworks for extracting social information from archaeological community patterns is the "societal approach" (Trigger 1978c:108) or anthropological paradigm (Clarke 1972). Such an approach involves "the study and identification of patterning and variability in archaeological data and its relationship to patterning and variability in the social structures with which it once formed an integral system" (Clarke 1972:7). This conceptual framework is particularly well-suited for reconstructing the residence system (e.g., Longacre 1970, Hill 1970) and socio-economic and socio-political behaviour of past communities from archaeological village remains, especially architecture and ceramic style distributions.

As a final note, Trigger (1978a:57) recommends that perhaps the most comprehensive approach to the reconstruction of Iroquoian community organization is one which entails the use of ethnographic, historic and archaeological data from the early contact period. Because there are a number of completely excavated villages and reasonably accurate ethnographic accounts of the early historic Iroquoians, it was decided to restrict the thesis to the Late Ontario Iroquoian period (A.D. 1450-1650). It was hoped that once the organizing principles of late prehistoric and early contact
Iroquoian villages were established, using the direct historic approach in conjunction with archaeological evidence, this would provide a firm base from which to make retrodictions about earlier Iroquoian village and social organization.

**Brief history of Ontario Iroquoian village pattern research**

W.J. Wintemberg pioneered (1939, 1972) Iroquoian village pattern research with the excavation of the Roebuck and Lawson prehistoric village sites. At the Roebuck site, Wintemberg (1972:10-11) sampled midden deposits and delineated house and palisade patterns. Recent excavations (Wright 1978:68-69) have confirmed Wintemberg's (1972) original inferences about the layout of this village.

During the 1950s, W. Jury generated plans of three Huron villages, but unfortunately, none of his work has been published (Trigger 1981:13). Walter Kenyon's (1968) investigation of the Miller site resulted in the first published ground plan of a prehistoric Iroquoian village.

In the 1970s, major advances in community pattern research were made by the total excavation and analysis of the Nodwell (Wright 1974) and Draper sites (Hayden 1979; Finlayson and Pihl 1980a, 1980b). Studies of ceramic style patterning within houses (Hayden 1979; Arthurs 1979) and between houses (Wright 1974; Pearce 1978a) in these sites have added tremendously to our knowledge of the composition and structure of prehistoric Iroquoian households and communities.

The most recent investigations of Ontario Iroquoian villages have been carried out in the context of regional studies. In particular, the
Trent Valley Project (e.g., Kirche (Nasmith 1981), Coulter (Eric Damkjar, personal communication, 1982) and Benson sites (Ramsden 1977a)) and concentrated research on several "Northern Tier" Neutral villages (e.g., Hamilton, Hood (Lennox 1981, 1978) and Christianson sites (Fitzgerald 1981)) have supplied valuable data on house patterns, village plans and site relationships in time and space.

Thesis organization

The thesis is divided into four sections:

1) Chapter 2 sets the time-space perspective and formulates a model of Late Ontario Iroquoian village organization based on ethnographic, archaeological and cross-cultural comparative data.

2) Chapter 3 presents an evaluation of the model by seeing how well it explains temporal trends in Ontario Iroquoian house size and village planning; in addition, predictions are offered concerning the relationship between house size, degree of community planning, ceramic style distributions and other variables.

3) In Chapter 4, the archaeological implications of the model are tested for goodness of fit against house pattern and ceramic data from the Fonger site, a protohistoric (A.D. 1600-1615) Neutral village.

4) Lastly, the essential elements of the model, test results and recommendations for future research are summarized in Chapter 5.
First of all, since the Iroquoian village is the subject of this thesis, let us define what we mean by the term 'village'.

Iroquoian village definition

Archaeologists have defined an Iroquoian village as any cluster of closely spaced longhouses and midden deposits, usually surrounded by a palisade and occupying more than 0.2 ha (0.5 acres) (Heidenreich 1978:377; Noble 1975a:38). Noble's (1975a:38) definition of large villages as "towns" (villages larger than five acres) is unacceptable, since this term implies some form of permanent settlement (Orme 1981:115).

In addition to these spatial parameters, anthropologists view Iroquoian villages as examples of semi-permanent communities. Soil exhaustion leading to periodic village relocation or a semi-permanent settlement pattern is characteristic of groups practicing swidden horticulture (Harris 1972:249; Smith 1972:414) and the Ontario Iroquois were no exception. Iroquoian villages were shifted to a new location every 10-20 years (Heidenreich 1978:381; Trigger 1976a:147) and can be classed as semi-permanent settlements (i.e., settlements which "are occupied for several years at a stretch but not for as long as a generation, and where most adult inhabitants will have lived elsewhere previously, and will expect to move again before they die" (Orme 1981:106)). It should be made clear that seasonal hamlets or campsites are not semi-permanent settlements (Trigger 1968; Chang 1962).

A final aspect of Iroquoian villages concerns the human group which occupied them. Based on the assumption that the membership of a swidden
settlement is relatively fixed for its duration, most anthropologists agree that a primitive horticultural village can be considered a single community (the "maximal group of persons who normally reside together in face-to-face association" (Murdock 1949:79)) (Tringham 1972a:xxi; Sears 1961:226; Layton 1972:379; Chang 1958:304-307; Fletcher 1977:64; Trigger 1968:61).

An Iroquoian village can be defined, therefore, as a cluster of longhouses greater than 0.41 ha (one acre) in size and showing evidence of having been occupied by a single semi-permanent community. Iroquoian settlements smaller than 0.41 ha are termed hamlets and those under 0.21 ha (0.5 acres) can be referred to as camps.

It is now appropriate to set the time-space framework of this thesis by outlining Ontario Iroquoian culture history.

Ontario Iroquois culture history

Prior to the in situ theory of Iroquoian development (MacNeish 1952), it was believed that northern Iroquoian populations migrated to their historic homelands from other regions of the Northeast, replacing indigenous Algonquin groups (Wright 1966:5). Using the direct historic approach and pottery typology, MacNeish (1952) demonstrated that the historic Iroquoian tribal groups of Ontario and New York had evolved in situ from hunting-gathering peoples. The appearance of semi-sedentary horticultural settlements in Ontario occurred around A.D. 500 with the Princess Point culture - the direct antecedent of the Ontario Iroquois (Stothers 1977:136; Wright 1972:57; Noble 1975a:38).

Wright (1966) employed a refined version of the in situ theory to
define the Ontario Iroquois Tradition. His widely accepted scheme divides the Ontario Iroquoian sequence into three stages: Early (A.D. 1000-1300), Middle (A.D. 1300-1400) and Late (A.D. 1400-1650) (Wright 1966:101).

**Early Ontario Iroquois (A.D. 700-1300)**

Recent chronological data indicate that this period began around A.D. 700-800 (Porteous site (Noble 1975a:38)), much earlier than the originally proposed date. Two contemporaneous populations are recognized: the Glen Meyer who inhabited southwestern Southern Ontario and the Pickering of southeastern Southern Ontario.

The Glen Meyer and Pickering possessed a reliance on maize horticulture (Noble 1975a), small longhouses clustered in palisaded villages or associated with seasonal food procurement and food-processing camps (Williamson 1983; Trigger 1976a:126), endemic warfare (Wright 1972), similar burial practices (bundle burials within villages (Wright and Anderson 1969; Wright 1978)), limited long-distance exchange and a poorly developed pipe complex (Trigger 1976a:169; Noble 1975a:47; Wright 1966:52).

On the other hand, there are certain material culture differences between the two groups, particularly in ceramic styles. Glen Meyer pots possess corded, smoothed-over cord or scarified surfaces and plain or linear impressed rims. Pickering vessels normally display ribbed-paddled or check-stamped bodies and rims decorated with push-pull and dentate-stamped designs (Wright 1966:53). In addition to these ceramic traits, ground slate knives and spurred lithic points are confined to Glen Meyer
Figure 1. Ontario Iroquoian cultural sequence.

(after Wright 1972)
sites and the cup-and-pin deer phalange and gaming disc are common finds in Pickering sites (Wright 1966:53; Fox 1982; Noble 1975b:47).

**Middle Ontario Iroquois (A.D. 1300-1450)**

On the basis of ceramic evidence, Wright postulates (1966:53,1972:74; Wright and Anderson 1969:75-79) that the Pickering people conquered, dispersed or assimilated the Glen Meyer about A.D. 1300. The Uren site represents the initial post-conquest phase, but a re-examination of the ceramic samples which Wright (1966) employed has led to some doubt about the conquest model (Milt Wright, personal communication, 1982). In any event, during Uren and Middleport times, the homogeneity of ceramic styles throughout Southern Ontario, namely, incised horizontal and vertical motifs, would tend to support some form of Glen Meyer and Pickering coalescence (Trigger 1976a:140).

This period witnessed a spectacular growth in longhouse size and was accompanied by the appearance of ossuary burial, an elaborate pipe complex and perhaps an increase in population, in response to an improved horticultural base (Wright 1972:78; Noble 1975a:40).

**Late Ontario Iroquois (A.D. 1450-1650)**

Few Iroquoianists agree on when the Middle Iroquoian period ended. Recent data support a late fifteenth-century date for the emergence of groups whose archaeological remains resemble those of the historic Huron and Neutral (Finlayson and Byrne 1975; Jamieson 1979; Smith 1977). In agreement with Dodd (1982:12), therefore, an A.D. 1450 date seems reasonable for the advent of the Late Ontario Iroquoian period.

Within the Late Iroquoian period, however, it is difficult to
precisely date sites because of fluctuations in radiocarbon formation during the sixteenth century (Trigger 1976a:449). Fortunately, refinements in ceramic seriation have produced reliable site sequences for certain areas (Kenyon 1972: Ramsden 1977b). According to ceramic chronologies, sometime after A.D. 1530, but prior to the arrival of Europeans themselves (protohistoric period), European materials begin to appear in Ontario Iroquoian sites (Noble 1980a; Trigger 1979).

Contrary to Dodd (1982:13), the simple presence/absence of European trade goods effectively distinguishes protohistoric from late prehistoric sites. It is not so simple, however, to separate protohistoric from early historic sites, although glass trade bead seriation may provide one solution (Kenyon and Fox 1982; Fitzgerald 1983). The historic Iroquoian period begins with Champlain's A.D. 1615 visit to the Huron country.

During the Late Iroquoian period, house size decreased, village size increased on average, populations became more concentrated geographically and alliance and exchange networks (connected with the formation of tribal confederacies) experienced a dramatic growth (Trigger 1976a: Ramsden 1977b). On a more specific level, the Southern division Huron gradually moved north to the Trent valley and then into their historic homeland, where they joined the Northern division Huron (Ramsden 1977b:291-292). This migration and resettlement was probably in response to the growing importance of European trade (Trigger 1976a; Ramsden 1977b:292,1978).

In contrast, relatively little is known about the prehistoric Neutral occupation of Ontario. On the basis of foreign ceramics and cannibalized human bone in the refuse dumps of the massively fortified Lawson and
Southwold sites (Pearce 1980a, 1980b: Smith 1977), it would appear that the prehistoric Neutral were engaged in large-scale warfare, perhaps with groups ancestral to the Mascouten; the Mascouten were the major enemies of the historic Neutral (Noble 1978; Stothers 1981). During protohistoric times, the Neutral concentrated around the west end of Lake Ontario, probably to obtain a share of the growing European trade and to escape harassment by the Mascouten (Fitzgerald 1981).

An outline of Ontario Iroquoian history and the distribution of historic Iroquoian groups are shown in Figures 1 and 2 respectively. For the benefit of the non-Iroquoianist reader, the salient features of each group have been highlighted on the next pages.

Huron

At the time of European contact, the Huron lived in about 18-25 villages, situated between Georgian Bay and Lake Simcoe (Heidenreich 1971; Trigger 1976a). Five tribal groups existed and each occupied a discrete territory. The Huron were involved in a direct trade relationship with the French and were the main suppliers of European items to other Ontario Iroquoian groups. The New York Iroquois, jealous of the Huron middleman position, regularly attacked Huron villages and trading parties and eventually dispersed the Huron in A.D. 1650 (Trigger 1976a).

Most aspects of Huron culture were shared by all historic Ontario Iroquoian groups (Trigger 1976a:100-103), including a primary dependence on horticulture, sexual division of labour (women tended crops and houses and men constructed villages, hunted, fished, traded and warred), palisaded villages containing small longhouses that were occupied by
Figure 2. Distribution of historic Iroquoian groups.
matrilineal extended families, clans and non-coercive tribal government, endemic warfare and prisoner torture. In addition to these culture traits, the Huron differed from the other Iroquoian nations in the small proportion of meat in their diet, presence of true ossuary burial and the absence of a developed chipped lithic industry (Heidenreich 1978).

Neutral

Named by the French for their lack of involvement in the Huron-New York Iroquois conflict, the historic Neutral were a loose-knit confederation of several tribes who lived in about 40 villages just west of Lake Ontario (Noble 1978:156). They differed from the Huron in several respects: a greater reliance on hunting and chipped lithic tools, smaller houses (Dodd 1982), burial of the dead in cemeteries (Kenyon 1982), body tattooing (Noble 1978:156-159) and less access to European trade goods. In spite of claims to the contrary (Noble 1978:153; Jamieson 1981), there is no archaeological evidence (i.e., no ceremonial centres, monumental architecture or specialized craft industries) for identifying the Neutral as a chiefdom.

Petun

Archaeological data on the Petun are scarce, but historic sources say they inhabited eight or ten villages south of the Nottawasaga Bay (Garrad and Heidenreich 1978:394). They appear to have been a Huron group who were allied with the Neutral against the Mascouten and harboured Neutral refugees in times of famine (Thwaites 1896-1901, 20:61). There are indications that the Petun were heavily involved in the protohistoric-historic fur trade network between the Ottawa and Neutral, which might explain the mutual alliance of these nations (Garrad and Heidenreich 1978:396).
St Lawrence Iroquois

Although not usually included in the Ontario Iroquois Tradition, the St. Lawrence Iroquois were, nevertheless, a significant group in proto-historic Ontario. In A.D. 1535, Cartier visited Hochelaga, one of their principal villages, but they apparently disappeared from the St. Lawrence Valley during the latter part of the sixteenth century. Ceramic data hint that they may have joined the Trent Valley Huron population as refugees, either as survivors of a European-introduced epidemic or more likely as victims of commercially motivated warfare with the Huron or Mohawk (Trigger 1979:217; Wright 1978:73).

There has been little archaeological investigation of St. Lawrence Iroquoian sites, but we do know that fish was an important constituent of their diet, cannibalism and warfare are evident, house and community patterns resemble those of the prehistoric Huron and Neutral, the dead were buried in the villages, chipped lithic tools are rare, but the potting ability of their women (pot symmetry and decoration) far surpassed that of any other Iroquoian people (Wright 1978:69-71).
Ethnographic accounts of Ontario Iroquoian villages

European explorers, traders and missionaries of sixteenth- and seventeenth-century Ontario left few detailed descriptions of Iroquoian villages. The major documentary sources include: Jacques Cartier's (A.D. 1534-1535) account of Hochelaga and other St. Lawrence Iroquoian settlements (Biggar 1924); Samuel de Champlain's A.D. 1615-1616 sojourn in Huronia (Biggar 1922-1936); Recollet missionary activities among the Huron (Sagard (A.D. 1623-1624) (Wrong 1939)) and Neutral (Dailon (A.D. 1626-1627) (LeClerq 1973, 2)) and the Jesuit missions to the Huron, Petun (A.D. 1632-1650) and Neutral (A.D. 1640-1641) (Thwaites 1896-1901).

These documents were searched for ethnographic data relating to the size, form and organization of Iroquoian villages. Although most of the data apply to the Huron, the Europeans who visited the Neutral and Petun noted the overall similarity in settlement patterns and customs of all Ontario Iroquoian nations (LeClerq 1973, 2:265-266; Biggar 1922-1936, 3:96; Thwaites 1896-1901, 21:197-199). In fact, the northern Iroquoian peoples shared one cultural pattern (Trigger 1976a:100-104), so it will be assumed that observations of the Huron are applicable to other Ontario Iroquoian groups.

It should be noted that engravings of Iroquoian villages sometimes accompanied chroniclers' accounts, such as Ramusio's (A.D. 1556) depiction of Hochelaga (Biggar 1924) and an engraving of the Iroquois village attacked by Champlain and his allies in A.D. 1615 (Biggar 1922-1936, 3:67-69). In both cases, however, the geometrical (circular or hexagonal) village outlines, the highly structured distribution of houses in blocks with streets and square plazas, square houses with windows and European-style
fortifications do not agree with written descriptions (Trigger 1976a:310). These illustrations therefore have little ethnographic value.

Ontario Iroquoian settlements can be classed in three size modes:

1) isolated cabins in agricultural fields (Thwaites 1896-1901, 8:143; 14:45)

2) small, special-purpose "hamlets of seven or eight cabins" (LeClerq 1973, 2:265-266) and

3) compact and sometimes palisaded villages, towns and "cities", containing 50 to 200 houses (LeClerq 1973, 2:265-266; Biggar 1924:156; Wrong 1939:92; Thwaites 1896-1901, 10:211).

Iroquoian villages had roughly ovate plans and were normally situated near a reliable water source, on a defensible height of land (Wrong 1939:92). They were occupied primarily during the winter months; in the summer they were virtually empty, since the women and children were in the fields tending crops and the men were away on fishing, hunting, trading or warring expeditions (Thwaites 1896-1901, 8:143; 10:53).

According to the earliest accounts (A.D. 1615-1624), village relocation occurred every ten, 15, 20 or 30 years (Thwaites 1896-1901, 10:275; 15:153; 19:133). The Hurons shifted village sites because of soil depletion or a scarcity of firewood within a convenient walk of the village (Wrong 1939:92-93; Thwaites 1896-1901, 10:275).

Palisades surrounded only the most populous villages or those closest to enemy borders and were composed of multiple (often three) rows of posts, reinforced with interwoven branches and supported by logs (Biggar 1924:155; Biggar 1922-1936, 3:48-49; Wrong 1939:91-92; Thwaites 1896-1901, 38:247).
Certain areas of the fortifications contained galleries which were accessible by notched-log ladders and well-stocked with stones and water to fend off enemy assaults. There were only one or two entrances to a palisaded village and these were so narrow that one was forced to turn sideways in order to pass through (Biggar 1924:156; Wrong 1939:92). In the event that the enemy breached or set fire to the stockade, an open area between the houses and stockade reduced the risk of houses catching fire and provided adequate space for combat within the village (Wrong 1939:92).

Little information is available about the arrangement of house structures in villages. Champlain observed a three or four metre space between juxtaposed houses and was told that this spacing prevented a localized house fire from spreading to other dwellings (Biggar 1922-1936, 3:125). Despite this measure, house fires were common and often resulted in the destruction of entire villages (Thwaites 1896-1901, 8:95,105; 10:35).

There are references to informal open areas or plazas within villages. Such areas were set aside for councils, public meetings, socializing and even witch-burning (Thwaites 1896-1901, 14:39). Cartier provides the best description:

we were lead by our guides . . . into the middle of the village, where there was an open square between the houses, about a stone's throw or thereabouts in width each way (Biggar 1924:162).

Streets were observed in the largest Huron villages (Thwaites 1896-1901, 13:187; 19:219-221; 20:29). It is not clear whether the term "street" refers to alleyways between houses or an alignment of houses in parallel rows, facing long public walkways.
House size varied considerably in some villages; single-fire cabins (Thwaites 1896-1901, 10:291) to longhouses of four, 18, 36, 54 or 72 m were recorded (Thwaites 1896-1901, 8:107), assuming a brass is equivalent to 1.8 m (Dodd 1982:138). Dwellings of village leaders were purposely constructed much larger than the rest because they were used for council meetings, community feasts and ceremonies and prisoner torture (Thwaites 1896-1901, 10:81). In at least one late historic village, there is evidence that a dichotomy existed between wealthy and poor households (Thwaites 1896-1901, 20:21).

Doors were placed in both ends of a longhouse and were open to all village members. This encouraged frequent inter-house communication (visits and socializing) among villagers (Thwaites 1896-1901, 19:185; 21:185).

House fronts were painted with black or red anthropomorphic and zoomorphic figures (Wrong 1939:98; Thwaites 1896-1901, 10:47; 15:181) and have been interpreted as lineage (Noble 1968:47) or clan totems which may have helped travellers find shelter among relations in distant villages (Engelbrecht 1982:11). On the other hand, foreigners (perhaps traders and ambassadors from hostile nations) in Huron villages were assigned to "special cabins" so that they could be monitored at all times. During their stay, they were not permitted to wander around the village (Thwaites 1896-1901, 10:229).

The construction of a house in an Iroquoian village was a community decision that was made in full council and if approved, the young men of the village helped the occupants erect the framework (Wrong 1939:79). Historic data suggest that houses were added to a preexisting village
only in exceptional circumstances, such as when a village was threatened with attack by a large enemy force (Wrong 1939:155-156). In fact, Huron communities appear to have incorporated new members (e.g., Wenro refugees) into existing households and did not build additional dwellings (Thwaites 1896-1901, 17:29; 20:47).

Accounts of Huron village politics indicate that large villages were divided into "family" sectors and that each sector was represented on the village council by a spokesman (a "Captain") (Biggar 1922-1936, 3:140; Thwaites 1896-1901, 10:231). In some cases, the largest Huron villages were formed by a defensive coalescence of several villages (Thwaites 1896-1901, 10:239-241), each former village occupying a distinct village sector. Sometimes these large settlements failed to resolve internal disputes and fissioned when they relocated (Wrong 1939:92; Thwaites 1896-1901, 8:105).

As a final note, villages of the historic Mohawk (A.D. 1634-1635) displayed several features reminiscent of Ontario Iroquoian villages: palisades with restricted entrances, numerous longhouses of variable size and arranged in "rows like streets" and house fronts "painted with all sorts of beasts" (Jameson 1937:140-141, 149).

In summary, ethnographic accounts provide clues to the identity of some determinants of Ontario Iroquoian village organization: socio-demographic and political factors, village defense strategy, fire prevention and social considerations.
Determinants of Late Ontario Iroquoian village organization

In the search for determinants of Ontario Iroquoian village organization, ethnographic documents, archaeological village plans and accounts of contemporary Neolithic communities were consulted. Perhaps the most useful data class is archaeological village plans. Unfortunately, complete or partial plans are available for only 14 Late Ontario Iroquoian village sites and relevant details for each are summarized in Table 1 and Figure 3.

Two basic excavation strategies are used to generate ground plans of Iroquoian settlements: extensive areal excavations and slit-trenching. The former is preferred since slit-trenching or wall-trenching (outlining house walls) reveals nothing about house interiors and is notoriously misleading when a site contains superimposed or extended house structures (Trigger 1981:11-12; Dodd 1982:56).

Only the Draper site has been "totally excavated" (Finlayson and Pihl 1980a), so this study is based mostly on partial village plans from sites possessing a minimum of four excavated longhouses.

**Determinants of village organization**

The potential determinants of Late Ontario Iroquoian village organization are cosmology, available construction materials, site drainage and topography, climate, fire prevention, sanitation, space conservation, defense and socio-political variables (village socio-economics, government, and demography). We can eliminate some of these at the outset.

**Cosmology**

Late Ontario Iroquoian cosmology does not seem to have been a
Key to Figure 3:

**Early Ontario Iroquoian sites**

<table>
<thead>
<tr>
<th>Glen Meyer</th>
<th>Pickering</th>
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<tr>
<td>1) Porteous</td>
<td>8) Miller</td>
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<td>2) Van Besien</td>
<td>9) Bennett</td>
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<td>3) Dewaele</td>
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**Middle Ontario Iroquoian sites**

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<td>11) Uren</td>
<td>14) Crawford Lake</td>
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<td>12) Nodwell</td>
<td>15) Slack-Caswell</td>
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<td>13) Moyer</td>
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**Late prehistoric-Protohistoric sites**

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<tr>
<td>16) Southwold</td>
<td>19) Coulter</td>
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<tr>
<td>17) Lawson</td>
<td>20) Kirche</td>
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<td>18) Draper</td>
<td>21) Benson</td>
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**Historic sites**

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<td>22) Christianson</td>
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<td>23) Hood</td>
<td>28) Ball</td>
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<td>24) Hamilton</td>
<td>29) Le Caron</td>
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<td>25) Walker</td>
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<td>26) Thorold</td>
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Figure 3. Location of Ontario Iroquoian sites mentioned in the text.
determinant of village layout, since house orientation is too variable (see Table 2) (Norcliffe and Heidenreich 1974:18). Religious factors would be expected to highly standardize house orientation in one cardinal direction. In fact, even burial orientations do not appear to have been prescribed by Ontario Iroquoian religion (Fitzgerald 1979:58).

Available construction materials

The type of building material available to human groups can set limits to the form and size of dwellings which in turn can influence village layout (Rapoport 1969:24-26; Trigger 1968; Cranstone 1972).

Ontario Iroquoians constructed their longhouses from saplings and bark (Thwaites 1896-1901, 8:105; 17:17) and there is no doubt that at least longhouse width was partly determined by the mechanical limitations of specific wood types and sapling sizes selected (Heidenreich 1971:116; Johnston and Jackson 1980:197). However, except for a moderate correlation between house width and length (Dodd 1982:164) and minor deviations in house widths related to regional differences in tree species (e.g., historic Huron and Neutral house widths (Dodd 1982:109)), Iroquoian longhouses exhibit remarkably standardized widths and do not exceed a nine metre threshold (Dodd 1982:76) (see Table 1 and Figure 6).

Given that longhouse widths and heights were roughly equivalent (Thwaites 1896-1901, 8:107), Ontario Iroquoian house widths were likely functions of optimal dwelling heights required to minimize interior wood-smoke problems. Smoke-caused blindness was common among old Huron (Trigger 1969:62) and eye disorders and respiratory diseases are endemic among contemporary longhouse dwellers, such as the Enga of Highland New Guinea (Marshall 1979:104-105). Relatively high ceilings would have made
Key to Figure 4:

1) Maximum house length (measured from interior of each end along house midline)

2) Maximum house width (maximum distance between side walls, measured from interior of wall)

3) House spacing (minimum distance between juxtaposed houses)

4) Minimum distance between house wall and innermost palisade row

5) Minimum distance between centre of house end and nearest midden periphery

6) Orientation (measured along midline or side wall of house to the nearest degree east of north - magnetic north in most cases)
smoke levels tolerable in a longhouse and it appears that, once established, ideal ceiling height and corresponding house width remained fixed for Ontario Iroquoian houses.

The extremely large prehistoric Onondaga longhouses (Tuck 1971:79,96) suggest that, given suitable topography, there were no structural limitations to the lengths of Iroquoian longhouses. As we shall see, longhouse length was directly related to household size. Thus, the building materials available to the Ontario Iroquois do not seem to have influenced village layouts.

Site drainage and local topography

The nature of site soils and topography had some influence on Late Ontario Iroquoian village organization. A soil analysis of the Walker Neutral village revealed that the sandy loam patches of the site were preferred for house construction, presumably facilitating drainage (Wright 1981:47-48). Also, since linear houses require fairly flat terrain, topography can impose limits to the placement of dwellings. For instance, large erosional gullies at the Walker and Draper sites (Wright 1981; Hayden 1979) effectively bifurcated these villages. Such natural features may have proved advantageous in the division of a large village into its constituent social aggregates (Hayden 1979:5).

Climate

Only in regions with severe climates are climatic factors a major determinant of house design and placement (Rapoport 1969:19-20). It is doubtful, therefore, that the temperate climate of Southern Ontario would have had much influence on Iroquoian house or village arrangement.
A concern for the prevention of structural damage to longhouses from high winds is not reflected by the orientation of houses in Late Iroquoian settlements. High velocity winds in Southern Ontario originate from a west or southwest direction, hitting many Late Iroquoian houses broadside (Norcliffe and Heidenreich 1974:19). In any event, village palisades would have functioned as windbreaks and protected houses from severe storms (Fitzgerald 1981:35).

It has been hypothesized that most Late Ontario Iroquoian villages exhibited a preferred northwest-southeast longhouse orientation, minimizing the house surface area presented to prevailing cold winds, thus maximizing longhouse thermal efficiency (Norcliffe and Heidenreich 1974; Noble 1968:217, 1975a:40; Trigger 1969:60; Wright 1981:49). Although the Enga of Highland New Guinea and the Danubians of the European Neolithic designed their longhouses to increase thermal efficiency (i.e., dwellings with a tapering ground plan, a sloping, aerodynamically-constructed roof design and orientation of the narrow entrance end into the prevailing cold winds (Marshall 1979:105, 1981:112-113)), none of the features of axially-pitched longhouses are reported ethnographically or demonstrated archaeologically for the Ontario Iroquois (Dodd 1982).

Furthermore, contrary to Norcliffe and Heidenreich (1974:27-28), the majority of Ontario Iroquoian longhouses were not oriented northwest-southeast. In a reassessment of the original work on longhouse orientation, Dodd (1982:118,242) discovered that Huron houses were, in fact, oriented in a northwest-southeast direction, but Neutral houses were aligned in east-northeast and northeast-southwest directions. She attributes this difference to local wind variability (Dodd 1982:118). The author's
derived results replicate Dodd's (1982) findings about historic Huron and Neutral houses (Table 2), but they also show that late prehistoric and protohistoric longhouses exhibited a significant non-preference for northwest-southeast orientations (Table 3).

As a final note, the historic Huron house orientations used in these studies derive primarily from three sites, only two of which express a northwest-southeast mode of house orientation (e.g., the Ball and Warminster sites). In fact, the Ball and Warminster sites are located less than two kilometres apart and may even represent sequential occupations of the same village. Therefore, the claims for Huron preferences in longhouse orientations should be considered tenuous, until more representative data are made available.

In summary, it is evident that there was no preferred Late Iroquoian longhouse orientation in relation to prevailing northwest winds. Indeed, it is unlikely that maximization of house thermal efficiency was a major control of house arrangement, except in some historic Huron villages.

Fire prevention

House fires were prevalent among the Late Ontario Iroquois, sometimes involving conflagrations of entire villages (Thwaites 1896-1901, 8:105-107; Wrong 1939:95; Biggar 1922-1936, 3:125). Perhaps the most effective fire prevention measure in an Iroquoian village would have been to widely space longhouses and to align them into the prevailing winds, so that flames would be fanned along houses rather than toward other houses (Trigger 1969:60). Champlain observed a three to four pace separation of Huron dwellings, supposedly to prevent fires from spreading house to house (Biggar 1922-1936, 3:125).
However, such house densities are not demonstrated by most Iroquoian village plans; only three sites (Kirche, Benson and Walker) possess a mean house wall spacing in excess of three metres. In other settlements (e.g., the Southwold (Smith 1977) and Hood sites (Lennox 1978)), even the occasional house fire did not seem to discourage the practice of juxtaposing dwellings less than two metres apart (see Table 1). These data give the impression that accidental house fires were simply accepted as part of village life and did not greatly affect the density of houses in Late Iroquoian villages (Norcliffe and Heidenreich 1974:22).

Sanitation

It has been suggested (Rowlands 1972:459-460) that sanitation problems are most acute in palisaded villages and might have influenced the placement of dwellings in such settlements.

Refuse and organic waste produced by the inhabitants of Iroquoian villages was disposed of in clearly designated areas called middens (Heidenreich 1971:147; Bellhouse and Finlayson 1979:106; Trigger 1981:35). Middens vary considerably in extent and generally occur in central open areas, between or adjacent to house ends and on the village periphery, piled against the palisade. There appears to have been no preferential use of any of these locations (Table 4), except that large middens (>200 m²) are restricted to central plazas or village perimeters and presumably received refuse from a number of households (Kapches 1979:27).

From the average distance between house doorways (centre of house ends) and midden edges, an Iroquoian had to walk no further than about nine metres outside his house to discard refuse (Table 5). Refuse was apparently tossed
in the most convenient place; thus, house locations determined toft areas or midden locations and not the reverse.

In terms of village sanitation, given the proximity of middens to houses and that middens were composed predominantly of wood ash, charcoal, potsherds and decomposing plant parts (village dogs would have consumed the more edible organics (Heidenreich 1971:148)), the middens probably did not present a health hazard. Although little is known about the disposal of human waste in villages, Hayden (1979:25) has suggested that some of the large, sterile organic stains, located outside house walls, may have been winter latrines. The general lack of concern for children urinating on longhouse floors (Wrong 1939:93) supports the idea that the Ontario Iroquois did not regard sanitation as a high priority in village planning.

Space conservation

The parallel alignment of longhouses in many Late Iroquoian settlements has been interpreted as conservation of space within a palisaded village (Noble 1969:19, 1975a:40; Trigger 1969:60; Wright 1981:49). Palisade construction, using ground-stone or even twice-as-efficient iron axes (Trigger 1976a:412), would have been a time-consuming task for any group of Iroquoians (Heidenreich 1971:153-155). Hence, it would have been desirable (applying Zipf's Law of Least Effort (Zipf 1949)) to minimize the stockade perimeter, yet maintain a large enough village area to accommodate a maximum number of houses, in anticipation of village growth. The most economical arrangement of longhouses in a palisaded village, therefore, would have been in closely spaced, parallel rows. Such configurations are seen in large protohistoric and contact Huron villages, such as the Benson, Ball and Warminster sites, and
exemplify the "street-like" house arrangements described in the historic literature (Thwaites 1896-1901, 13-187). In most other cases, houses are juxtaposed in roughly similarly aligned clusters.

So, if defensive works (both natural and man-made) imposed limits to an Iroquoian village's capacity to expand (Iroquoian villagers would have remodelled fortifications only in exceptional cases of village coalescence), one would expect to observe the closest house spacing or greatest house densities in villages that were enclosed by the greatest number of defensive barriers.

To test this hypothesis, the average minimum distance between juxtaposed house walls, essentially a house density index, was calculated and the number of natural defenses (steep breaks in slope, watercourses), palisade rows and earthworks were enumerated for each village in the sample (Table 6 and 7). Correlations were computed between house density and village size and the number of defensive barriers. There was no significant correlation between village size and house density (Table 7) and a rank-order correlation showed no significant relationship between house density and the number of barriers to site expansion (Table 8).

It is worthwhile to note, however, that some of the highest house densities occur in sites which occupy naturally defensible locations and were surrounded by massive palisades (e.g., Le Caron site), sometimes in combination with earthworks (e.g., Southwold and Lawson sites). One of the lowest densities was observed in the Walker site, the only unpalisaded village in the sample. Although no significant relationships were found, the data hint that, in some palisaded settlements, there were attempts made to conserve village space by juxtaposing longhouses in parallel
Defense

In Iroquoian archaeology, defense has been invoked as a major determinant of house size and village layout (Trigger 1969:17, 1976a:421; Pearce and Smith 1980; Finlayson and Pihl 1980a:13; Finlayson and Poulton 1979:11; Johnston and Jackson 1980:176).

Theoretically, defense is a potential determinant of dwelling size and village patterning. Rowlands (1972:455-456) notes that some responses that people can make to the threat of an attack are: to concentrate themselves in one secure, easily defended dwelling unit, to arrange their dwellings irregularly to create confusion and impede the progress of intruders, to order dwellings in a defensive fashion, such as concentric rings or to surround their settlement with palisades or other fortifications. If the latter defense strategy is adopted, stockades permit dwellings to be "arranged more conveniently inside and prevents some houses being put at greater risk than others" (Rowlands 1972:456). In other words, in fortified settlements, there should be less need for houses to be arranged defensively.

Misinterpretation of defense theory has led several Iroquoianists (Smith 1977:77; Pearce and Smith 1980; Johnston and Jackson 1980:178; Finlayson and Pihl 1980a:13; Finlayson and Poulton 1979:11; Nasmith 1981:155) to claim that several details of fortified Iroquoian villages, such as central open areas, narrow spaces between houses, house extensions and internal fences or cordons, were deliberately designed to channel and hinder the progress of an attacking force, once they had penetrated the palisade.
The major weakness of this model is that it implies organized large-scale raids, dozens of combatants and fighting within villages (Finlayson and Pihl 1980a:13). In fact, none of these features characterized Iroquoian or Mississippian warfare (Heidenreich 1978:386; Dickson 1981:913) of the early contact period; prior to the introduction of firearms to tribal societies, aboriginal weaponry and military strategy were usually ineffective against palisaded villages (Vayda 1976:92; Larson 1972:390-391). Furthermore, ethnographic accounts indicate that the nature of prehistoric and early contact warfare among the Ontario Iroquois appears to have been no different from primitive warfare in contemporary stateless societies (Heidenreich 1978:386), involving disorganized ritual battles, small raiding parties, surprise attack, ambush, stealth and capturing or killing isolated individuals outside settlements (Service 1962:114-115; Chagnon 1968:110; Berndt 1964:184; Heider 1979:97; Sillitoe 1978:267; Vayda 1976:23).

As a final note, even the defensive open areas between houses and palisade, which were documented for the Huron (Wrong 1939:92), are not commonly observed archaeologically. In a sample of eight village sites, only two historic villages substantiate Sagard's (Wrong 1939) statement (see Table 8). It may be that the practice of setting fire to or chopping through palisades, leading to combat inside Iroquoian villages, was strictly a historic phenomenon, as a result of commercially motivated warfare. This would account for the general lack of concern for placing houses against stockades in protohistoric and late prehistoric villages (e.g., Lawson, Draper, Kirche, Ball and Christianson sites (Table 9)).
Defensively positioned longhouses, therefore, did not likely appear in Ontario Iroquoian villages until after A.D. 1640, when firearms and iron weaponry became widely available to the New York Iroquois (Trigger 1976a:629-631).

As an alternative explanation to high house densities, house extensions and fences inside Late Iroquoian villages, I would suggest that these features were probably caused by village overcrowding, under conditions of intense warfare. In the late contact period, intense warfare motivated the Huron to coalesce several small villages into large fortified strongholds (Trigger 1969:17). It is suspected that such defensive concentrations would have entailed a certain amount of overcrowding. In a crowded Iroquoian stronghold, a great concern for space conservation would have produced high house densities; absorption of refugees by existing households would have required frequent house extensions; and perhaps internal fences were attempts to ameliorate overcrowding and reduce conflicts, by restricting the frequency of interaction between different social groups (Hodder 1982:193-194).

In summary, the defense model of Iroquoian village organization is rejected and in its place, it is argued that high house densities, house extensions, open areas and fences in Late Iroquoian villages are more accurately interpreted as responses to overcrowding, refugee problems, space conservation and physical separation of socio-political aggregates, under conditions of unusually intense hostilities.
Socio-political model of Late Ontario Iroquoian village layout

Although overcrowding, conservation of village space and maximization of longhouse thermal efficiency influenced some village arrangements, none of the potential determinants examined thus far have provided an adequate explanation for the majority of Late Iroquoian village layouts. It will be proposed that the primary determinants of Late Ontario Iroquoian village organization were socio-political variables, related to the nature and composition of Iroquoian households, village demography and government.

Underlying assumptions and definitions

Before presenting the model, there are certain definitions and assumptions that must be made explicit.

First of all, the term "clan" is defined as a non-residential, exogamous group of two or more lineages, who claim common descent from a mythical ancestor and who often share totems and special ceremonies. Clan segments or sub-clans are simply residentially localized members of the same clan (Service 1962:116-117; Schusky 1972:26-28). Late Iroquoian longhouse clusters will be interpreted as localized clan segments ("clan-barrios" (Murdock 1949:74)), formed by the political and economic coalition of several matrilineal households (Trigger 1969:55-56). Clans may originate for purposes of defensive alliance, emergency food-sharing, exchange or access to seasonal or critical resources and are important institutions for integrating various social groups and communities in tribal societies (Service 1962:116-117; Dalton 1981:22-23).

Secondly, it is assumed that any house within a longhouse cluster has a higher probability of being socially closer to its immediate neighbours
than to houses in other clusters. This is based on the observation that, in many small-scale societies, including such diverse groups as Mbuti Pygmies (Turnbull 1962:68-69), African pastoralists (Hodder 1981:68) and New Guinea horticulturalists (Heider 1979:47), closely related people tend to live closer together than more distantly related people. In short, social distance is highly correlated with physical distance in such societies (Evans-Pritchard 1940:124-125; Chang 1958:302; Sahlins 1968:18-19, 1972:197; Sommer 1969:16,64; Fletcher 1977:62; Hayden 1978:111).

A final assumption concerns the location and proximity of doorways in Iroquoian longhouses. Ethnographic accounts inform us that longhouses had doorways in both ends (Thwaites 1896-1901, 19:221; 21:285). Normally, it is extremely difficult to identify house entrances archaeologically because entrances are usually poorly defined, repairs can obscure doors and often there are unexpected gaps in house walls due to poor post preservation. On the other hand, the well-preserved houses of the Nodwell site (Wright 1974:70) show obvious doorways in one or both ends. Extremely large longhouses, such as the Middleport houses, probably had additional doors or fire escapes in the sides.

In primitive communities, the proximity and direction of house doorways are reliable physical indicators about social relations and interaction between households. For instance, among the Hopi of the American Southwest, pueblo doorways connect only the apartments of related families (Adams 1983:59); Mbuti Pygmies orient the entrances of their huts towards friends or relatives and away from disliked neighbours (Turnbull 1962:68); and among the Mailu Islanders of New Guinea, members of the same clan occupy longhouses on opposite sides of a village street,
but face their doorways toward one another (Fraser 1968:28). It is proposed that the frequency and intensity of interaction (social, economic and ritual) between households of an Iroquoian village can be inferred archaeologically from the physical distance between longhouse doorways; the greater the distance between house entrances, the less the interaction between households.

**Nature of Ontario Iroquoian households**

The ethnographic evidence suggests that the Huron longhouse functioned primarily as a dwelling, sheltering an average of eight to ten families (Thwaites 1896-1901, 15:153; 16:243; 17:177; 35:87; Wrong 1939:94; Biggar 1922-1936, 3:123-124). However, longhouses were far from ideal homes. They were noted for their high incidence of theft, overcrowding, lack of privacy, abundant mice, fleas and other vermin, poor sanitation, dust and smoke problems and constant danger of catching fire (Heidenreich 1971:122; Trigger 1969:62; Thwaites 1896-1901, 8:95,105-107; 10:35). Given these disadvantages, why did Iroquoians live in longhouses and what was the nature of the social group who occupied them?

To answer the first question, there are several reasons for longhouse life. First, mutual defense and security are obvious advantages to longhouse habitation (Rowlands 1972:455; Trigger 1969:56; Heidenreich 1971:123; Geddes 1961:30). Secondly, economic interdependence of residence members would have been a significant factor in the emergence and maintenance of longhouses (Heidenreich 1971:123; Hayden 1977:5; Hayden and Cannon 1982:151; Geddes 1961:30). Lastly, increased economic diversity and leisure time is made possible by life in multi-family as opposed to nuclear family dwellings. Nuclear family households are
responsible for supplying all of their own needs and the work per capita cannot be reduced as it can in extended households (Heidenreich 1971:123; Hayden 1977, 1978).

The nature and composition of the longhouse household is not so easy to explain. Some Iroquoian archaeologists believe that longhouse membership was based strictly on matrilineal and matrilocal criteria, implying that Ontario Iroquoian households (or human groups who constitute a commensal and co-operative unit and reside together under the same roof (Wilk and Rathje 1981:4)) were composed exclusively of matrilineally related families (Morgan 1962:315; Noble 1969:18; Heidenreich 1971:77; Trigger 1963:155). Brian Hayden (1977:8, 1979:23), on the other hand, rejects the traditional model of the Iroquoian household and proposes that the longhouse group was an economic corporate one. He adds that longhouse size was directly related to the size of the corporate group that a principal trader could attract, direct and maintain under one roof. According to Hayden's model, longhouse membership was based on both kinship and economic criteria and exhibited considerable flexibility.

I accept Hayden's (1977; Hayden and Cannon 1982) definition of the Late Ontario Iroquoian longhouse as a corporate group, assuming a corporate group is composed of usually kin-related persons who "function as individuals in relation to property" (Goodenough 1951:30-32), but I disagree that longhouse membership was highly flexible. Hayden (1977:3-5, 1979:24) cites Cara Richards' (1967) ethnohistoric study of Huron residence patterns and archaeological longhouse extensions as evidence for relative flexibility in longhouse membership. There are problems with both of these data sources.

First, claims for non-matrilocal residence among the historic Huron
(Richards 1967) are based on ambiguous ethnographic observations
(reflecting the Jesuits' poor comprehension of Huron kinship terminology)
and are biased toward cases of chiefly avunculocal residence (where
nephews of influential headmen went to live in their maternal uncle's
household) (Trigger 1976a:55, 1978a:56-58). In fact, one can infer
from Sagard's statement (Wrong 1939:124) on Huron divorce that a
married woman tended to remain in her family's household.

Secondly, Hayden's (1977:5, 1979:24) hypothesis that house extensions
indicate a high degree of residential flexibility in Late Ontario
Iroquoian longhouses seems to apply only to late prehistoric and early
protohistoric villages. Dodd (1982:81-82,86) observed that house
extensions are rare (8%) in Early Iroquoian and historic villages, but
are relatively common (16-20%), particularly multiple extensions,
in the largest houses of Middle Iroquoian and late prehistoric and
protohistoric sites. As we shall see, the latter periods witnessed
unusually intense warfare and unprecedented village coalescence, population
displacements and refugee problems (Ramsden 1977a:30-31, 1978; Trigger
1976a:159-163). While house extensions during these periods were indeed
products of residential flexibility, they were likely precipitated by
abnormal warfare conditions and not by the postulated lure of economic

Thus, there is insufficient evidence for positing that residential
flexibility, among households of the Late Ontario Iroquois, was due to
ephemeral residence behaviour, controlled by the waxing and waning of
household fortunes. One is left with the alternate and more realistic
hypothesis that the preferred residence pattern of the Ontario Iroquois
was uxorilocal, except for a certain amount of chiefly avunculocal
residence and some variability in house membership, resulting from idiosyncratic residence preferences, divorces, fights or incorporation of refugees or allies into preexisting households. Verification of this latter hypothesis can come only from future archeological work and not additional ethnohistoric research (Trigger 1969:56, 1981:9-10).

In summary, during relatively peaceful periods, most Late Ontario Iroquoian households probably consisted of a core of matrilineally related females, their husbands and children (plus a limited number of fictive kin and unrelated families) who shared cornfields, foodstuffs, trade goods, tools and acted as independent units of production from other households (Trigger 1969:34-35; Heidenreich 1971:123; Wrong 1939:101-103). This interpretation is not a significant departure from Hayden's (1977) definition of the Iroquoian household as a corporate group. Tribal lineages, living under one roof, are in essence corporate groups; lineages co-operate economically, share common property (i.e., specific rights over certain land, hunting territories, waterways, quarries, trade routes), recognize internal leaders (big-men) and are responsible for the safety, conduct and burial of their members (Dalton 1981:22-23; Service 1962: 123-124; Schusky 1972:25; Goodenough 1951:30-32).

**Size of Ontario Iroquoian longhouses**

Late Ontario Iroquoian house size (i.e., length) varies both diachronically and synchronically. As we shall see, house size declined throughout Late Iroquoian times, in response to several different pressures, but our concern for the moment is with synchronous variability.

Essentially, the size of an Iroquoian longhouse was directly related to the number of occupants (Casselberry 1974). There are two
potential "noise" factors, however, associated with this relationship.

First, not all longhouse floor space was habitable; at least one end of each house contained small communal corn and wood storage areas (Thwaites 1896-1901, 8:107; Wrong 1939:95; Biggar 1924-1936, 3:123). Archaeological analysis of Ontario Iroquoian longhouses (Dodd 1982:76, 164) has found that the size of end storage areas is highly correlated with house size and that the amount of storage space remains constant in houses over 30 m long. This latter finding suggests that the largest houses may not have been strictly wealth-based, as Hayden postulates (1977:9, 1979:23). Wealthy Iroquoian households would be expected to possess large per capita storage areas, assuming that such households accumulated large food reserves for feasting, exchange or emergency aid to allies and trading partners. In fact, they do not.

A second consideration concerns the variability in longhouse size. Referring to Table 1, Late Ontario Iroquoian house lengths are most variable in the late prehistoric and protohistoric periods. On the other hand, historic Iroquoian villages consist mostly of similar-sized houses (about 10-25 m long), except for the occasional cabin (less than 10 m long) and one or two extremely large houses (greater than 35 m long).

Small cabins in Late Iroquoian villages tend to be restricted to central plazas (e.g., Ball site (Dodd 1982:100,182)) or open areas between the village core and palisade (e.g., Hood site (Lennox 1978)). Dodd (1982:122) postulates that small cabins functioned as dwellings and may represent additions of small groups of refugees or allies to villages. It could also be argued that these small structures served as temporary guest houses for foreign ambassadors or traders.
At the other end of the scale, extremely large longhouses were probably the dwellings of headmen. The Huron deliberately built the house of a civil headman much larger than all others because it was this structure that hosted village councils, feasts, dances and prisoner torture, in addition to being simply a residence (Thwaites 1896-1901, 10:181). Archaeologically, such structures are highly visible. For instance, the two longest houses in the Ball site are situated in different sectors of the village and have been interpreted as the dwellings of civil headmen for two localized clan segments (Knight and Snyder 1982:61).

Another distinctive feature of large longhouses is hearth spacing. Dodd (1982:75-76) observed that hearth spacing is greatest in the longest Ontario Iroquoian houses, implying that these structures had lower population densities than smaller ones. Wealthy or high-status households in primitive communities have, on average, larger floor areas per capita (Hayden and Cannon 1982:139) than poorer households. At least in chiefly houses, then, archaeological data tend to support Hayden's (1977,1978) arguments for large longhouses being occupied by privileged or wealthy individuals.

However, the low population densities in large longhouses could also be accounted for by the multi-functional nature of these structures. Basically, a chiefly household may not have been much more wealthy than neighbouring, smaller ones (we can infer from the relatively equal per capita size of storage cubicles in longhouses that they were not). The fact that members of a chiefly household possessed less crowded quarters may have been simply an indirect advantage to living in a public building,
which had to accommodate large numbers of people from other households and villages, on special occasions.

Finally, I would argue that Late Ontario Iroquoians were not inherently competitive over trade routes and material wealth, contrary to Hayden (1977, 1978, 1979). It is accepted that infrastructural determinants (economic and environmental pressures) promote the emergence and maintenance of corporate groups in stateless societies (Hayden and Cannon 1982:149-151), but it is unlikely that trade in wealth items caused and sustained Ontario Iroquoian corporate groups. Indeed, the maximum development of the longhouse and presumably strong corporate groups were prehistoric phenomena, probably in response to competition over scarce essential resources (hides, meat and chert). Hayden (1977, 1978, 1979; Hayden and Cannon 1982), on the other hand, suggests that large longhouses resulted from competition over wealth or highly desired resources. In short, we simply disagree over the types of resources that Ontario Iroquoians fought over, not the conditions under which Ontario Iroquoian corporate groups originated.

There are several lines of evidence which indicate that Ontario Iroquoians were neither avaricious nor lazy. First, aside from council houses, there are only minor size differences between protohistoric and historic houses in most villages. According to Hayden's (1977, 1978) model, one would expect a maximum development of house size during the protohistoric. Protohistoric villages should be composed of only a few large longhouses, whose members would have been engaged in fierce competition over the control of trade routes and redistribution of European goods.
The empirical evidence, however, does not support these expectations. With the exception of chiefly dwellings and cabins, the relatively small size differences between most houses (standard errors of 4-10 m) of the Late Iroquoian period are more easily explained by random demographic and social variables, such as birth rates, sex ratios, the number of females of reproductive age living in each house, the frequency of disputes between housemates that produce residential relocation (e.g., divorce, jealousies, insults and tensions) and idiosyncratic residence preferences.

Secondly, as already mentioned, house storage areas in large longhouses are no larger per capita than in small houses. This implies that larger houses were not wealthier, at least in terms of accumulated foodstuffs.

In addition, ethnographic data suggest that it would have been very difficult for any individual or household to have acquired excessive wealth through trade monopolies. In Huron society, there were no institutions (except sorcery accusations (Trigger 1976a:424)) for preventing the violation of trade route monopolies. Traders who used routes without the owner's permission, if accompanied by several cohorts or if they managed to reach the village without being apprehended, were not normally prosecuted (Thwaites 1896-1901, 10:223-225). Also, the high incidence of theft, gambling and ceremonial exchange, in the context of curing rituals, dream fulfillment and burials, were highly effective mechanisms for preventing wealth accumulation in Iroquoian society (Ramsden 1981).

Lastly, Ontario Iroquoian headmen were chosen, respected and followed because they demonstrated superior skills in policy-making, settling of disputes, organizing military and peace expeditions and initiating games,
feasts, dances, burials and other ceremonial exchanges, in addition to being successful traders and generous providers of material amenities (Trigger 1969:69; Heidenreich 1971:79). In short, one should not over-emphasize the economic role of Iroquoian leaders. In fact, sometimes when Huron headmen became Christians and could no longer participate in traditional feasts and gift exchange, they continued to exert considerable influence in their communities, in spite of substantially reduced economic roles (Trigger 1976a:713).

**Socio-politics and Ontario Iroquoian villages**

It has been argued that Late Ontario Iroquoian households were corporate groups composed of a core of related families. It is too simplistic, however, to view each household as a completely independent entity, particularly when confronted with archaeological evidence for distinct residential clusters of longhouses within Iroquoian villages.

**Late Ontario Iroquoian village types**

Late Iroquoian villages display essentially two types of longhouse arrangements: structured and disordered. Disordered villages, for example, the Kirche and Hood sites, are characterized by a haphazard house arrangement. On the other hand, structured villages reflect a fair degree of community planning and have distinctive clusters of closely spaced longhouses, flanking an open area. There are three variants of this village type:

1) radial cluster villages contain houses which are arranged in fans around central plazas and occur most often among the prehistoric Huron (e.g., Draper and Coulter sites)

2) aligned cluster villages display less obvious house clusters,
are distinguished by sets of houses with different modes of orientation and are exemplified by Lawson, Southwold, Benson and Christianson sites

3) parallel row villages possess "streets" that are defined by parallel rows of houses; discrete residential wards are indicated by slightly different house alignments and, in some cases, are physically separated by fences (e.g., Warminster and Ball sites (Knight and Snyder 1982:54-55); and it is significant that this village pattern occurs only in large contact Huron sites, precisely the villages which were described by the Jesuits as having "streets" (Thwaites 1896-1901, 13:187; 19:219-221).

Figure 5 illustrates disordered and structured village plans. The three structured village types are simply different geometrical solutions to the same problem of arranging a group of linear houses, so that their ends (doorways) are as close as possible to each other within a cluster, while simultaneously conserving internal village space. There is a slight temporal trend in structured village forms during the Late Iroquoian period. Radial cluster villages seem to have been the preferred village arrangement of prehistoric groups; aligned villages are predominantly late prehistoric and protohistoric phenomena; and parallel villages are restricted to large contact Huron sites.

Perhaps the best explanation of Late Iroquoian village patterns can be found in the socio-political organization of contemporary swidden communities.
Figure 5. Late Ontario Iroquoian village types.
Ontario Iroquoian village demography and socio-politics

Late Ontario Iroquoian villages varied in size from 0.41 ha to 6.0 ha (one to 15 acres) (Trigger 1969:55; Noble 1975a:38-40; Heidenreich 1971:145) and were probably occupied by 300 to 1500 individuals (Trigger 1976b:30). According to data from New Guinea (Forge 1972), there is a strong tendency for tribal communities of more than about 350 people to be internally segregated into discrete residential units, mainly because it is extremely difficult for an individual to have a personal knowledge of all other adults in a community larger than this (Layton 1972:381). Additional cross-cultural data for primitive horticulturalists support the generalization that discrete sectors of large communities tend to be occupied by localized lineages, clan segments or clans (James 1949:19; Chang 1958:306-307; Cranstone 1972:496; Fraser 1968:28; Longacre 1981:52).

Late Iroquoians were no exception. Early historic accounts mention that large Huron communities were composed of several clan segments which appear to have been localized in village sectors. Each localized sub-clan was represented on the village council by a civil headman who occupied the largest house in the clan-barrio (Trigger 1969:54-57; Heidenreich 1971:78-79; Thwaites 1896-1901, 10:231). Small Iroquoian villages (less than 300 inhabitants) might have been comprised of a single sub-clan (Trigger 1976a:54, 1976b:30).

Wright (1981:49) have suggested that Late Ontario Iroquoian village plans might best be accounted for by contemporary Neolithic community and socio-political organizations (Chang 1958). In a study of 53 contemporary Neolithic societies, Chang (1958) identified three community types: unplanned, planned monolineage and segmented multilineage. Each community type is defined on the basis of community size, level of socio-political complexity and geometrical patterning of dwellings. The concept of community types can be profitably applied to the defined Late Iroquoian village types.

Chang's (1958:306) unplanned community (normally a dispersed and disorganized arrangement of dwellings, reflecting little socio-political or economic co-operation between constituent households) might explain very small, unpalisaded or disordered Ontario Iroquoian village patterns. It is significant that the only disordered villages in our sample (Kirche, Hood and Walker sites) were occupied during the late prehistoric or late contact periods. Both periods were characterized by unusually intense warfare, demographic upheaval and disruption of established socio-political systems (Trigger 1976a:601-602,709-710; Wright 1966:69-78; Engelbrecht 1982; Ramsden 1977a:30-31, 1977b:293, 1978).

A planned village is usually small, consisting of a few independent houses arranged according to a preconceived plan. It is a single planned unit, often composed of houses arranged in a circle around a small plaza which sometimes contains . . . the chief's house . . . the planned village pattern positively indicates a monolineage community (Chang 1958:306).

Planned Neolithic communities can be identified with small Ontario Iroquoian sites less than about 0.8 ha in size, with maximum population
estimates of less than 300 people, living in six to eight longhouses. There are no examples of this community type in our site sample, but it is expected that such villages would be unpalisaded (although the one acre historic Neutral Bogle I and II sites (hamlets) were both palisaded (Paul Lennox, personal communication, 1982)) and would display a single row or radial cluster of similar-sized houses. Undifferentiated house sizes are also expected in such villages, since large council houses appear to have been associated with only the most populous Huron villages (Heidenreich 1971:121).

Lastly, a segmented village contains two or more lineages, each localized in one segment of the community. The segments are in effect small, planned, sometimes fenced villages with dwelling houses arranged in a pattern, centering on a plaza . . . the segmented community pattern seems to indicate the existence of several lineages, each occupying a segment (Chang 1958:307).

This definition of segmented villages can be modified to include a community of two or more sub-clans, not lineages. Structured Ontario Iroquoian villages represent segmented communities. Each residential ward of a segmented Iroquoian village should contain one unusually large house which had been occupied by the sub-clan headman.

The primary advantages to Neolithic segmented villages are: socio-political aggregates or clan segments can retain a considerable amount of autonomy; the frequency of inter-community conflict is reduced; and village fissioning, due to unresolved clashes between clan segments, can occur along clan lines with only minimal physical disruption to a community. Fission of communities is common among tribal societies and is historically documented for the Huron (Wrong 1939:92; Thwaites 1896-1901,
It is now appropriate to present the socio-political model of Late Ontario Iroquoian village organization.

(1) Late Iroquoian longhouses comprised corporate groups that were composed of a core of matrilineal kin and a few unrelated individuals.

(2) Except for chiefly residences, longhouse size was essentially a function of the number of occupants. Although longhouse membership remained relatively fixed for the life of a dwelling, additions were occasionally built to accommodate newlyweds, allies, refugees, adopted prisoners or disaffected relatives from other houses or communities.

(3) There are only minor size differences between most Late Ontario Iroquoian longhouses, except for council houses and cabins. Council houses functioned as the dwellings of village or clan-barrio leaders and were built much larger than other houses, so that they could contain community feasts, dances and other gatherings. Such houses appear to have had a higher per capita living area than smaller houses (Dodd 1982), as indicated by hearth spacing and the size of end storage areas.

(4) Each Iroquoian household contained a certain amount of economic orchestration, as evidenced by House 2 at the Draper site (Hayden 1977, 1979). However, most Late Iroquoian households were not involved in competitive wealth accumulation, but were economically designed for sharing food procurement and processing, collecting and storing essential resources (hides, clay and firewood) and manufacturing tools (clay pots, hunting and fishing equipment, stone woodworking implements, etc.).

(5) Most households were tied in economic and socio-political
coalitions with neighbouring households. Such coalitions were in effect localized sub-clans who co-operated for labour-intensive work activities (house building, harvesting, hunting and fishing, land clearance), for ameliorating economic disaster (crop failures) and for a stronger voice in village affairs.

(6) The layout of Late Ontario Iroquoian villages was determined primarily by socio-political factors (community size and coherency of socio-political aggregates). In late prehistoric and late historic communities, disorganized village governments caused disordered village patterns or unplanned Neolithic communities. On the other hand, most Late Iroquoian villages were highly structured, exhibiting one or more distinct clusters of longhouses. Within each cluster, longhouses are juxtaposed and sometimes similarly aligned and are arranged around informal open areas which often contain middens. These clusters are interpreted as sub-clan residential wards or "clan-barrios" (Murdock 1949: Flannery 1976a).

(7) Large Iroquoian villages contained two or more clan-barrios. The clan-barrio functioned as an independent socio-political entity and social and economic interaction is expected to have been greatest within clan-barrios, assuming physical and social distance are highly correlated in preindustrial societies. In the event of unresolved conflict between two clan segments, fissioning of the community upon relocation was facilitated by the physical segregation of sub-clans in the original village.

(8) Lastly, in addition to socio-political determinants, some village layouts were influenced by subsidiary determinants, such as
maximization of longhouse thermal efficiency (Norcliffe and Heidenreich 1974), conservation of space in overcrowded or strongly fortified communities and village site soil conditions and topographic relief.

Prior to outlining the archaeological implications of this model for Ontario Iroquoian village patterns, it is desirable to first evaluate the parsimony, power and scope of the model. Specifically, the model should be capable of retrodicting and explaining earlier Ontario Iroquoian socio-political organization from an examination of village layouts. It shall be argued that observed temporal transformations in Ontario Iroquoian longhouse size and village layout reflect evolutionary changes in the socio-political system of the Ontario Iroquois.
The aim of this chapter is to assess the explanatory power and scope of the model and to outline its archaeological implications. In particular, we would like to see if the model can explain observed trends in Ontario Iroquoian house size and village patterning.

Trends in Ontario Iroquoian house size and village layout

There are a number of developmental stages in the history of Ontario Iroquoian longhouses and village organization: Stage 1 (Early Ontario Iroquois); Stage 2 (Middle Ontario Iroquois); Stage 3 (late prehistoric-protohistoric period); Stage 4 (historic period).

Stage 1

The origin of the Ontario Iroquoian longhouse can be traced archaeologically to at least A.D. 800. The Porteous site, a small Princess Point or transitional Glen Meyer hamlet, contained incipient longhouse structures averaging 11.5 m long (Stothers 1977:125). The appearance of the Glen Meyer and Pickering cultures in the ninth century coincided with a slight increase in house and settlement size, likely in response to a greater dependence on horticulture, population increase and a more sedentary lifestyle (Noble 1975a:40; Trigger 1976a:136; Wright 1972:71).

Early Iroquoian house size and village form remained remarkably unchanged for over three centuries (see Figures 6 and 7). Most villages of this period are characterized by a relatively small size (average of
Key to Figure 6:

**Ontario Iroquoian sites**

1) Porteous  
2) Van Besien  
3) Calvert  
4) Dewaele  
5) Miller  
6) Reid  
7) Bennett  
8) Uren  
9) Gunby  
10) Nodwell  
11) Moyer  
12) Crawford Lake  
13) Draper  
14) Benson  
15) Ball  
16) Warminster  
17) Hood  
18) Southwold* (earthwork site)  
19) Lawson* (earthwork site)
Figure 6. Chronological trends in Ontario Iroquoian house dimensions.
0.6 ha (Dodd 1982:98,180)), palisade rearrangements, absence of interior village middens (Table 11) and disorganized plans with several randomly oriented, superimposed house structures (Fox 1982:8-9). House interiors exhibit low post densities (Dodd 1982:94,175) and abundant refuse pits.

**Stage 2**

In the latter part of the thirteenth century, longhouses suddenly expanded (Figure 6). At the Uren site (A.D. 1250-1300), for example, houses average 27 m long and appear to have been arranged in two distinct groups with opposite orientations (M. Wright 1979). The longhouse grew throughout the fourteenth century, attaining its maximum size in the early fifteenth century (see Figure 6). In fact, the Middleport period (A.D. 1350-1450) witnessed houses of monstrous proportions - both the Moyer (Wagner et al 1973) and Slack-Caswell sites (Jamieson 1979) contained 90 m house structures. Even from a modern standpoint, such dwellings would have been impressive pieces of architecture.

Village size slightly increased during this period (a mean of 0.9 ha (Dodd 1982:98)) and villages became highly organized. Middens accumulated inside elaborate palisade systems and houses were aligned parallel to one another. The frequency of house extensions and interior house post densities are greater in Middleport sites than in Early Iroquoian ones (Dodd 1982:94,175,177).

**Stage 3 and Stage 4**

As Noble (1975a:42) notes, "the heyday of the Ontario Iroquois longhouse" was short-lived. After A.D. 1450, dwellings seldom exceeded
Key to Figure 7:

1) Early Iroquoian village (A.D. 800 - 1300)
   (i) small site size
   (ii) short houses
   (iii) superimposed houses and palisades
   (iv) haphazard house arrangement (disordered village)
   (v) small circular structures

2) Middle Iroquoian village (A.D. 1300 - 1450)
   (i) moderate site size
   (ii) extremely long houses
   (iii) complex palisade system
   (iv) parallel house alignment (aligned cluster village)
   (v) small circular houses

3) Late prehistoric - early protohistoric village (A.D. 1450 - 1550)
   (i) large site size
   (ii) diverse house sizes
   (iii) elaborate fortifications (sometimes earthworks)
   (iv) palisade expansions, house extensions and houses outside palisade
   (v) radial cluster village

4) Historic Huron village (A.D. 1615 - 1650)
   (i) large site size
   (ii) relatively short houses except for council houses
   (iii) palisade or house expansions are rare or absent
   (iv) small cabins in open areas
   (v) parallel row village
Figure 7. Ontario Iroquoian village morphology.
50 m, except in the largest settlements, where one or two houses appear to have been deliberately constructed much larger than all others (e.g., the Ball site (Knight and Snyder 1982)). A steady decline in longhouse size characterized the entire Late Iroquoian period; a trend which may have ended in nuclear family cabins had it not been truncated by the dispersal of the Ontario Iroquois in A.D. 1649-1651.

Villages attained a maximum size (average of 2.5 ha (Dodd 1982:99)) in the Late Iroquoian period and there are marked formal differences between late prehistoric and protohistoric-contact settlements.

Late prehistoric sites (ca. A.D. 1450-1530) often show evidence of expansions, house extensions (especially multiple ones) (Dodd 1982:96,177), superimposed houses (Dodd 1982:181), highly elaborate palisades and other defensive works (e.g., earthworks and ditches), internal fences that connect houses to palisade, relatively long houses that are closely spaced in aligned or radial clusters and high house interior post densities (Dodd 1982:94,175).

Protohistoric and contact sites (A.D. 1530-1650), on the other hand, are larger (Dodd 1982:98,180) and appear to have been better planned, but display fewer expansions, overlapped houses, defensive works and lower house interior post densities than late prehistoric sites (Dodd 1982:94, 175).

Explanation of trends in Ontario Iroquoian village organization

The scenario favoured here for explaining changes in the house size and village form of the Ontario Iroquois consists of three evolutionary phases:

(1) Phase 1 begins with small Early Iroquoian houses, grouped
haphazardly in unplanned communities. Sudden expansion of house size and the appearance of planned communities seems to have occurred in an atmosphere of climatic change, intense warfare, and increasing development of long-distance trade, pipe complexes and ossuary burial.

(2) Phase II occurs during the late prehistoric which witnessed unprecedented warfare and socio-political upheaval, followed by a relatively peaceful period, a decrease in house size and an increase in community planning.

(3) Phase III encompasses the protohistoric and contact periods. House size continued to decline, in spite of increased competition and warfare over highly desired European items. Epidemic disease and the gradual erosion of native socio-political systems are seen as possible causes of the obsolescence of the longhouse and formal village life among the Ontario Iroquois.

**Early Ontario Iroquoian village patterns**

On the basis of small house and village size and disordered house arrangements, Early Ontario Iroquoian villages have been interpreted as autonomous, unplanned communities (Trigger 1976a:139, 1981:25). Noble (1968:301-302) postulates that the disorganization of these communities reflects an absence of formal village government and clans, weakly developed matrilineages and low population densities. In addition, this period displays little evidence for protracted warfare and cannibalism, long-distance exchange, smoking pipe complexes and true ossuary burial (Wright 1966:39,51).

The nature of Early Iroquoian village occupation, as shown by low post densities inside houses and a high incidence of overlapped structures
(rebuilding episodes), was short-term with multiple occupations of the same site over a relatively long period of time (Fox 1982:8-9; Trigger 1981:25). Furthermore, there is evidence that these villages may have been only seasonally or sporadically occupied. It is becoming increasingly clear that Early Iroquoian villages were surrounded by a host of seasonal camps and hamlets and that the main palisaded villages were likely occupied only during the winter months (Williamson 1983). In addition, the Early Iroquoian habit of throwing refuse in abandoned storage pits inside dwellings resembles the discard behaviour of the Nootka and Bororo, other longhouse dwellers who periodically shifted residence location within the same village (Murray 1980:495).

Sometime during the thirteenth century, longhouses suddenly expanded and villages became well-organized. Ontario Iroquoian residential changes were accompanied by changes in other key variables: climate, population size and density, warfare and cannibalism, long-distance exchange, pipe complex and ossuary burial. The interrelationships of these variables are diagrammed in Figure 9 and are briefly summarized below.

1) Climate - A pollen core from Hell's Kitchen Lake in central Wisconsin indicates that the climate of the Great Lakes region may have become cooler and drier approximately A.D. 1300-1450 (Baerris et al. 1976: 52). It is interesting that a similar change is suggested by the Crawford Lake pollen core from Southern Ontario (McAndrews 1976).

2) Population size - The Middle Iroquoian period is considered a time of population growth and increased population density (Wright 1966:59; Trigger 1976a:143; Noble 1968:307, 1975a:44). Survey data from east Elgin County, Ontario, compiled by Poulton (1980:10), reveal an increase in the
number of village sites from Glen Meyer (seven sites) to Middleport (14 sites) times. An improved horticultural base with increased production of beans may have promoted this population expansion (Noble 1975a; Wright 1972).

3) Warfare and cannibalism - There is a general increase, throughout Middle Iroquoian times, in the complexity of village fortifications, incidence of traumatic injuries on skeletal remains and amount of scattered human bone in village refuse contexts (Wright 1966:57; Trigger 1976a:144-145; Ramsden 1977a, 1978; Finlayson and Pihl 1980a; Williamson 1978). Human remains in middens are interpreted as evidence for the existence of cannibalism. Cross-culturally, cannibalism and torture are usually found in situations of intense external warfare, where the belligerents seldom trade or intermarry and revenge is the deep-rooted cause of war (Hallpike 1973:460; Vayda 1976:46; Sillitoe 1978:263). It is significant that cannibalism seems to have been most prevalent among the late prehistoric Neutral and Huron (e.g., in the Lawson, Southwold, Kirche, sites (Pearce and Smith 1980; Nasmith 1981)). Ceramic evidence from these sites suggest that the prehistoric Huron were involved in endemic war with the St. Lawrence Iroquois (a geographically distant group to the Huron) and the Neutral were probably fighting the ancestral Mascouten (Stothers 1981) (again geographically distant from the Neutral). These conflicts terminated sometime in the sixteenth century (ca. A.D. 1550), when cannibalism declines in popularity (Trigger 1976a:219; Ramsden 1978:104-105; Wright 1978:73). It will be argued that competition over strategic resources (hunting territories, deer herds and chert) probably played an important role in the cause and persistence of this warfare pattern.
4) Long-distance exchange - Prior to A.D. 1300, there is little evidence for long-distance trade among Ontario Iroquoian groups. Exotic items, such as native copper and marine shell, are extremely rare in Early Iroquoian sites (Wright 1966:39; Trigger 1976a:169). It is not until the early fifteenth century that wider trade networks appear to have been established. It is no coincidence that the rise of long-distance trade seems to have occurred when house size and inter-village hostilities were on the decline. Exchange of primitive valuables is an essential element of alliance formation in tribal societies (Dalton 1977:198).

5) Pipe complex - Before A.D. 1300, clay smoking pipes are uncommon in Iroquoian sites and are crudely made (Wright 1966:62-63). In the latter part of the fourteenth century, however, ceramic pipes became abundant and highly stylized. Even more interesting, there are indications that each Middle Iroquoian settlement may have possessed a distinctive pipe style (data from a cluster of Middleport sites in the Crawford Lake region show discrete village-pipe associations (David Smith, personal communication, 1982)). Assuming pipes were male-related artifacts, cross-cultural data support the idea that male artifacts become most stylistic when intense resource competition and warfare are present (Hodder 1978,1982; Wobst 1977).

6) Ossuary burial - Iroquoian ossuary burial is primarily a post-A.D. 1300 phenomenon and becomes widespread only after A.D. 1400 (Wright 1966:60; Johnston 1979:96-97). According to the Huron, the purpose of ossuary burial was to maintain tribal solidarity (i.e., by mixing the bones of the dead from different communities, the living were expected to act like relatives and live in peace (Trigger 1976a:87)). Ossuary burial was a powerful mechanism of alliance reinforcement.
It is suggested that all of these variables were directly related to socio-political developments among the Ontario Iroquois of the fourteenth and fifteenth centuries and can be explained by the following scenario.

**Phase 1**

About A.D. 1300, Ontario Iroquoian peoples appear to have abandoned the sand plains of southwestern Southern Ontario and emigrated north to areas with heavier loam soils (Fox 1976). The cause of this population movement is unknown, although climate and other ecological factors (e.g., soil depletion and local extirpation of deer) probably played significant roles. Indeed, if there was a real shift to cooler and drier climate around A.D. 1300, the effects would have been most pronounced among the late Glen Meyer and Middleport populations living on the sand plains. A drier climate, in particular, might have led to increased summer droughts and soil depletion. Perhaps as maize harvests became less productive on the Southern Ontario sand plains (archaeological evidence for the use of smaller corn cobs around A.D. 1400 indicates some stress in the environment (Sykes 1981: 29)), Iroquoian groups began moving north to areas with heavier, moister loam soils. Although much more palynological data are needed to support this hypothesis, climate change might explain the simultaneous abandonment of the Ontario sand plains (Fox 1976) and the Allegheny Plateau in New York by Iroquoian peoples around A.D. 1300-1400 (Hasenstab 1981).

The northward expansion of Middle Iroquoians, however, would have resulted in competition over strategic or localized resources (especially prime agricultural land in areas of secondary forest, deer herds (Gramly 1977), and chert quarries (e.g., Slack-Caswell site (Jamieson 1979)) between
the immigrant and indigenous populations. In the absence of centralized authority, disputes over critical resources often end in warfare (Vayda 1976).

Abundant evidence for endemic warfare in the fourteenth and fifteenth centuries exists in the form of heavily fortified settlements (e.g., Uren, Lawson and Southwold sites) and cannibalized human remains in village dumps. A state of chronic war would have restricted inter-village communication and long-distance exchange and promoted village endogamy, fraternal interest groups (indicated by elaborate village-specific pipe styles) and strong military leaders who controlled large lineage households (indicated by mammoth longhouses). As noted for Highland New Guinea tribes, in

a warlike environment populated by extremely unstable groups it appears that some people will tolerate despotic leadership in return for relative safety from outside enemies. It is probable that in these societies big men accomplish their political manipulations more readily and openly in wartime (Sillitoe 1978:259).

Thus, Middleport village leaders can be considered "war lords" in the sense that they attracted followers and attained power, wealth and success through prowess in war.

This period of unrest witnessed a substantial growth in dwelling size due to expanding village populations, both from internal population growth and the adoption of refugees and defeated enemy, and the defensive amalgamation of households under powerful military leaders. Structured Middle Iroquoian village plans reveal a high degree of socio-political co-ordination at the community level. As clans and tribes probably did not exist at this time (Engelbrecht 1982; Tuck 1978), village councils were likely dominated by the most influential and populous lineages.
Phase II


Hiding in large longhouses to escape the constant threat of surprise attacks, raids and headhunting would have been a rather neurotic lifestyle. No human group prefers war over peace; people fight because they are forced to for their political independence or very survival (Halpke 1973). It is little wonder, therefore, that alliance formation is an integral part of primitive warfare (Dalton 1977; Chagnon 1968; Heider 1979).

In fifteenth- and early sixteenth-century Ontario, natural differences in village size would have given some Iroquoian communities a military advantage over smaller, weaker neighbours. In war, a militarily weak Iroquoian community had two options - either it attempted to defend its territory and resources against a numerically superior enemy and was dispersed, subjugated or annihilated or more likely it increased its chances for survival by forging an alliance with a friendly, neighbouring village. Given sufficient time, large numbers of villages would have become enmeshed in alliances and would have required special institutions for maintaining and reinforcing group solidarity. I would suggest that the ceremonial exchange of exotic items (furs, native copper, marine shell beads and other primitive valuables), village exogamy (exchange of marriage partners),
formation of clans (Engelbrecht 1982:13), and ossuary burial were some of the institutions which promoted and sustained the first Iroquoian tribal alliances.

With increased alliances and confederacies, improved relations between allied villages would have permitted greater long-distance exchange and increased residential flexibility through village exogamy. During the fifteenth century, wide regional interaction is reflected by more numerous occurrences of native copper and marine shell in Ontario Iroquoian village sites (e.g., Nodwell site (Wright 1974)) and the extreme homogeneity of ceramic styles over considerable distances. Similarly, ossuary burial became important at this time (Johnston 1979) and may have originated to strengthen the initial non-aggression pacts between communities of the same tribe. Sometime in the mid-sixteenth century, this alliance process culminated in tribal confederacies and the emergence of the Huron, Neutral, and Five Nations Iroquois as distinct political entities (Trigger 1976a: 156-157; Engelbrecht 1982:13).

The effect of all this fraternizing with the enemy would have diminished the authority of the military leaders who were responsible for building the enormous houses of the fourteenth and fifteenth centuries. In the more peaceful early sixteenth century, Iroquoians were not compelled to reside in large longhouses. Given the disadvantages to large dwellings, it is little wonder that late prehistoric Iroquoians opted for life in smaller houses.

In terms of late prehistoric and protohistoric socio-politics, "clan segments probably took over many of the earlier organizational functions of lineages within a community" (Engelbrecht 1982:13).
Phase III

Protohistoric and contact villages were highly planned communities, implying less residential mobility and more cohesive socio-political integration than in earlier periods. In addition, the trend toward smaller Iroquoian houses continued throughout the sixteenth and seventeenth centuries, but new forces came into play, namely, the effects of indirect and direct contact with Europeans.

In A.D. 1535, Cartier contacted, traded with and visited several St. Lawrence Iroquoian settlements. Prior to this date, European-Iroquoian relations were of an indirect nature (Trigger 1979; Fitzgerald 1983), but it is possible that European trade goods and epidemic disease filtered inland to Iroquoian groups from the Atlantic Coast as early as A.D. 1500 (Ramsden 1978). While the relatively low volume of early protohistoric trade would not have caused major changes in Iroquoian society and economics (Trigger 1979), protohistoric epidemics would have greatly disrupted Late Iroquoian social, political and residential behaviour.

From what is known about all other "virgin-soil epidemics" introduced by Europeans to isolated societies, rapid and massive depopulation quickly followed the first contacts (e.g., Maori (Wright 1959:62); Australian Aborigines, Fijians (Burnet and White 1972:16-17,123); Northwest Coast Haida (Blackman 1977:46); Amazonian tribes (James 1949:77); Atlantic Coast tribes (Martin 1978:48-51; Cook 1973); and Southeast aboriginal peoples (Milner 1980)). Given suitable vectors, there is no reason why epidemic disease could not have travelled far in advance of actual European presence (Borah 1976:22-23). Smallpox, influenza and other highly infectious
Key to Figure 8:

| Middle Ontario Iroquoian sites | 1 | Moyer |
|                              | 2 | Crawford Lake |
| Late Ontario Iroquoian sites  | 3 | Draper |
|                              | 4 | Lawson |
|                              | 5 | Southwold |
|                              | 6 | Kirche |
|                              | 7 | Coulter |
|                              | 8 | Benson |
|                              | 9 | Ball |
|                              | 10 | Fonger |
|                              | 11 | Christianson |
|                              | 12 | Warminster |
|                              | 13 | Thorold |
|                              | 14 | Le Caron |
|                              | 15 | Walker |
|                              | 16 | Hamilton |
|                              | 17 | Hood |
Figure 8. Temporal trend in Late Ontario Iroquoian house size.
diseases were unknown in pre-Columbian North America and when introduced reduced the non-immune populations by 50 - 70% (Dobyns 1966:406). The survivors of the New World epidemics often concentrated themselves in fewer villages and smaller houses (Blackman 1977; James 1949). Although it has been suggested (Brasser 1978:78; Trigger 1979:217) that a sixteenth-century European epidemic disease may have contributed to the disappearance of the St. Lawrence Iroquois, until more data are forthcoming, the possibility of protohistoric epidemics among the Ontario Iroquois will remain an unknown. Furthermore, it is doubtful that the effects of the A.D. 1634-1641 smallpox epidemics among the Ontario Iroquois would be visible in the archaeological record (i.e., architectural changes), since only a ten-year response period was available prior to the A.D. 1651 dispersals. Nevertheless, the potential impact of European epidemics on Late Iroquoian house size and village organization cannot be ruled out.

In the late contact period, I would suggest that European trade, capitalism and Christianity disrupted native economic, social and political systems, causing village disorganization and the virtual disappearance of longhouses.

As European items became ubiquitous, village headmen would not have been able to enforce trade monopolies, and iron tools, particularly axes, would have reduced the need for pooling labour reserves for house building and clearance of nuclear family garden plots. The result of these changes would have been an increase in nuclear family independence and an erosion of the power and authority of clan leaders and longhouse corporate groups (Hayden and Cannon 1982:149). The introduction of Christianity in the 1640s exacerbated this trend, enabling more and more individuals to escape
Figure 9. Trends in variables related to the socio-political development of the Ontario Iroquois.
their redistributive obligations (Trigger 1976a:707). In the late historic period, extended family households (longhouses) ceased to be the preferred mode of residence. Nuclear family dwellings observed among the Onondaga in A.D. 1677 (Tuck 1971) would eventually have been seen in Huron and Neutral villages, if the Ontario Iroquois had not been dispersed in A.D. 1651.

In summary, the socio-political model seems to provide a parsimonious and accurate explanation for evolutionary change in house size and village form among the Ontario Iroquois. It is preferred over its major rival, the socio-economic model, for several reasons.

The socio-economic model of Ontario Iroquoian settlement development was formulated by Hayden (1977, 1978, 1979; Hayden and Cannon 1982) and Ramsden (1978). They postulate (Hayden 1978:112-113; Ramsden 1978:103-105) that the size and organization of Ontario Iroquoian longhouses and villages were governed by socio-economic factors, particularly the degree to which wealthy individuals could control trade and thereby attract supporters with lures of economic benefits. They view the introduction of European trade goods to early sixteenth-century Iroquoians as the principal driving force behind the development of unusually large longhouses and increased village size and complexity, exemplified by the Draper site.

There are two basic flaws with this argument. First, the model fails to account for the fact that the largest Ontario Iroquoian longhouses were strictly prehistoric phenomena! As outlined earlier, longhouses attained their maximum dimensions in the early fifteenth century (Dodd 1982:117-118) and had substantially decreased in size prior to A.D. 1500, both in terms of absolute and average house size. Even if Iroquoian longhouses reached an
apogee as late as A.D. 1550, historical data suggest that it is unlikely that European trade had a significant impact on Ontario Iroquois culture much before A.D. 1550 (Trigger 1979, 1981:33; Fitzgerald 1983:19). Also, archaeological data do not support the socio-economic hypothesis. For instance, metal items found in the Draper site are probably not of European origin (Finlayson and Pihl 1980a:9); and, in any event, there is little evidence that large Iroquoian villages had superior access to exotic goods (Trigger 1981:33).

The other major weakness of the socio-economic model is the emphasis placed on competition over highly desired resources, especially primitive valuables and European trade goods, as the fundamental cause of large longhouses and settlements and intense warfare patterns among the Ontario Iroquois. While this author agrees with Hayden's (1978:112; Hayden and Cannon 1982:151) proposal that competition over strategic resources (corn, meat, fish, hides, clay and chert) was the ultimate determinant of prehistoric Iroquoian warfare, socio-political development and village organization, it was argued earlier in the thesis that it would have been extremely difficult for individual Iroquoian big-men, households or communities to monopolize trade routes and control access to wealth items. In addition, maximum house and village size do not occur in protohistoric times, as would be expected by the socio-economic model. To explain, if prehistoric Ontario Iroquoians were highly competitive over trade routes and the acquisition of wealth, then the appearance of European goods should certainly have triggered a brief period of intense conflict and inter-group competition over monopolization of European trade. Also, the superior
quality of metal tools over aboriginal stone counterparts would have been an added incentive for obtaining exclusive access to such goods. Archeological evidence, however, does not support this. Except for the late historic period, the greatest warfare intensities and largest population concentrations appear to have been late prehistoric events (ca. A.D. 1450-1530) (e.g., Lawson, Southwold, Draper, Coulter and Kirche sites), not protohistoric events. Even assuming that limited amounts of European material had arrived in Southern Ontario around A.D. 1500, it seems incredible that Ontario Iroquoians would have begun killing one another on a massive scale over a handful of beads and trinkets.

Summary

To summarize this discussion, the socio-economic model (i.e., trade route monopolies and wealth accumulation) provides an insufficient explanation for the evolution of Ontario Iroquoian longhouse and village organization. Instead, it has been suggested that Iroquoian abandonment of the Ontario sand plains (ca. 1300-1400) led to increased competition and warfare over localized strategic resources (arable land, deer herds and chert) and large longhouses, controlled by powerful military leaders. Over time, intense warfare gradually precipitated military alliances, tribal organization, increased village exogamy and residential flexibility and a decline in longhouse size. As alliances expanded, local hostilities were reduced which eroded the authority of despotic military big-men. Following initial European contact, epidemics, depopulation, the ubiquity of trade goods, capitalism and Christianity
resulted in the complete disintegration of the Ontario Iroquoian longhouse and formal village life.

Archaeological implications of the model

Given that the socio-political model of Ontario Iroquoian village organization is accurate, certain archeological patterns are implied. First, consider Late Ontario Iroquoian villages.

Implications

(1) Late Iroquoian villages larger than one hectare (greater than 350 people) should comprise a number of relatively short houses, arranged in two or more radial clusters or parallel rows around informal open areas. Within each longhouse cluster or residential ward, there will be several discrete middens and at least one house which is considerably longer than the rest. Juxtaposed house ends, containing doorways, are expected to face a common plaza.

(2) Evidence for a defensive site location, heavy fortifications, house extensions, village expansion, overcrowding (high house density, internal village fences) should be most often associated with villages which are the largest or closest to enemy borders.

(3) Large longhouses, as implied by the socio-political model, should show more signs of feasting, ritual and trading activity than shorter houses, assuming such houses were occupied by the sub-clan heads in Late Iroquoian communities. Archaeological data for testing this implication would include house floor post densities and feature concentrations (Hayden 1977, 1979), frequencies of exotic items, such as native copper, non-local cherts, European goods, and perhaps the
abundance and diversity of faunal remains associated with each house. Large longhouses would be expected to exhibit high internal post densities clustered around central hearths, high frequencies of exotic items and diverse faunal assemblages, as a result of feasting activity.

(4) If each residential ward was composed of several co-operative uxorilocal households, then ceramic homogeneity would be expected to be maximized within each ward and minimized between wards. This prediction assumes that variability in ceramic styles is a direct function of the amount and intensity of friendly interaction between potters, that Iroquoian females were the potters and that they learned potting prior to marriage, and that each longhouse made, used and broke its own pots (Deetz 1965; Longacre 1970; Hill 1970).

In addition to predictions concerning village patterns of the Late Ontario Iroquois, the socio-political model has several implications for Early and Middle Iroquoian village patterns and archeology as well.

(5) It has been suggested that Early Ontario Iroquoian villages were occupied only seasonally or sporadically by relatively independent households. As such, Early Iroquoian villages are expected to contain numerous short and superimposed houses arranged in a haphazard fashion. Within-village middens should be rare or absent; palisade systems are expected, but should not be well-developed; and there should be little evidence for long-distance exchange, cannibalism, ossuary burial, elaborate pipe complexes and widespread ceramic style homogeneity.

(6) Settlements of the Middle Iroquoians were presumably lineage-based and dominated by powerful lineage big-men. Village sites, therefore,
are expected to contain several massive dwellings, aligned in the same direction to conserve interior village area. Fortifications should be highly complex, consisting of multiple rows of palisade and perhaps earthworks and ditches. Dense midden and house wall post concentrations are also anticipated, in accordance with the postulated long-term occupations of these village strongholds. Lastly, there should be a high incidence of house and village expansions and plenty of evidence for the coalescence of ceramically distinct communities, composed of refugees, allies and captured enemies, particularly in the latter half of the fifteenth century. Between A.D. 1450-1500, coincident with the hypothesized decrease in inter-community hostilities, we expect to see a reduction in average house size and the incidence of cannibalized human bone in village refuse (except in villages who warred with geographically distant groups), and an increased heterogeneity in pipe and ceramic styles within communities, as compared to preceding Middleport times. In addition, trade in exotic items, but not European goods, and ossuaries should become more prevalent throughout the late prehistoric period, as communities became more involved in tribal alliances.

(7) As noted earlier, during the late contact period, villages are expected to be disordered and should possess the smallest average house size, except for Early Iroquoian villages.
CHAPTER IV
MODEL OPERATIONALIZATION

It is insufficient to simply assume that the model of Ontario Iroquoian village organization is an accurate picture of the past. The model must be tested.

Perhaps the most useful types of archaeological data for testing hypotheses about prehistoric Iroquoian community organization are house patterns and representative ceramic samples from totally excavated village sites (Trigger 1981:2-3). In 1978, when this project was initiated, there were no well-documented Late Iroquoian sites available for study which had been totally excavated. A decision was made, therefore, to select and excavate a site which would provide a complete community pattern and adequate artifact sample, yet do the least amount of destruction to the archaeological site inventory. The Fonger site (AhHb-8) was chosen as the case study.

Case study

The Fonger site is located in a ploughed field, adjacent to an unnamed tributary of Fairchild's Creek, near Brantford, Ontario (see Figure 10). A preliminary survey had determined that the site was a protohistoric Neutral village (ca. A.D. 1610-1620), covering about 0.8 ha (Kenyon 1972).

Site selection was based on several considerations:

1) the relatively small site size would enable the exposure of a major portion of the village, despite resource and time constraints

2) the site was ploughed; ploughed Ontario Iroquoian sites are more common and have less archaeological potential than undisturbed sites because
Figure 10. Location of the Fonger site.
the primary context of house living floors and the upper portions of features and middens have been removed by the plough (Hayden 1979:11; Kapches 1979:28); thus, total excavation of a ploughed site will result in relatively minor information loss and impact to the archeological resource base

3) operationalization of the model demanded a Late Ontario Iroquoian village site; the Fonger site's protohistoric date fit the requirements, and, like other protohistoric-contact sites, a less complex ground plan and more congruence with the ethnographic record would be obtained by excavating the Fonger site, rather than a prehistoric site

4) the site is easily accessible and the landowner was favourable to site excavation over two field seasons.

Excavation strategy and data collection techniques

The objectives were to uncover as much of the village as possible and to collect representative artifact samples from all middens.

In the 1978 field season, four two-metre wide test trenches were laid across the site in east-west and north-south transects to intercept house walls and palisade. Surface collections identified several refuse concentrations (middens), two of which were extensively sampled in one metre horizontal units, using arbitrary 10 cm vertical controls. Midden matrix was screened through ½ inch mesh. Once located, house patterns were excavated in five m² units or wall-trenched, recording all post mold and feature locations with cross-tape triangulation.

House patterns in the west half of the site were considerably more complex than had been expected and were time-consuming to record. It
became obvious, during the first field season, that a full village plan could not be acquired.

In 1979, therefore, excavation was concentrated in the east half of the village to locate additional houses, to determine the extent of the palisade and to secure a larger sample of ceramics from various areas of the site, using a ¼ inch mesh this time. Unfortunately, in all but two cases, the relatively thin sheet middens of the village had been destroyed by ploughing or downslope movement and yielded few analyzable ceramic rim fragments. The final results of the investigations are diagrammed in Figure 11 and 12 and the amounts of each midden sampled are presented in Table 12.

**Site dating**

Several items of European manufacture were found in the Fonger site, implying a protohistoric or contact period occupation. The protohistoric period for the Neutral began around A.D. 1550, when small amounts of European goods were reaching Neutral villages, prior to direct European contact or written documentation (Trigger 1979:215; Noble 1980a; Kenyon 1972:2; Fitzgerald 1983). Judging from the relative abundance of European metal scrap and ornaments in the site, a late protohistoric or early contact (A.D. 1590-1630) date seems applicable. However, recent refinements of contact Neutral site chronology (Fitzgerald 1981:243; 1983) suggest that the absence of European glass beads, copper kettles and complete iron axes in the Fonger site indicates an occupation prior to A.D. 1620. In summary, the Fonger site would seem to date approximately A.D. 1600-1615.
Village form and size

Surface distributions of cultural material, hillslopes on three sides and rows of palisade on the remaining eastern side of the Fonger site confirm that it is 0.8 ha in size.

At least 18 longhouses were constructed during the occupation of this village, but for reasons which will be mentioned later, only 12 of these structures appear to have been contemporaneous.

The outline of the village is kidney-shaped, dictated by local topographic features (see Figure 11 and 12); about 50 degree slopes flank the north, west and southwest sides of the village. The subsoil is a homogeneous loamy sand, and despite the occasional patch of clay, rodent burrow or tree-throw, the conditions were exceptional for post mold and feature identification.

Village expansion

A village expansion is evident in the eastern portion of the site, where two temporally distinct palisades were uncovered. The innermost palisade is inferred to be the earlier one, since it is superimposed by House 13 and Midden B. Furthermore, many of the palisade posts under Midden B and the floor of House 13 were filled with either ash and charcoal or refuse, suggesting that the palisade had burned and then been dismantled, prior to midden accumulation. It is likely that the enlargement of the original palisade was related to the conflagration that consumed House 8, 11 and 14. Expansion of the east fortifications increased village size by about 15%, from 0.68 to 0.8 ha.
Figure 11. Excavation plan of the Fonger site.
Community pattern analysis

To review the predictions of our model, we expect to see in the Fonger village:

1) one or more clusters or rows of relatively short, juxtaposed longhouses arranged around open areas
2) houses within each cluster sharing one or more middens and perhaps showing similar alignments and
3) differences in ceramic styles between longhouse clusters, assuming that house clusters represent localized and autonomous socio-political groups and that the frequency and intensity of social interaction was greater within house clusters than between them.

An idealized plan of the site appears in Figure 12.

Palisade

As noted earlier, the Fonger village was stockaded. At some point in the village's history, however, the eastern portion of the stockade was damaged and relocated 15 m further east. The inner and original palisade consisted of three compact rows of posts (averaging 8.7 cm in diameter) and the outer stockade consisted of four tiers of posts with mean diameters of 7.7 cm. A single line of posts on the edge of the north slope is interpreted as a palisade because a break in slope by itself would not have effectively protected an Iroquoian village against a surprise attack (Heidenreich 1978:375-376).

The outermost palisade row seems to bifurcate and merge several times and would have created a confusing maze of narrow corridors and dead ends, presumably to hinder the progress of enemy raiders. Similar stockade
FONGER SITE (AhHb-8)

- House wall
- Midden
- Palisade
- Extrapolated palisade

Figure 12. Ground plan of the Fonger village.
patterns are documented for Huron villages (Wrong 1939:92) and occur in other Late Ontario Iroquoian sites (Pearce and Smith 1980:194; Finlayson and Pihl 1980a:12; Johnston and Jackson 1980:194).

**Middens**

Because the site ceramic sample derives primarily from midden contexts, the nature, depth and contents of each refuse dump have been summarized in Table 12. Middens A and B are the most extensive refuse deposits in the site and therefore were sampled intensively. From Figure 13, it is clear that the matrices and depths of Middens A and B are dissimilar, indicating different formation processes. Specifically, Midden A is composed of a deep layer of ash and likely represents a long-term accumulation of hearth sweepings from nearby houses, perhaps Houses 1, 2, 3 and 7. Midden B, on the other hand, is a thinner mixture of ash and organic silt and may have been enlarged by debris-clearing operations, subsequent to the fire. Other village middens are generally small, surface scatters of refuse and possess only minimal primary deposits. As our model predicted, the largest refuse heaps (Middens A and B) are associated with open areas that are surrounded by houses.

**House patterns**

Descriptions of floor plans and contents of individual houses of the Fonger site are presented in detail elsewhere (Warrick 1982) and will not be repeated here. For the reader's benefit, however, a summary of the essential features of each house is provided in Table 13. The structures are Neutral in design; completely excavated houses possess "slash pits" and linear end stains, features which are present only in historic Neutral dwellings. These features are interpreted as remnants of partitions or
Figure 13. Profiles of Middens A and B from the Fonger site.
structural supports which may have divided Neutral longhouse interiors into storage and nuclear family compartments (Lennox 1978:22; Fitzgerald 1981:46-49; Dodd 1982:32).

In general, the size, spacing and arrangement of dwellings within the Fonger site are in accordance with the model expectations.

**House size**

Houses are relatively short ($\bar{X}=17.5$ m long, $s=4.9$, $n=11$) and exhibit minor variability in width ($\bar{X}=7.1$ m, $s=0.4$, $n=18$). The small differences in house size across the site imply that most households were occupied by equal numbers of people.

In terms of status or wealth variation between households, European metal is evenly distributed within the site (see Figure 14). Assuming that European materials were regarded as primitive valuables in proto-historic Iroquoian society, it is evident that none of the Fonger households had privileged access to European goods or other items of wealth. Following this further, Hayden (1977:5) suggests that, other factors being equal, feature and post densities will be greatest in the largest, wealthiest longhouses. Unfortunately, the incomplete and overlapped house structures of this site preclude investigation of this relationship, but it is significant that Dodd (1982:164) found no correlations between Ontario Iroquoian house size and feature and post densities. Dodd (1982:166) did find, however, that there is a moderate but significant correlation between the wall post and interior post densities of longhouses, suggesting that interior post densities are greatest in houses that were occupied the longest (Dodd 1982:81; Johnston and Jackson 1980:197; Trigger 1981:16).
Figure 14. Distribution of European trade goods in the Fonger site.

FONGER SITE
(AhHb-8)

- House wall
- Midden
- Palisade
- Extrapolated palisade

European metal
- Cu scrap
- Cu bead
- Bronze/brass scrap
- Bronze/brass bead
- Fe
In summary, it is accepted that the average floor area of wealthy longhouses will tend to be larger than the average for poorer ones (Hayden and Cannon 1982:138-139; Wilk and Rathje 1981). Because of the "noise" inherent in post densities, however, the frequency of features and post molds in Iroquoian house floors is a poor archaeological measure of the relative wealth of the household which produced them.

**House arrangement**

Houses were placed relatively close together in this village. Using minimum distances between adjacent house walls (see Figure 4 for method of measurement), pre- and post-fire house density estimates were calculated. The post-fire spacing ($\bar{X}=1.3$ m, $s=0.9$, $n=12$) of dwellings tends to be greater than the pre-fire spacing ($\bar{X}=1.9$ m, $s=1.6$, $n=12$). (Statistical tests are inappropriate, however, as these samples are not independent). This implies that, subsequent to the fire, the villagers became more concerned about preventing future house fires from becoming village conflagrations and enlarged the village area to permit wider spacing of rebuilt houses. Also, gaps at least 2.5 m wide separated houses from the palisade, a defensive feature normally restricted to late historic Iroquoian villages.

It was argued earlier that social relationships generally governed the proximity of longhouses in a village. However, when villages were obviously constructed with defense in mind, they were commonly surrounded by breaks in slope, watercourses, complex fortifications and exhibited dense longhouse concentrations. The Fonger village appears to have been built with defense as a high priority.
In A.D. 1623, it was reported (Wrong 1939:158) that the Neutral had been chronically at war with the Fire Nation (Mascouten) for several years. Protohistoric Mascouten sites have been located in the Ohio area, at the west end of Lake Erie (Stothers 1981). The small size and location of the Fonger village on the western frontier of the historic Neutral country (Kenyon 1972; Noble 1978) would have made it particularly vulnerable to Mascouten attacks and raids, and so, it was fortified. Huron villages that were closest to enemy borders were normally fortified as well (Thwaites 1896-1901, 34:125-127; Biggar 1929, 3:122; Wrong 1939:91-92).

There is no obvious directional preference shown in Fonger house orientations (see Table 14). Modal house orientation is in a north-northeast direction, similar to other historic Neutral villages (Dodd 1982:118). Thermal efficiency cannot be ruled out in this case until local winter wind conditions for various localities in Southern Ontario have been compiled and tested against Iroquoian house orientations.

According to the model, house superimposition should be rare or absent in Late Iroquoian villages, except where there is evidence of house destruction and rebuilding, as a result of some catastrophic event (fire, flood) or unusually intense warfare. Fortunately, most of the overlapped house patterns in this site can be accounted for by a village conflagration which levelled House 8, 11 and 14, followed by a rebuilding episode. Evidence for this fire derives from several data sources.

**Village fire**

Settlement pattern evidence

Accidental house fires were prevalent among the Ontario Iroquois, and it is recorded that, during dry summer months, longhouses were "almost as
susceptible to fire as matches. Hence arise many of the conflagrations of villages" (Thwaites 1896-1901, 8:105). There are several lines of evidence that suggest a fire partially destroyed Houses 8,11 and 14 and portions of the eastern stockade of the Fonger village.

(1) The close proximity of burned houses and palisade sections implies that the fire was a single event.

(2) Each of the three burned houses possess significantly greater proportions of ash and charcoal-filled interior support features than unfired houses (Table 15), and virtually every wall post of the fired houses was ash-filled. Ash, fire-reddened soil and charred wood was usually concentrated in a shallow (6-7 cm deep) concavity in the top of these pits and posts.

(3) The burned house sites were apparently cleared and reoccupied. Houses 15,10 and Midden B superimpose the burned house floors.

(4) As mentioned earlier, the fire-damaged palisade was dismantled and moved farther east.

As a final note, experimental burnings of replicas of wattle-and-daub Iron Age houses in Denmark produced abundant ash, charcoal on house floors and resulted in ash and charcoal concentrations, where posts had formerly stood (Coles 1973:64-67).

Artifact distributions

The three burned longhouses contained a significantly higher number of serviceable chert cores, unused chert blocks and fired ceramic waste than the unburned houses of the west village (see Table 16 and 17). Furthermore, the ash deposits of support features (slash pits) in the burned houses yielded a diverse inventory of artifacts, including
European metal items, useable lithic tools, portions of clay pots, personal ornaments (bone and shell beads) and gaming pebbles (polished quartzite pebbles).

Data from an experimental burning of a reconstructed Iron Age house in Denmark suggest that when wood structures catch fire, they burn with incredible swiftness and intensity - in less than five minutes the entire pole and thatch structure was ablaze and after twenty minutes it had collapsed. Temperatures of 700-900°C were recorded inside the house (Coles 1973:66).

If we apply this scenario to an Iroquoian longhouse, the observed artifact patterns in the burned Fonger dwellings can be explained. Residents of a burning longhouse would have had little time to salvage useable tools and personal possessions, and the heat generated would have been more than sufficient to fire clay potting waste that lay scattered in or around the dwelling (Sideroff 1980:194). In order to reuse the house sites, they would have required cleaning. Clearing burned house floors would have involved removing the remnants of charred posts and filling in the resulting holes with ash, charcoal and artifact-bearing debris.

In general, prehistoric house structures that have witnessed rapid and unplanned abandonment (due to fire) characteristically contain abundant de facto refuse (Schiffer 1972:160, 1976:33), such as complete and serviceable tools, whole pottery vessels and stored foodstuffs (e.g., burned domestic sites from the Southeast (Hally 1981:738) and Mesoamerica (Winter 1976:28)).
Sequence of house construction

The sequence of house construction for the village is based on house or midden superimposition and house wall post densities. It is assumed that houses which were occupied the longest in an Iroquoian village would have experienced the greatest amount of repair; and thus, they should possess the greatest densities of wall posts (Johnston and Jackson 1980: 197; Dodd 1982:81).

Original (pre-fire) village

Referring to Table 18 and Figure 12, the first structures to be built were Houses 2, 4, 5, 7, 8, 14, 16 and 17 and were surrounded by the innermost rows of palisade. Sometime prior to the fire and village remodelling, House 16 was taken down and House 1 erected. Finally, on the basis of post densities, Houses 6, 9 and 11 appear to have been the latest additions to the original community. (Burned and repaired posts in the northeast corner of House 6 and the proximity of House 6 and 8 provide additional evidence that this house was constructed prior to the fire).

So, just before the fire occurred, the village would have comprised Houses 1, 2, 4, 5, 6, 7, 8, 9, 11, 14 and 17 and presumably portions of Middens A, B, C, E and F.

Post-fire village

The conflagration destroyed Houses 8, 11 and 14, and possibly House 17, severely damaged a section of the stockade and caused significant residential changes in the eastern half of the village. On the basis of low post densities in the rebuilt house walls (Houses 3, 10 and 13), it is inferred that the fire occurred relatively late in the site's history.
Perhaps related to post-fire reorganization, it seems that Houses 9 and 17 were abandoned, Houses 12 and 18 were constructed and Midden D was deposited. As there is no evidence that unburned dwellings were vacated prior to village relocation, the terminal phase village would have been composed of Houses 1-7, 10, 12, 13, 15 and 18.

**Site population**

As noted earlier, Late Iroquoian villages which were occupied by more than about 350 people were probably divided into residential wards. Therefore, in order to lend credence to any division of the Fonger village into wards, the population estimate for the site should exceed this threshold value.

Population reconstructions for Iroquoian sites are usually based on house floor areas (Casselberry 1974) or on the number of hearths per house (Heidenreich 1971; Wright 1974). Although there are more complete house excavations for the post-fire rather than pre-fire phase of the site, there are still only eight houses for which total lengths and widths are known. In order to remedy this situation, it was assumed that the incomplete houses (Houses 4, 7, 10 and 15) averaged 18 m long and contained 4 m long storage compartments, estimated from the correlation of Neutral house and storage area sizes that is provided by Dodd (1982:77).

Using Casselberry's (1974) empirical formula for calculating the population of a longhouse from its floor area (population = 1/6 house floor area in m²), we arrived at a site population of 203 persons. This figure is based on a combined house floor area for the post-fire houses of 1219 m² and assuming that 28 m² of each house floor was reserved for
storage. This value seems somewhat low, however, and even Casselberry (1974:119) warns that this formula occasionally underestimates the actual population of multi-family dwellings.

Perhaps a more reliable estimate of village population is the number of hearths per house, assuming two families per hearth and six individuals per family (Trigger 1981:32; Wright 1974:75; Heidenreich 1971:123). Unfortunately, central hearths were poorly preserved in the Fonger houses (likely removed by ploughing), so the average hearth spacing in historic Neutral houses, as calculated by Dodd (1982:234-235), was used instead. Dodd (1982) found that hearths in Neutral houses were located four metres from both ends and were spaced about three metres apart. Therefore, if hearths were 0.5 metres in diameter, a Neutral house 18 m long would have contained three hearths or one hearth per six metres of house length. Using these figures, a site population of 438 (36 hearths) was derived. This result is identical to Heidenreich's (1971:123) population estimates for similar-sized historic Huron houses of about 36 people per house. It would appear, then, that the site population estimate (greater than 350 persons) does justify a division of the Fonger village into residential sectors.

**Community organization**

It is hypothesized that the Fonger village contained at least two residential wards, each occupied by an aggregate of closely interacting households. This division derives from inferences about village demography, sequence of house construction and occupation and the proximity and
geometrical patterning of houses, middens and open areas.

First of all, concerning village demography, it has been estimated that the pre-abandonment village population probably exceeded 350 persons, the critical point at which Neolithic communities usually begin to break up into discrete residential segments for socio-political reasons (Forge 1972).

Secondly, the house construction sequence demonstrates that the west and east portions of the village were occupied continuously and can be considered roughly contemporaneous.

Lastly, referring to Figure 12, three informal open areas, or areas large enough to accommodate a house, exist in the village: in the west, south and east sectors of the village. The western open area contains Midden C and E and is surrounded by House 1-5 (we are concerned here with describing only the post-fire village layout). In the eastern half of the village, Midden B occupies the majority of the plaza which is enclosed by Houses 13, 10 and 18 and the southeast palisade. The central group of houses is somewhat problematic. Although the ends of Houses 7, 6, 15, 18 and 12 appear to face the open area which contains Midden A, they are spaced relatively far apart. In fact, it is conceivable that, if Houses 1, 6 and 7 all possessed north end doorways, more social interaction might have occurred between these households, in the vicinity of Midden F, than between any of the other households of the village core.

In addition, although Midden A seems to occupy a focal point in the central plaza, its thickness, extent and accumulation in a natural hillside depression suggest that it may have been deposited by both the west and central households. As noted earlier, for reasons of conservation of
internal village space, middens in Ontario Iroquoian settlements normally occur in areas which were most convenient, yet which had the least potential for human use, such as hillsides, between houses and against or outside palisades. Therefore, given the lack of hillside middens in the west village (except for Midden F) and the shallow and limited extent of Midden C and E, it is suggested that the west residential group made a special effort to keep their central courtyard free of trash, by discarding it in Midden A.

For the purposes of the ceramic analyses, therefore, Midden A and most of the central houses have been grouped with the west residential ward. Thus, the Fonger village is bifurcated into two provenience units: the west village (House 1-7 and 16 and Middens A, C, E and F) and the east village (Houses 8-15, 17 and 18 and Midden B and D). It is assumed that the constituent households of each village sector interacted more with each other than they did with households from the other sector.

In summary, house pattern data from the Fonger village conform to many of the expectations of the socio-political model of Iroquoian village organization:

1) mean house size is relatively small and uniform ($\bar{x}=17.5$ m long) and fits our expectations for protohistoric villages
2) there appears to have been no preferred alignment of houses in a northwest direction (modal orientation is to the north-northeast as in other historic Neutral sites)
3) wealth differences were not demonstrated between households or residential wards
4) the juxtaposition of houses in compact clusters is related to
strong concerns about defense (defensive siting of the village and triple palisade)

5) the unexpected observation of superimposed houses and palisade expansion can be explained by a village conflagration and subsequent remodelling episode and

6) two clusters, arranged around informal open areas that contain middens, have been interpreted as clan-barrios.

One critical question remains to be answered - are there the predicted dissimilarities in ceramic styles between the two residential wards?

Ceramic sociology and Ontario Iroquoian village organization

According to Deetz (1965), Hill (1970) and Longacre (1970), in a preindustrial community, in which matrilocal residence is the norm and potting is a female activity, ceramic styles should be clustered in the site. This theory assumes that ceramic stylistic variability in a community is directly related to the degree of interaction between resident potters, pot styles are learned in the residence of origin and transmitted mother to daughter and each household makes, uses and breaks its own pots (Deetz 1965:2; Leone 1968:1150; Hill 1970a:15-16, 1970b:38; Longacre 1970:28).

Critics of this theory, however, have emphasized that, before residence patterns can be convincingly inferred from ceramic style patterning in archaeological sites, one must first resolve certain issues. Specifically, it should be established that residence patterns were primarily matrilocal or uxorilocal (Allen and Richardson 1971); that the learning of ceramics occurred prior to marriage (Stanislawski 1973a, 1973b,
1977; Hayden and Cannon 1982); that pots were made, used and broken in each residential unit being compared (i.e., non-specialist production) (Trigger 1981); that ceramic exchange and inter-household borrowing of pots was minimal (Plog 1980); that the ceramic sample is statistically representative (Hodder 1978); that the provenience units being analyzed are essentially contemporaneous (Flannery 1976b; Dumond 1977); and that post-occupational disturbances did not significantly alter original artifact patterns (Schiffer 1972, 1976).

In Ontario Iroquoian archaeology, few investigators have dealt with these matters in an explicit and systematic manner. It is no surprise, therefore, that following initial theoretical formulations (Noble 1968), archaeologists have experienced little success in identifying the nature of Ontario Iroquoian community organization and residence behavior from intra-site ceramic style patterning. With the exception of convincing arguments for generational continuity in ceramic style micro-traditions within House 2 at the Draper site (Arthurs 1979) and the successful delineation of distinct household ceramic styles at the Nodwell site (Wright 1974), most ceramic patterning research in Ontario Iroquoian sites (e.g., Southwold (Smith 1977), Draper (Pearce 1978a), Slack-Caswell (Jamieson 1979), Kirche (Nasmith 1981) and Ball sites (Knight and Snyder 1982)) has been inconclusive because of overly-simplistic and unsystematic approaches and a lack of explicit consideration for the weaknesses of the "Deetz-Hill-Longacre" theory.

I believe that the study of ceramic distributions in Ontario Iroquoian sites can lead to valuable insights about community structure and residence patterns, but first there is a pressing need for explicitly recognizing
the difficulties and limitations of applying the "Deetz-Hill-Longacre" hypothesis to such sites. Prior to analyzing the Fonger ceramics, therefore, the assumptions and problems, concerning the learning, manufacturing, use, discard and exchange of Ontario Iroquoian pottery, and methodological issues of Ontario Iroquoian ceramic sociology will be presented.

**Underlying assumptions**

First, it is assumed that ceramic stylistic variability in an Iroquoian community was directly related to the degree of interaction between resident potters; closely interacting potters will tend to share similar ceramic styles. Although this assumption has been questioned (Plog 1980:125; Wobst 1977), ethnoarchaeological data from the Maya (Hayden and Cannon n.d., 1982), a Tarascan community (Friedrich 1970:337), the Hopi-Tewa (Stanislawski 1977), the Kalinga of the Philippines (Longacre 1981) and the Lozi and Nuba of sub-Saharan Africa (Hodder 1982:122-123,151) indicate that ceramic styles are most readily transmitted or copied under conditions of close friendly interaction, such as economic co-operation, kin relations or friendships.

Secondly, in spite of the fact that residence rules (emic) may not be accurate predictors of residence patterns (etic) in a society (Allen and Richardson 1971), historic accounts inform us that Iroquoian women tended to remain, after marriage, in their households of orientation, except in rare cases of chiefly avunculocal residence (Trigger 1976a:419, 1978a). Additional ethnographic evidence, supporting the priority of matrilocal or uxorilocal residence among the Ontario Iroquois, is that matrilineal sub-clans appear to have been localized in separate residential wards or

A final assumption is that the majority of longhouses in Late Ontario Iroquoian villages were occupied by the same core of related individuals for the duration of village occupation. Although it is recognized that disputes, quarrels and divorce may have led to a small amount of residential flexibility (Hayden 1979:23), large changes in household composition, as revealed by longhouse extensions, seem to have occurred only in the late prehistoric period, in a context of unprecedented population displacements, refugee problems, village coalescence and exceptionally intense warfare.

Iroquoian ceramic manufacturing

Was the manufacture of Iroquoian pots exclusively a female activity and was it non-specialized?

Ethnographic documents clearly state that Huron women made the pottery, using the paddle and anvil technique "especially round pots without handles or feet, in which they cook their food, meat or fish" (Wrong 1939:102,109).

In terms of specialization, Trigger (1981:29) has recently suggested that Iroquoian ceramic vessels may have been produced by a small number of skilled women for an entire village. There is sufficient evidence, however, to suggest that this was not the case.

First of all, in a number of contemporary horticultural communities, most households make their own pottery (e.g., Maya (Hayden and Cannon n.d.), Lozi and Nuba (Hodder 1982:122,143), Kalinga (Longacre 1981:52) and Shipibo-Conibo (DeBoer and Lathrap 1979:105)). Because of the limited role
of clay pots in Iroquoian society (pots were used for preparing, cooking and serving meals, storing foodstuffs and fetching and storing water), and because it would have been difficult for any Iroquoian group to have controlled access to the ubiquitous clay deposits of Southern Ontario (Chapman and Putnam 1966:93), there is no reason to expect that each Iroquoian household and community did not meet its own ceramic needs.

Secondly, there is convincing archaeological evidence that indicates Iroquoian pots were manufactured by most women. Pearce (1982:5) discovered broken pots, pot manufacturing waste and juvenile ceramics at each sampled cabin site that surrounded the prehistoric Lawson village. Assuming that these cabin sites correspond to the ethnographically documented agricultural cabins which were occupied during the summer by a woman and her children (Trigger 1976a:36), it seems obvious that most women probably made their own pots.

Lastly, if pots were produced by only the best potters in a village (incipient specialization), we would expect a high degree of standardization in vessel shape, decoration and manufacturing technique (Rice 1981:223). Furthermore, we should be able to get an idea of the number of individual potters in a village by examining idiosyncratic ceramic attributes, such as the width of spaces between design elements (Friedrich 1970:340; Redman 1977:49; Hill 1977). This hypothesis was tested on the Fonger site ceramics.

In terms of overall vessel shape and quality, the Fonger ceramics exhibit a wide range of variability, in such things as the size and type of tool used to execute designs, rim symmetry, precise location of
decoration, the degree of firing and the size and type of temper. It is difficult to quantify most of these attributes, however, without conducting detailed scientific analyses which are beyond the scope of this thesis.

On the other hand, an attempt was made to determine how many individual potters were represented in the Fonger site ceramic sample, by measuring the spacing of decorative elements on each vessel. Hill (1977:101) and others (Redman 1977; Friedrich 1970) have postulated that line metrics (e.g., spacing and angle of design elements) on ceramics, analogous to handwriting metrics, should reflect the subconscious and highly idiosyncratic motor performances of a potter and might be sensitive indicators of individual decorating styles. Assuming that repetitive-type motor habits change little over a person's lifetime (Hill 1977:101), if a small group of women produced the pots for a whole village, then the line metrics of rim decoration should cluster in a few discrete groups. On the other hand, if each woman made her own pots, then line metrics on a sample of pots should exhibit no clustering and be widely dispersed.

Figure 16 describes how the spacing measurements were taken on each of the Fonger rim sherds. It should be noted that small rim fragments (less than 5% of the rim circumference) may not give reliable estimates of design element spacing for the entire vessel mouth. In an attempt to control for this source of error, the measure was applied only to rims which possessed five or more elements of decoration and associated spaces. It was felt that a minimum of five repetitive hand movements would sufficiently capture the idiosyncratic motor habits of a potter.
Figure 15. Analytical areas of a Neutral pot.

Figure 16. Method of estimating design element spacing or inter-element space density on a Neutral rim sherd.
In an effort to control for potential individual variability in element spacing caused by the use of different techniques, only vessels with impressed designs were used in the following analysis, resulting in a sample of 70 rim sherds. This restriction would ensure that each vessel being measured had been decorated by the same motor habit.

Prior to making inferences from ceramic design element spacing, it was first necessary to demonstrate that element spacing does, in fact, reflect individual motor habits and that it is independent of pot size, as estimated by pot mouth width (see Table 24). First, consider the nature of element spacing. Assuming that each Iroquoian pot was made and decorated by only one potter, then the design element spacing for both the exterior and interior motifs should be roughly equivalent. On a sample of 17 rims possessing both exterior and interior impressed motifs, a paired variate t-test (Thomas 1976:251) showed no significant difference between the exterior and interior element space densities (Table 19). This implies that each pot was decorated by only one potter.

Secondly, as expected (Table 20), there is no significant correlation between decorative element spacing and pot size.

Proceeding with the analysis, while there exists a reasonable margin of error in estimating spacing density, Figure 17 and Table 20 indicate that a sizeable number of individual motor habits are expressed in the Fonger ceramics. In fact, the density distributions imply that probably most women in the Fonger village made their own pots. It is not known whether potting was conducted by individuals within each longhouse or by ad hoc work groups in the open areas of residential wards. The incidence of ceramic waste in Fonger house pits suggests that some potting
Figure 17. Frequency of design element spacing estimates on impressed motif pots from the west and east areas of the Fonger village.
activity took place in the houses.

**Learning Iroquoian potting**

In order to make valid inferences about past community organization from ceramic styles, one must determine that potting skills were learned prior to marriage and mostly within the household of orientation (Hayden and Cannon 1982:148).

On a theoretical level, it has been proposed (Hayden and Cannon n.d.: 10) that the learning of non-specialized crafts in tribal societies occurs primarily by observation within the household or corporate group of origin. Also, data from contemporary Mayan households demonstrates a strong linear relationship between the age at which potting is learned and the frequency of pots produced in the household of learning (Hayden and Cannon n.d.:27) - the more pots produced in the household of origin, the younger the age at which potters learned the necessary skills within those households. Additional ethnoarchaeological data suggest that women in primitive societies learn basic potting skills at a relatively young age (usually five to 15 years) and certainly prior to marriage (e.g., Kalinga (Longacre 1981:60) and Nuba (Hodder 1982:145)).

Among the Ontario Iroquois, potting was probably learned primarily within the household or residential ward of origin. It has already been argued that economic, social and political interaction was probably most intimate between members of the same longhouse or clan-barrio in Iroquoian villages. Furthermore, it seems likely that pots were produced by each household and, perhaps, by each family of a household. It is significant that the ratio between adult and juvenile vessels in the east and west
sectors of the Fonger village are not significantly different (Table 22), indicating that potting was learned in both areas of the village.

This latter interpretation assumes that juvenile vessels represent the products of young girls, learning the craft of potting. Moulded clay waste and fired, crudely made pinch pots (juvenile vessels) are common occurrences in Iroquoian longhouse floors. Because the pinch pots exhibit a continuum of quality, probably reflecting increased competence with age, and resemble adult-produced vessels in form, design and technique, it seems reasonable to attribute these artifacts to novices at ceramic manufacturing (Pearce 1978b:1; Kenyon 1968:47; Wright 1966:32; Wright and Anderson 1969:26).

To summarize this discussion, the available evidence argues that most Ontario Iroquoian women learned how to make pots as young girls by watching and copying the work of adult potters in their own households. It is recognized that a small amount of teaching or copying of ceramic styles likely occurred between neighbouring households or even between the residential wards of an Iroquoian village. However, I do not accept the suggestion that craft learning in simple societies is characterized by a high degree of innovation and learning networks that crosscut corporate groups and communities (Stanislawski 1977; Stanislawski and Stanislawski 1978; Friedrich 1970:337). Such statements are based on observations of competitive semi-specialist potters who produce wares for commercial markets; none of these conditions apply to the Ontario Iroquois.
Figure 18. Relationship between historic Neutral pot mouth width and pot volume.
(data from Kenyon 1982)
Iroquoian pot function

Since vessel function can distort ceramic style distributions within a community, it is important to compare only vessels with similar functions (Plog 1980:17-19). Fortunately, Late Iroquoians manufactured only one pot form but in different sizes (Trigger 1981:29). Nevertheless, it should be determined that the function of Iroquoian pots was independent of pot size.

Prior to estimating the size of the Fonger ceramic vessels, it was necessary to establish that pot mouth widths are an accurate measure of vessel size or volume. A sample of complete vessels from the historic Neutral Grimsby cemetery (W. Kenyon 1982) show a significant positive correlation between pot mouth width and vessel volume (see Figure 18 and Table 24).

Comparing the distributions of vessel size (inferred from rim diameter estimates) from the east and west sides of the Fonger village (Figure 19 and Table 25 and 26), we see that there is no significant difference between the two areas in pot size frequencies or mean pot size. In addition, assuming interior carbon encrustations are associated with cooking pots, a simple visual inspection of Figure 19 suggests that pot size was independent of function. The interpretation of carbon encrustations as food remnants derives from historic accounts, which state that, when the Huron boiled corn in clay pots, they had to stir it to prevent it sticking to the pot walls (Biggar 1922-1936, 3:126-127; Wrong 1939:105-107).

As a final note of interest, in contemporary societies which possess only one form of cooking pot (e.g., the Fulani (David 1972:141) and Kalinga
Figure 19. Frequency of pot sizes in the west and east areas of the Fonger village.

W village
\[ n = 50, \bar{x} = 24.3 \text{ cm}, s = 9.1 \]

E village
\[ n = 44, \bar{x} = 26.0 \text{ cm}, s = 9.6 \]

Estimated pot mouth width (cm)

Carbonized int.
(Longacre 1981:53)), pot size is related to the number of people who are being served the meal. Using this information, it is likely that Neutral vessel mouth widths less than 22 cm (i.e., about one to six litres) were small cooking pots that were used by individuals and nuclear families, for example, menstruating women cooked their food in separate "little pots" (Wrong 1939:67). Larger pots were presumably reserved for guests and household feasts.

Ceramic exchange and borrowing

Chemical analyses of pot fabrics from a sample of Ontario Iroquoian sites have shown that some of the foreign pottery in village sites may have been transported considerable distances, during village relocation or by travellers and traders (Trigger et al 1980:132). Although mineralogical or chemical tests of the Fonger pot fabrics were beyond the scope of this thesis, only three obvious "foreign" vessels (shell-tempered and cord-wrapped-stick-impressed) were found in the eastern half of the site. These pots were originally interpreted as products of a Mascouten captive (Warrick 1982), but in light of the trace element research (Trigger et al 1980), they may, in fact, have been transported to the village as plunder or trade items. The incidence of ceramic exchange, however, seems to have been minimal at this site, and we can discount exchange as a potential "noise" factor in the ceramic style analysis.

A more critical issue involves inter-household borrowing or trading of pots. According to ethnoarchaeological work, the majority of households in primitive horticultural villages contain only a small proportion of ceramic vessels which have not been manufactured in the household of use. For instance, in a Shipibo-Conibo village only 3% of the pots were not made
in the household in which they were found (DeBoer and Lathrap 1979:121); and in two Nuba compounds, just 16% of the pots had not been produced locally (Hodder 1982:142-143). In light of these observations, it will be assumed for this analysis that inter-household pot exchange or borrowing was a relatively infrequent practice in Late Ontario Iroquoian communities.

Ceramic breakage

The ethnographic record is silent concerning the number of pots made and broken each year and the causes of pot breakage in Iroquoian households. Cross-cultural data again provide some helpful insights.

In Neolithic communities, the frequency of pot manufacture normally depends on the rate at which pots are broken. In turn, the breakage rate for pots is a function of vessel size, mode and frequency of use, portability, and fragility (David 1972:141; DeBoer and Lathrap 1979:126-127). Thus, the preponderance of small cooking vessels (less than 30 cm mouth width) in the Fonger sample implies a more frequent use of small rather than large vessels.

Under normal conditions of use, Iroquoian cooking pots lasted "for a very long time" (Wrong 1939:109). In contemporary simple societies, small cooking pots commonly have use-lives of two or three years (Longacre 1981:63; David 1972:141). Common causes of pot breakage in such societies include dropping pots outside the village while water fetching or cleaning, children or scavenging dogs knocking over vessels in houses or pots simply falling apart from prolonged storage of cold water (Longacre 1981:63; DeBoer and Lathrap 1979:126-127; Wrong 1939:109).
Ceramic discard

The nature and location of ceramic discard in Iroquoian villages is poorly understood. Studies of contemporary horticultural communities who use clay pots provide some clues; potsherds in open areas between houses are periodically swept up and deposited in peripheral middens (DeBoer and Lathrap 1979:128; Longacre 1981:64). The fact that most potsherds are found in the middens of Ontario Iroquoian villages implies a similar concern for cleaning house floors and village courtyards.

The few archaeological studies, which have concentrated on the distribution of sherds belonging to a single vessel within Iroquoian sites, have found that sherds which physically mend are usually five to ten metres apart, within the same house (Wright 1974:91; M.Wright 1979:16). On the other hand, the same studies suggest that occasionally pieces of broken ceramics were subject to a fair degree of lateral movement in Iroquoian villages. For instance, in the Nodwell site, the maximum separation of two rim sherd mends was about 17 m (Wright 1974:91); in the Uren village, sherds from the same pot were found a distance of 30 m apart (M. Wright 1979:16); and in the Ball site, two fragments of the same pipe were found in different house floors separated by over 130 m (Knight and Snyder 1982: 56).

In the Fonger site, pot mends occur mostly within the same midden, but the less frequent intra-village ceramic mends have been diagrammed in Figure 20. From the occurrence of conjoined sherds in Midden A and B and evidence from other sites, strict isomorphism between the location of use and the location of discard of ceramics in Iroquoian settlements cannot be assumed.
Contemporaneity of analytic units

Presented with a small Iroquoian village that had been occupied continuously for only ten to twenty years, in the absence of superimposed structures due to village abandonment and reoccupation, the houses and deposits of that village can be considered approximately contemporaneous. In addition, unless there is stratigraphic evidence to the contrary, Iroquoian village middens are assumed to have gradually accumulated throughout a site's lifetime (Woolfrey et al. 1976:6). Therefore, the east and west areas of the Fonger site are considered essentially contemporary.

It should be noted that these assumptions are based on the premise that ten to twenty years is a relatively brief span of archaeological time, and that most dating methods currently available in the Northeast are hard-pressed to isolate events of shorter duration.

Ceramic sample reliability

Referring to Figure 21, the Fonger site ceramic sample was collected principally from two middens - Midden A and B. Both middens have estimated areal extents of less than 200 m². Bellhouse and Finlayson (1979:121) recommend that small middens (less than 175 m²) in Iroquoian sites should be totally excavated in order to ensure that the ceramic sample collected is statistically representative. Unfortunately, time constraints allowed us to excavate only 26% of Midden A and 15% of Midden B by area. Thus, adhering strictly to the recommended criteria, the Fonger ceramic samples from these middens are not representative.

However, it should be noted that these criteria are founded on midden data from the Draper site, a large Huron village formed by the defensive coalescence of several ceramically diverse communities (Ramsden 1978:103).
Figure 20. Distribution of ceramic mends in the Fonger site.

FONGER SITE
(AhHb-8)

- House wall
- Midden
- Palisade
- Extrapolated palisade

KEY

- Physical mend
- Inferred mend

RIM

SHOULDER

2330 Catalogue No.
Consequently, one would expect each midden of this site to contain a relatively diverse ceramic assemblage. In contrast, the Fonger site ceramics are extremely homogeneous within each midden; for example, only six different exterior rim motifs occur in the entire site. When sampling archaeological sites, in order to secure a representative sample of a diverse population of artifacts, a large proportion of units must be sampled to guarantee the acquisition of rare artifacts, in the case of the Draper site, rare ceramic types. Sites with more homogeneous ceramic assemblages, on the other hand, would require less intensive sampling to acquire a representative ceramic sample (Nance 1981:152-155). Thus, it is felt that the ceramic samples from the Fonger site middens, although slightly biased, are still amenable to statistical manipulation using nonparametric tests.

In addition, the central and deepest portions of Midden A and B were the areas excavated (see Figure 13). If the sampling fractions had been calculated using midden volume instead of midden area, the sampling fractions of each midden would be considerably larger.

In any event, the results of our statistical tests on the Fonger site ceramics should be considered tentative, pending the collection of larger samples.

**Post-occupational disturbance**

Ploughing is the major post-occupational disturbance which could have significantly altered original ceramic distributions in the Fonger site. Several studies have demonstrated, however, that there is no appreciable horizontal movement of artifacts in ploughed sites (Binford et al. 1970:2-3; Redman et al. 1970:280; Dancey 1974; Roper 1976; Trubowitz 1978;
Figure 21. Provenience of ceramic vessels in the Fonger site.
Hoffman 1982). In addition, the landowner informed us that the Fonger site had been deep-ploughed for only twelve years and always in the same north-south direction. Even if sherd displacement had occurred in this site, ceramics from the east and west halves of the village would not have been mixed.

In summary, it is clear that the Fonger site and other Late Iroquoian villages satisfy most of the necessary prerequisites for identifying residence patterns from ceramic style distributions, such as predominantly uxorilocal residence, non-specialized female potters, manufacture of pots in the household of use, and little ceramic exchange. One question remains, however, do the Fonger site ceramic data support the hypothetical division of the village into two residential wards?

**Fonger site ceramic analysis**

**Sample size and vessel counts**

Rim sherds, with surface and sub-surface provenience and having intact lip and exterior faces and complete collars, were selected for the analysis. Rim sherds are the most highly decorated area on Neutral pottery, display considerable variability in several attributes and are most easily identified with complete vessels. (Distinctive pipe styles may have been associated with social groups in Iroquoian villages (Ramsden 1977a:20; Noble 1979:83; Woolfrey et al 1976:9; Arthurs 1979:90), but the virtual absence of complete pipe bowls in the Fonger site precluded this avenue of research. In any case, we are more interested in the style patterning of female-related artifacts).
Rims that did not physically mend were grouped according to similarities in decoration, profile, lip thickness, paste, temper and colour. The number of rim groups formed by this procedure is the minimum number of vessels (Millett 1979). Minimum vessel counts are preferred over rim sherd counts because they avoid the problem of differential breakage patterns for different-sized pots, and they are especially useful on relatively small rim samples (ease of matching rims) and where it is desirable to relate different areas of a village by rim cross-mending (see Figure 20) (Millett 1979:77; Wright 1980:22; Finlayson and Pihl 1980b: 129).

A total of 178 vessels were used in the analysis and vessel provenience is shown in Figure 21.

Attributes

Ceramic attributes are much more useful than ceramic types for reconstructing past community organization and residence behaviour because attributes are mutually exclusive, are less subjective than types, provide greater potential for describing ceramic variation than types, and attributes constitute discrete decisions of the potter (Deetz 1968:33; Ramsden 1977b:16-18; Wright 1980:22-25; Engelbrecht 1980:28).

A search of the relevant literature on Iroquoian ceramics (Whallon 1968:226; Wright 1974:229; Smith 1977:86-87; Ramsden 1977b:165; Pearce 1978a:59-60; Engelbrecht 1978:145; Knight and Snyder 1982:53) helped produce the following list of attributes which are believed to have been predominantly influenced by social or functional factors and are most useful for dealing with intra-community ceramic style variability in Iroquoian sites. They include:
1) exterior, lip and interior decorative motif and technique
(motifs for the Fonger vessels are presented in Table 28-30 and
techniques used in executing designs on the vessels were linear
impressing, incising and punctating following definitions in
Wright and Anderson (1969:29-42))

2) rim form (collared and uncollared - see Figure 15 for the
location of the collar on Iroquoian pots)

3) collar base shape (angled or rounded)

4) collar height (measured in mm from the lip edge to collar base)

5) lip width (measured in mm)

6) maximum temper size (sherd edges were examined with the unaided
eye and the largest visible piece of temper was measured to the
nearest mm)

7) presence/absence of interior carbon encrustation (in some cases,
excessive scrubbing during sherd washing may have removed these
deposits, which are interpreted as the burned remains of food)

8) estimated pot mouth width (sherds representing at least 5% of
the original rim circumference were placed on a circle graph, and pot
mouth width was recorded to the nearest two centimetre increment;
however, Neutral pots were non-wheel thrown, so there is a
considerable margin of error (hopefully random) associated with this
estimate)

9) spacing between impressed motif elements on rim exterior and
interior (estimated by measuring an arbitrary distance greater than
one centimetre between any two motif elements, counting the number of
spaces between those elements, and then dividing the number of spaces by the distance (see Figure 16); this provides a measure of the average number of spaces per centimetre of rim circumference).

**Results**

Nonparametric statistical tests were conducted to identify ceramic attribute clusters within the Fonger site. Any test result with a probability value less than 0.05 was considered significant. For discussions of statistical tests used, the reader is referred to Sokal and Rohlf (1969), Blalock (1972) and Thomas (1976).

It has already been mentioned that the east and west village sectors display no significant difference in pot size distributions, mean pot mouth width, mean spacing between exterior rim design elements or the ratio of adult to juvenile vessels. Other ceramic attributes which show no difference include exterior motif, lip motif, rim form, collar base shape, mean lip thickness, mean collar height and mean maximum temper size (Table 28-36). Lip and interior technique were not treated statistically since impressed designs constituted almost 100% of decorated rims in both categories.

Only interior motif and exterior design technique showed significant deviations between the east and west village areas. Specifically, the west village contains more vessels with plain interiors than the east village (Table 30), and there is a higher proportion of incised rims in the west half of the village (Table 33). It is unlikely that such subtle ceramic differences served to communicate social identity (Hodder 1982) in the Fonger community. Nevertheless, the fact that there are some ceramic
differences between the village sectors, particularly in technique of
decoration (Stanislawski 1977), support our expectations concerning craft
learning in tribal communities. Namely, learning occurs primarily within
the household or residential neighbourhood of origin (Hayden and Cannon

Discussion

The general lack of ceramic style differences between the presumed
residential wards of the Fonger village may be due to a combination of
several factors. First of all, according to the findings of Bellhouse and
Finlayson (1979), the ceramic samples from Midden A and B might be biased
(i.e., too small).

Secondly, it was assumed earlier that middens in Iroquoian sites
represent refuse accumulations from a limited number of spatially contiguous
houses. It is conceivable that discrete house-midden relationships in
Iroquoian villages (based on house-midden proximity and Zipf’s (1949) Law
of Least Effort) did not exist for the entire duration of village
occupation. Ceramic cross-mends in the Fonger site seem to indicate a
certain amount of lateral cycling of refuse within the village, prior to
final deposition.

Another factor which may have disturbed the ceramic patterning within
the site is the village fire and remodelling episode, especially if
villagers from the burned houses were temporarily sheltered in the western
residential ward, while new dwellings were being constructed.

On a more theoretical level, the extreme homogeneity of ceramic
designs and attributes and the uniform distribution of European goods
within the Fonger village indicate an unexpectedly high amount of
socializing, residential mixing and economic co-operation between residential wards, if our architectural identification of such wards is accurate. In the absence of inter-community competition and social antagonisms or tensions, such as political or economic rivalry, there should be little incentive for village residential units to differentiate their pot styles (Hodder 1982:123; Hayden and Cannon n.d.:14). This may explain why the communities of non-stratified societies normally exhibit extreme conformity and conservatism in ceramic styles (Nicklin 1971:31; Hodder 1982:41,146).

As a final note, the usual mechanisms for integrating socio-political groups in preindustrial communities, such as clan exogamy, sodalities and age grades, may have been so successful in Iroquoian villages that they have made archaeological discrimination of individual household relationships in such villages extremely difficult. This might be the reason why ceramically similar longhouses in Ontario Iroquoian villages are rarely spatially contiguous (e.g., Nodwell site (Wright 1974:308) and Ball site (Knight and Snyder 1982:53-54)).
CHAPTER V
CONCLUSIONS

As outlined in the introduction, the purpose of this thesis was to identify the determinants of Late Ontario Iroquoian (A.D. 1450-1650) village organization and to formulate an operational model which would account for variability in the patterning of such villages. The conclusions of this study are summarized in four sections: determinants of Late Ontario Iroquoian village organization; socio-political model of Ontario Iroquoian village layout; results from model operationalization; and recommendations for future research.

Determinants of Late Ontario Iroquoian village organization

An Iroquoian village was defined as any cluster of longhouses greater than 0.4 ha in size and representing the occupation of a single semi-permanent community.

Possible determinants of Ontario Iroquoian village layout include cosmology, available construction materials, site topography, climate, fire prevention, sanitation, space conservation, defense and socio-political variables. It was suggested that many of these factors, however, had little or no influence on Iroquoian village arrangement.

1) Cosmology, building materials, sanitation and fire prevention did not appreciably affect Ontario Iroquoian village layout.

2) Site drainage may have influenced the placement of dwellings in some villages; there may have been a preference for erecting houses on soft, sandy soils.

3) Climate (maximization of longhouse thermal efficiency by
orienting house ends into the prevailing winds) appears to have affected house orientations only in historic Huron villages.

4) Overcrowding and a concern for conservation of internal village space can account for the close juxtaposition and parallel alignment of longhouses in most Late Iroquoian settlements which were heavily fortified.

5) Contrary to popular opinion, it was argued that defense was not a major determinant of village organization, particularly in palisaded villages. Palisaded Iroquoian settlements were essentially impenetrable prior to the introduction of European weaponry and offensive military strategy. Traditional Iroquoian warfare involved small groups of raiders, surprise attacks, stealth and killing of isolated victims outside villages, and not large armies, village siege, breaching of palisades and armed combat within villages.

6) Socio-political variables (village socio-economics, government and demography) appear to have been the primary forces which shaped the evolution and form of the Late Ontario Iroquoian village.

Socio-political model of Ontario Iroquoian village layout

An examination of the archaeological and ethnographic record for the Ontario Iroquois, supplemented by comparative data from contemporary swidden communities, suggests that socio-political factors are the major determinants of the layout of primitive horticultural communities, including those of the Ontario Iroquois.

The socio-political model of Late Iroquoian village organization is based on several propositions:

1) Iroquoian longhouses constituted corporate groups, but longhouse
membership remained relatively fixed for the life of a house and was based predominantly on kin (lineage) relations.

2) Households were not intrinsically competitive over wealth, contrary to the socio-economic model of Ontario Iroquoian house and village size (Hayden 1977, 1979; Ramsden 1978).

3) Households were tied in economic (subsistence) and socio-political coalitions with neighbouring households in a village; normally clan-related households were placed spatially contiguous in large Iroquoian villages and formed the core of each coalition.

4) Layout of Late Ontario Iroquoian villages was determined by community size and the degree of coherency of localized sub-clan coalitions; in late prehistoric and late contact communities, disorganized village governments caused disordered village patterns, but most Late Iroquoian villages were highly structured, with one or more distinct clusters of longhouses.

5) The "longhouse cluster" is an aggregate of juxtaposed houses, arranged around an informal open area and sharing one or more middens; archaeologically, there are three types of longhouse clusters: radial (houses arranged in fans), aligned (groups of houses with similar alignments) and parallel row (houses arranged in "street-like" rows); longhouse clusters are interpreted as clan-barrios, in which social and economic interaction is expected to have been intense.

6) Large Iroquoian villages (greater than 350-500 inhabitants) contained two or more clan-barrios, sometimes physically separated by fences.
Trends in Ontario Iroquoian house and village form

Evaluation of the socio-political model revealed unexpected trends in Ontario Iroquoian house size and village form which were explained by the following scenario.

Early Ontario Iroquoian villages contain groups of small houses which are usually superimposed and arranged haphazardly, indicating little development of village government, clans and household co-operation. In the fourteenth century, however, the Iroquoians seem to have abandoned the sand plains of Southern Ontario. This event caused population movements, created increased competition and warfare over localized strategic resources (prime arable land, deer herds and chert quarries), gave rise to heavily fortified but overcrowded village strongholds and brought about the appearance of excessively large longhouses that were organized under powerful military leaders. Intense inter-community warfare persisted until A.D. 1450, after which autonomous villages began forming military alliances with friendly neighbouring communities. Eventually, expanding alliance networks produced increased village exogamy and residential flexibility, the appearance of clan and tribal institutions, more voluminous long-distance exchange, increased village planning, but a decline in longhouse size. As local hostilities disappeared, so did the power and authority of despotic military big-men. In protohistoric times, except for external warfare and possibly bouts with European epidemics, life was peaceful and villages were relatively stable. Following initial European contact, however, the introduction of epidemics, depopulation, the ubiquity of trade goods, capitalism and Christianity resulted in the complete disintegration of the Ontario Iroquoian longhouse and formal village life.
Results of model operationalization

The socio-political model was tested with architectural and ceramic data from the Fonger site (AhHb-8), a protohistoric (A.D. 1600-1615) Neutral village.

The layout of the village was in accordance with the model expectations: relatively short houses arranged in two clusters around central plazas; no preferential alignment of houses into prevailing northwesterly winds; no wealth differences (in terms of European items) between households or longhouse clusters were demonstrated; defensive concerns (defensive siting, triple palisade, high house density) were a high priority because this site was closest to enemy (Mascouten) borders; and the unexpected superimposition of several houses in the site can be explained by a village conflagration which destroyed at least three houses and caused a village expansion.

In an attempt to validate the architectural subdivision of the Fonger site into two residential wards, ceramic style distributions were analyzed. Of nine attributes examined, only interior rim motif and exterior rim technique showed differences between the hypothesized residential areas. The general failure of ceramic styles to isolate residential wards in the Fonger village was attributed to possibly biased ceramic samples, lack of discrete midden-house relationships in Iroquoian villages, the village fire or the absence of political rivalry and economic competition between village factions.

Recommendations for future research

Probably the most significant contribution to Iroquoian archaeology which has emerged from this thesis is the concept of the "longhouse
cluster". The longhouse cluster is perhaps the most productive unit of analysis within Iroquoian villages for two reasons. First, one of the most profitable approaches for identifying social patterns from archaeological remains in prehistoric settlements involves averaging relevant attributes from a group of similar or related households rather than studying individual households (Hayden and Cannon 1982:140-141). In Late Iroquoian villages, longhouses normally contain highly variable artifact assemblages. Using the longhouse cluster approach (grouping spatially contiguous houses), the averaged artifact patterns for a group of houses will provide a much more accurate picture of community organization than would be possible by simply analyzing single households in isolation.

Secondly, if longhouse clusters are in fact the physical remains of clan-barrios, then comparisons between longhouse clusters of an Iroquoian village could supply valuable information about the dynamics of pre-contact Iroquoian communities, including the degree of socio-political integration between village segments, social and ritual interaction and economic competition between sub-clans, identity of sodalities (e.g., dance and curing societies), and residence behaviour. It is hoped that future work on Iroquoian community organization will adopt the longhouse cluster as the primary analytical unit.

There are several problems for future research which came to light in the course of investigating Ontario Iroquoian village organization. First, there is an urgent call for greater precision in dating Iroquoian sites and areas within sites. It has been shown that house post densities may be reliable predictors of the length of time that houses were
occupied, but more work is needed to determine the exact relationship between post densities and time. Once such relationships are identified, then we can begin to deal with the presently difficult problem of estimating duration of site occupation. In order to convincingly establish changes or trends in the socio-political and village organization of the Ontario Iroquois, we must develop more accurate methods of dating Iroquoian villages, such as refined ceramic seriations, dating sites on the diversity and quantity of European trade goods (see Fitzgerald 1983), and exploring pollen dating and dendrochronological applications.

Secondly, the socio-political model which has been outlined in this thesis hinges on village demographic reconstructions. At the present, counting hearths in houses is a good index of population, but only for sites with well-preserved hearths. In the absence of hearths, we are left at a loss. Thus, more work is needed to develop a greater variety of empirical methods for calculating populations of Iroquoian villages from such data sources as site size, midden density, number of ceramic vessels, and the number of bodies in related cemeteries. Furthermore, if we ever desire an answer to the possibility of protohistoric epidemics among the Ontario Iroquois, improved estimates of regional populations must be made, through site survey and site size measurement.

Other recommendations concern Iroquoian ceramic style research. Studying the distribution of ceramic styles in Iroquoian sites can independently verify hypotheses about village organization based solely
architectural data. However, the test of the socio-political model on the Fonger site pointed out several inadequacies in our understanding of the intra-village distribution of Iroquoian ceramic styles. Specifically, future analyses of Iroquoian pottery should concentrate on the identification of idiosyncratic ceramic attributes (a key to understanding who made Iroquoian pots), determination of the ultimate discard location of sherds from single vessels, physico-chemical characterization of Iroquoian pot fabrics in order to determine the ratio between foreign and locally made wares in village sites, and the design of sampling strategies to deal with small Iroquoian villages.

Lastly, in the brief discussion of the development of the Ontario Iroquois from a socio-political perspective, a scenario was produced to explain observed trends in house and village form. In the process, numerous questions were raised which should be pursued further: what factors promoted the origin of Iroquoian longhouses and village life; what climatic changes occurred during Iroquoian development and what effects did these have on Iroquoian culture; what population changes took place throughout the Ontario Iroquoian sequence; what was the nature of prehistoric Iroquoian warfare; how extensive was late prehistoric Iroquoian exchange; when did competition over wealth accumulation begin, if ever; and when were European goods and disease first introduced to the Ontario Iroquois? Any one of these questions would involve a thesis-length answer.

As a final note, it has been said that an "archaeologist is a social scientist who studies extinct communities" (Asch 1975:173). It is hoped
that this work has demonstrated the potential of archaeology for bringing extinct communities back to life.
TABLES
Table 1. Late Ontario Iroquoian village data

<table>
<thead>
<tr>
<th>Site</th>
<th>Approx. date (years A.D.)</th>
<th>Village size (ha)</th>
<th>Max. No. of houses</th>
<th>Modal house orient.</th>
<th>House length (m)</th>
<th>House width (m)</th>
<th>Reference</th>
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<td>9</td>
<td>WNW</td>
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<td>8 5.6 0.5</td>
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<td>NW</td>
<td>10 26.5 13.8</td>
<td>10 5.8 0.6</td>
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<td>NW</td>
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<td>38 7.5 0.6</td>
<td>Hayden 1979; Finlayson and Pihl 1980a/b</td>
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<td>23 7.1 0.5</td>
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<td>9 7.2 0.6</td>
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<tr>
<td>Site</td>
<td>Approx. date (years A.D.)</td>
<td>Village size (ha)</td>
<td>Max. No. of houses</td>
<td>Modal house orient.</td>
<td>House length (m)</td>
<td>House width (m)</td>
<td>Reference</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------------</td>
<td>-------------------</td>
<td>-------------------</td>
<td>---------------------</td>
<td>------------------</td>
<td>----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thorold</td>
<td>1615-1630</td>
<td>4.1</td>
<td>5</td>
<td>NW</td>
<td>9 29.3 10.9</td>
<td>4 7.1 0.3</td>
<td>Noble 1980b</td>
</tr>
<tr>
<td>Walker</td>
<td>1630-1640</td>
<td>4.1</td>
<td>11</td>
<td>NNE</td>
<td>11 16.9 9.5</td>
<td>11 7.1 1.0</td>
<td>Wright 1981</td>
</tr>
<tr>
<td>Hamilton</td>
<td>1640-1650</td>
<td>2.4</td>
<td>5</td>
<td>NE</td>
<td>4 21.7 4.0</td>
<td>4 7.1 0.2</td>
<td>Lennox 1981</td>
</tr>
<tr>
<td>Hood</td>
<td>1630-1641</td>
<td>2.8</td>
<td>15</td>
<td>ENE</td>
<td>11 16.1 5.6</td>
<td>13 6.5 0.5</td>
<td>Lennox 1978</td>
</tr>
</tbody>
</table>
Table 2. Historic Huron and Neutral house orientation

<table>
<thead>
<tr>
<th>House orientation class (degrees east of north)</th>
<th>Historic Huron $o_i$</th>
<th>Historic Neutral $o_i$</th>
<th>$G_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-30 (NNE)</td>
<td>1</td>
<td>8</td>
<td>9.40*</td>
</tr>
<tr>
<td>31-60 (NE)</td>
<td>4</td>
<td>9</td>
<td>4.53*</td>
</tr>
<tr>
<td>61-90 (ENE)</td>
<td>2</td>
<td>15</td>
<td>17.22*</td>
</tr>
<tr>
<td>91-120 (WNW)</td>
<td>2</td>
<td>2</td>
<td>0.16</td>
</tr>
<tr>
<td>121-150 (NW)</td>
<td>36</td>
<td>6</td>
<td>13.11*</td>
</tr>
<tr>
<td>151-180 (NNW)</td>
<td>23</td>
<td>5</td>
<td>6.38*</td>
</tr>
<tr>
<td>Totals</td>
<td>68</td>
<td>45</td>
<td>50.80**</td>
</tr>
</tbody>
</table>

* significant G-statistic values ($p < 0.05$), df=1

** significant G-statistic total ($p < 0.001$), df=5

Table 3. Late prehistoric-protohistoric Ontario Iroquoian house orientation

<table>
<thead>
<tr>
<th>Orientation</th>
<th>$o_i$</th>
<th>$e_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northwest (121-180° east of north)</td>
<td>51</td>
<td>76</td>
</tr>
<tr>
<td>Not Northwest</td>
<td>101</td>
<td>76</td>
</tr>
<tr>
<td>Totals</td>
<td>152</td>
<td>152</td>
</tr>
</tbody>
</table>

$x^2=16.44$, df=1, $p < 0.001$
Table 4. Location of middens in Ontario Iroquoian villages

<table>
<thead>
<tr>
<th>Midden location</th>
<th>$o_i$</th>
<th>$e_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central open area</td>
<td>25</td>
<td>30.3</td>
</tr>
<tr>
<td>Palisade</td>
<td>27</td>
<td>30.3</td>
</tr>
<tr>
<td>Between houses</td>
<td>39</td>
<td>30.3</td>
</tr>
</tbody>
</table>

$x^2 = 3.79$, df=2, $0.1 < p < 0.5$

Table 5. Average distance between house ends and middens in Late Iroquoian villages

<table>
<thead>
<tr>
<th>Site</th>
<th>Average minimum distance (in metres)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
</tr>
<tr>
<td>Kirche</td>
<td>22</td>
</tr>
<tr>
<td>Benson</td>
<td>22</td>
</tr>
<tr>
<td>Coulter</td>
<td>16</td>
</tr>
<tr>
<td>Ball</td>
<td>29</td>
</tr>
<tr>
<td>Draper</td>
<td>32</td>
</tr>
<tr>
<td>Christianson</td>
<td>5</td>
</tr>
</tbody>
</table>
Table 6. Average minimum spacing between houses in Late Iroquoian villages

<table>
<thead>
<tr>
<th>Village site</th>
<th>Average minimum distance between house walls (m)*</th>
<th>n</th>
<th>( \bar{x} )</th>
<th>s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lawson</td>
<td></td>
<td>6</td>
<td>1.7</td>
<td>0.6</td>
</tr>
<tr>
<td>Southwold</td>
<td></td>
<td>14</td>
<td>1.3</td>
<td>0.6</td>
</tr>
<tr>
<td>Draper</td>
<td></td>
<td>38</td>
<td>1.6</td>
<td>1.4</td>
</tr>
<tr>
<td>Coulter</td>
<td></td>
<td>19</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>Kirche</td>
<td></td>
<td>18</td>
<td>3.3</td>
<td>3.3</td>
</tr>
<tr>
<td>Benson</td>
<td></td>
<td>25</td>
<td>3.4</td>
<td>1.9</td>
</tr>
<tr>
<td>Warminster</td>
<td></td>
<td>22</td>
<td>1.4</td>
<td>0.7</td>
</tr>
<tr>
<td>Ball</td>
<td></td>
<td>38</td>
<td>2.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Le Caron</td>
<td></td>
<td>5</td>
<td>0.7</td>
<td>0.4</td>
</tr>
<tr>
<td>Christianson</td>
<td></td>
<td>6</td>
<td>1.2</td>
<td>0.4</td>
</tr>
<tr>
<td>Walker</td>
<td></td>
<td>8</td>
<td>4.7</td>
<td>2.9</td>
</tr>
<tr>
<td>Hood</td>
<td></td>
<td>13</td>
<td>2.4</td>
<td>1.5</td>
</tr>
</tbody>
</table>

* minimum distance was measured between the closest two house walls - either the side or end walls
### Table 7. Late Iroquoian village size and house spacing

<table>
<thead>
<tr>
<th>Village site</th>
<th>Size (ha)</th>
<th>Mean house spacing (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Le Caron</td>
<td>1.6</td>
<td>0.7</td>
</tr>
<tr>
<td>Ball</td>
<td>3.5</td>
<td>2.2</td>
</tr>
<tr>
<td>Warminster</td>
<td>5.9</td>
<td>1.4</td>
</tr>
<tr>
<td>Hood</td>
<td>2.8</td>
<td>2.4</td>
</tr>
<tr>
<td>Christianson</td>
<td>1.4</td>
<td>1.2</td>
</tr>
<tr>
<td>Walker</td>
<td>4.1</td>
<td>0.7</td>
</tr>
</tbody>
</table>

Pearson's $r = +0.34$, $p > 0.1$

### Table 8. Limits to Late Iroquoian village expansion and house spacing

<table>
<thead>
<tr>
<th>Rank order of village</th>
<th>Palisade rows and earthworks</th>
<th>Natural limits</th>
<th>Total limits</th>
<th>Rank of limits to site expansion</th>
<th>Rank of mean house spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lawson</td>
<td>10</td>
<td>3</td>
<td>13</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Warminster</td>
<td>5</td>
<td>3</td>
<td>8</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Hood</td>
<td>5</td>
<td>3</td>
<td>8</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Benson</td>
<td>6</td>
<td>2</td>
<td>8</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Christianson</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Coulter</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Southwold</td>
<td>5</td>
<td>-</td>
<td>5</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Le Caron</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Ball</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Kirche</td>
<td>3</td>
<td>-</td>
<td>3</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>Walker</td>
<td>-</td>
<td>2</td>
<td>2</td>
<td>11</td>
<td>11</td>
</tr>
</tbody>
</table>

Kendall's $\tau = +0.18$, $Z = 0.81$, $p \approx 0.2$
Table 9. Minimum distance between house and palisade in Late Iroquoian villages

<table>
<thead>
<tr>
<th>Village site</th>
<th>Minimum distance from house wall to palisade (inner row) (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lawson</td>
<td>0.2</td>
</tr>
<tr>
<td>Southwold</td>
<td>0.1</td>
</tr>
<tr>
<td>Kirche</td>
<td>1.5</td>
</tr>
<tr>
<td>Warminster</td>
<td>7.1</td>
</tr>
<tr>
<td>Ball</td>
<td>3.4</td>
</tr>
<tr>
<td>Le Caron</td>
<td>2.9</td>
</tr>
<tr>
<td>Christianson</td>
<td>3.2</td>
</tr>
<tr>
<td>Hamilton</td>
<td>8.0</td>
</tr>
</tbody>
</table>
Table 10. Early and Middle Ontario Iroquoian village data

<table>
<thead>
<tr>
<th>Site</th>
<th>Approx. date (years A.D.)</th>
<th>Reference</th>
<th>House length (m)</th>
<th>House width (m)</th>
<th>Maximum length (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>n</td>
<td>X</td>
<td>s</td>
</tr>
<tr>
<td>Porteous</td>
<td>800</td>
<td>Stothers 1977</td>
<td>4</td>
<td>11.3</td>
<td>2.2</td>
</tr>
<tr>
<td>Miller</td>
<td>1125</td>
<td>Kenyon 1968</td>
<td>6</td>
<td>16.0</td>
<td>2.8</td>
</tr>
<tr>
<td>Van Besien</td>
<td>950</td>
<td>Noble 1975b</td>
<td>3</td>
<td>18.6</td>
<td>3.9</td>
</tr>
<tr>
<td>Reid:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glen Meyer</td>
<td>1250</td>
<td>M. Wright 1976, 1978</td>
<td>5</td>
<td>17.5</td>
<td>10.3</td>
</tr>
<tr>
<td>Middleport</td>
<td>1400</td>
<td></td>
<td>1</td>
<td>56.4</td>
<td></td>
</tr>
<tr>
<td>Calvert</td>
<td>1100</td>
<td>Fox 1982</td>
<td>4</td>
<td>15.2</td>
<td>5.1</td>
</tr>
<tr>
<td>Nodwell</td>
<td>1350</td>
<td>Wright 1974</td>
<td>11</td>
<td>27.2</td>
<td>10.3</td>
</tr>
<tr>
<td>Crawford Lake</td>
<td>1435-1459</td>
<td>Finlayson and Byrne 1975</td>
<td>4</td>
<td>35.7</td>
<td>8.3</td>
</tr>
<tr>
<td>Moyer</td>
<td>1400</td>
<td>Wagner et al 1973</td>
<td>8</td>
<td>51.7</td>
<td>23.7</td>
</tr>
<tr>
<td>Slack-Caswell</td>
<td>1410</td>
<td>Jamieson 1979</td>
<td>1</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Uren</td>
<td>1250</td>
<td>M. Wright 1979</td>
<td>9</td>
<td>25.1</td>
<td>18.1</td>
</tr>
<tr>
<td>Bennett</td>
<td>1250</td>
<td>Wright and Anderson 1969</td>
<td>3</td>
<td>13.1</td>
<td>4.8</td>
</tr>
<tr>
<td>Dewaele</td>
<td>1050-1100</td>
<td>Fox 1976</td>
<td>1</td>
<td>8.2</td>
<td></td>
</tr>
<tr>
<td>Gunby</td>
<td>1300</td>
<td>Rozel 1979</td>
<td>5</td>
<td>24.6</td>
<td>14.2</td>
</tr>
</tbody>
</table>
Table 11. Occurrence of middens in Ontario Iroquoian villages

<table>
<thead>
<tr>
<th>Time period</th>
<th>Sites with interior village middens</th>
<th>Sites without interior village middens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Iroquoian</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Middle and Late Iroquoian</td>
<td>14</td>
<td>2</td>
</tr>
</tbody>
</table>

Fisher's Exact Test: $p = 0.00006$, critical $\alpha = 0.025$

Table 12. Fonger site midden data

<table>
<thead>
<tr>
<th>Midden</th>
<th>Estimated areal extent (m²)</th>
<th>Maximum thickness (cm)</th>
<th>Predominant matrix</th>
<th>Amount of midden sampled area (m²)</th>
<th>Volume (l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>70</td>
<td>60</td>
<td>ash</td>
<td>18</td>
<td>4800</td>
</tr>
<tr>
<td>B</td>
<td>105</td>
<td>22</td>
<td>organic silt/ash</td>
<td>16</td>
<td>1650</td>
</tr>
<tr>
<td>C</td>
<td>30</td>
<td>17</td>
<td>organic silt</td>
<td>2</td>
<td>145</td>
</tr>
<tr>
<td>D</td>
<td>20</td>
<td>5</td>
<td>organic silt/ash</td>
<td>3</td>
<td>45</td>
</tr>
<tr>
<td>E</td>
<td>15</td>
<td>17</td>
<td>organic silt/ash</td>
<td>2</td>
<td>260</td>
</tr>
<tr>
<td>F</td>
<td>20</td>
<td>30</td>
<td>organic silt</td>
<td>1</td>
<td>300</td>
</tr>
<tr>
<td>House No.</td>
<td>Portion excavated</td>
<td>Maximum length (m)</td>
<td>Maximum width (m)</td>
<td>Features</td>
<td>Distance to nearest house wall (m)</td>
</tr>
<tr>
<td>----------</td>
<td>------------------</td>
<td>-------------------</td>
<td>------------------</td>
<td>----------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>complete</td>
<td>19.2</td>
<td>7.8</td>
<td>38</td>
<td>0.2</td>
</tr>
<tr>
<td>2</td>
<td>complete</td>
<td>16.2</td>
<td>7.2</td>
<td>25</td>
<td>1.5</td>
</tr>
<tr>
<td>3</td>
<td>partial (&gt; 1/2)</td>
<td>26.5</td>
<td>7.5</td>
<td>14</td>
<td>2.5</td>
</tr>
<tr>
<td>4</td>
<td>partial (&lt; 1/2)</td>
<td>20⁺</td>
<td>7.0</td>
<td>8</td>
<td>1.5</td>
</tr>
<tr>
<td>5</td>
<td>partial (&lt; 1/2)</td>
<td>23.0</td>
<td>6.8</td>
<td>9</td>
<td>2.5</td>
</tr>
<tr>
<td>6</td>
<td>partial (&lt; 1/2)</td>
<td>17.5</td>
<td>7.5</td>
<td>11</td>
<td>1.2</td>
</tr>
<tr>
<td>7</td>
<td>minimal</td>
<td>16⁺</td>
<td>7.5</td>
<td>10</td>
<td>0.2</td>
</tr>
<tr>
<td>8</td>
<td>partial (&lt; 1/2)</td>
<td>11⁺</td>
<td>6.7</td>
<td>27</td>
<td>0.9</td>
</tr>
<tr>
<td>9</td>
<td>complete</td>
<td>12.5</td>
<td>6.9</td>
<td>26</td>
<td>3.0</td>
</tr>
<tr>
<td>10</td>
<td>partial (&gt; 1/2)</td>
<td>12⁺</td>
<td>7.0</td>
<td>15</td>
<td>5.0</td>
</tr>
<tr>
<td>11</td>
<td>partial (&gt; 1/2)</td>
<td>17⁺</td>
<td>7.0</td>
<td>29</td>
<td>0.9</td>
</tr>
<tr>
<td>12</td>
<td>partial (&lt; 1/2)</td>
<td>13.0</td>
<td>6.5</td>
<td>6</td>
<td>1.0</td>
</tr>
</tbody>
</table>
Table 13. (continued)

<table>
<thead>
<tr>
<th>House No.</th>
<th>Portion Excavated</th>
<th>Maximum* length (m)</th>
<th>Maximum* width (m)</th>
<th>Features</th>
<th>Distance to nearest house wall (m)</th>
<th>Wall post** density (posts/m)</th>
<th>Orientation (degrees east of mag. N (1978))</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>partial (&gt; 1/2)</td>
<td>13.5</td>
<td>7.0</td>
<td>23</td>
<td>5.2</td>
<td>1.8</td>
<td>87</td>
</tr>
<tr>
<td>14</td>
<td>partial (&gt; 1/2)</td>
<td>11.0</td>
<td>7.2</td>
<td>30</td>
<td>0.5</td>
<td>4.0</td>
<td>108</td>
</tr>
<tr>
<td>15</td>
<td>minimal</td>
<td>16⁺</td>
<td>6.5</td>
<td>5</td>
<td>1.2</td>
<td>-</td>
<td>38</td>
</tr>
<tr>
<td>16</td>
<td>complete</td>
<td>21.5</td>
<td>7.0</td>
<td>11</td>
<td>0.2</td>
<td>2.6</td>
<td>69</td>
</tr>
<tr>
<td>17</td>
<td>minimal</td>
<td>11⁺</td>
<td>7.5</td>
<td>9</td>
<td>0.5</td>
<td>-</td>
<td>95</td>
</tr>
<tr>
<td>18</td>
<td>partial (&lt; 1/2)</td>
<td>18.5</td>
<td>6.5</td>
<td>2</td>
<td>1.0</td>
<td>-</td>
<td>123</td>
</tr>
</tbody>
</table>

* House length and width were measured from the interior of house walls

**Wall post density was calculated by counting the number of wall posts along both sides (excluding corners and ends) of the house and averaging the two sides. If a house was only partially excavated, the density was calculated for the most complete wall section and therefore may not be wholly representative of the entire house.
Table 14. Fonger site house orientations

<table>
<thead>
<tr>
<th>Orientation class (degrees east of Mag. N (1978))</th>
<th>0i</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-30 (NNE)</td>
<td>5</td>
</tr>
<tr>
<td>31-60 (NE)</td>
<td>1</td>
</tr>
<tr>
<td>61-90 (ENE)</td>
<td>3</td>
</tr>
<tr>
<td>91-120 (WNW)</td>
<td>3</td>
</tr>
<tr>
<td>121-150 (NW)</td>
<td>2</td>
</tr>
<tr>
<td>151-180 (NNW)</td>
<td>4</td>
</tr>
</tbody>
</table>

Modal house orientation is to the NNE

Table 15. Frequency of ash-filled slash pits in Fonger site houses

<table>
<thead>
<tr>
<th>Houses</th>
<th>Slash pits with ash</th>
<th>Slash pits without ash</th>
</tr>
</thead>
<tbody>
<tr>
<td>House 8, 11, 14 (burned houses)</td>
<td>22</td>
<td>2</td>
</tr>
<tr>
<td>Unburned houses</td>
<td>10</td>
<td>61</td>
</tr>
</tbody>
</table>

$G_{adj.} = 28.182$, $df=1$, $p < 0.005$
Table 16. Distribution of serviceable chert cores in Fonger site houses

<table>
<thead>
<tr>
<th>Houses</th>
<th>$O_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burned houses (Houses 8, 11 and 14)</td>
<td>30</td>
</tr>
<tr>
<td>Unburned houses</td>
<td>14</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
</tr>
</tbody>
</table>

\[ X_{adj.}^2 = 5.11, \, df = 1, \, 0.01 < p < 0.025 \]

Table 17. Distribution of fired ceramic waste in the Fonger site

<table>
<thead>
<tr>
<th>Village sector</th>
<th>$O_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>West village</td>
<td>23</td>
</tr>
<tr>
<td>East village</td>
<td>55</td>
</tr>
<tr>
<td>Total</td>
<td>78</td>
</tr>
</tbody>
</table>

\[ X_{adj.}^2 = 12.32, \, df = 1, \, p < 0.005 \]
Table 18. Fonger site longhouse wall post densities

<table>
<thead>
<tr>
<th>House No.</th>
<th>Wall post density (posts/m)</th>
<th>House No.</th>
<th>Wall post density (posts/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>4.5</td>
<td>12</td>
<td>3.0</td>
</tr>
<tr>
<td>4</td>
<td>4.5</td>
<td>6</td>
<td>2.9</td>
</tr>
<tr>
<td>2</td>
<td>4.2</td>
<td>9</td>
<td>2.8</td>
</tr>
<tr>
<td>5</td>
<td>4.0</td>
<td>16</td>
<td>2.6</td>
</tr>
<tr>
<td>14*</td>
<td>4.0</td>
<td>11*</td>
<td>2.3</td>
</tr>
<tr>
<td>1</td>
<td>3.8</td>
<td>3</td>
<td>2.2</td>
</tr>
<tr>
<td>10</td>
<td>3.1</td>
<td>13</td>
<td>1.8</td>
</tr>
<tr>
<td>8*</td>
<td>3.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Burned house
Table 19. Comparison of exterior and interior design element spacing on Fonger site vessels

<table>
<thead>
<tr>
<th>Exterior space density (spaces/cm)</th>
<th>Interior space density (spaces/cm)</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8</td>
<td>0.8</td>
<td>-</td>
</tr>
<tr>
<td>1.2</td>
<td>2.1</td>
<td>-0.9</td>
</tr>
<tr>
<td>1.5</td>
<td>1.3</td>
<td>0.2</td>
</tr>
<tr>
<td>1.5</td>
<td>1.8</td>
<td>-0.3</td>
</tr>
<tr>
<td>1.5</td>
<td>1.8</td>
<td>-0.3</td>
</tr>
<tr>
<td>1.5</td>
<td>1.8</td>
<td>-0.3</td>
</tr>
<tr>
<td>1.5</td>
<td>3.0</td>
<td>-1.5</td>
</tr>
<tr>
<td>1.5</td>
<td>3.4</td>
<td>-1.9</td>
</tr>
<tr>
<td>1.6</td>
<td>1.3</td>
<td>0.3</td>
</tr>
<tr>
<td>1.6</td>
<td>1.4</td>
<td>0.2</td>
</tr>
<tr>
<td>1.6</td>
<td>1.6</td>
<td>-</td>
</tr>
<tr>
<td>1.8</td>
<td>1.1</td>
<td>0.7</td>
</tr>
<tr>
<td>1.8</td>
<td>2.7</td>
<td>-0.9</td>
</tr>
<tr>
<td>2.4</td>
<td>1.0</td>
<td>1.4</td>
</tr>
<tr>
<td>2.6</td>
<td>1.9</td>
<td>0.7</td>
</tr>
<tr>
<td>2.9</td>
<td>3.2</td>
<td>0.3</td>
</tr>
<tr>
<td>3.4</td>
<td>2.2</td>
<td>1.2</td>
</tr>
</tbody>
</table>

\[ t = -1.23, \text{df}=16, \ 0.4 > p > 0.2 \]
Table 20. Correlation between estimated pot mouth width and exterior design element spacing on Fonger site vessels

<table>
<thead>
<tr>
<th>Element spacing width (spaces/cm)</th>
<th>Mouth width (spaces/cm)</th>
<th>Element spacing width (spaces/cm)</th>
<th>Mouth width (spaces/cm)</th>
<th>Element spacing width (spaces/cm)</th>
<th>Mouth width (spaces/cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.6</td>
<td>280</td>
<td>2.6</td>
<td>300</td>
<td>1.5</td>
<td>200</td>
</tr>
<tr>
<td>1.6</td>
<td>240</td>
<td>1.6</td>
<td>200</td>
<td>3.2</td>
<td>160</td>
</tr>
<tr>
<td>1.8</td>
<td>360</td>
<td>1.6</td>
<td>200</td>
<td>3.7</td>
<td>300</td>
</tr>
<tr>
<td>2.8</td>
<td>420</td>
<td>1.5</td>
<td>160</td>
<td>4.0</td>
<td>420</td>
</tr>
<tr>
<td>3.7</td>
<td>320</td>
<td>1.2</td>
<td>140</td>
<td>3.0</td>
<td>200</td>
</tr>
<tr>
<td>2.1</td>
<td>360</td>
<td>2.5</td>
<td>200</td>
<td>2.8</td>
<td>420</td>
</tr>
<tr>
<td>1.1</td>
<td>380</td>
<td>1.9</td>
<td>160</td>
<td>2.5</td>
<td>320</td>
</tr>
<tr>
<td>2.2</td>
<td>420</td>
<td>0.7</td>
<td>120</td>
<td>1.5</td>
<td>140</td>
</tr>
<tr>
<td>1.7</td>
<td>300</td>
<td>1.5</td>
<td>220</td>
<td>1.6</td>
<td>260</td>
</tr>
<tr>
<td>1.8</td>
<td>200</td>
<td>3.4</td>
<td>140</td>
<td>2.9</td>
<td>340</td>
</tr>
<tr>
<td>5.2</td>
<td>200</td>
<td>2.6</td>
<td>200</td>
<td>1.3</td>
<td>160</td>
</tr>
<tr>
<td>1.3</td>
<td>240</td>
<td>1.7</td>
<td>140</td>
<td>2.4</td>
<td>160</td>
</tr>
<tr>
<td>2.2</td>
<td>360</td>
<td>1.1</td>
<td>240</td>
<td>1.8</td>
<td>400</td>
</tr>
<tr>
<td>2.8</td>
<td>320</td>
<td>3.9</td>
<td>240</td>
<td>2.9</td>
<td>100</td>
</tr>
<tr>
<td>3.1</td>
<td>220</td>
<td>2.2</td>
<td>160</td>
<td>3.1</td>
<td>440</td>
</tr>
<tr>
<td>2.0</td>
<td>140</td>
<td>2.9</td>
<td>300</td>
<td>3.5</td>
<td>280</td>
</tr>
</tbody>
</table>

Pearson's $r = +0.22$, $r^2 = 0.048$, $n = 48$, df = 46, $p > 0.1$
Table 21. Comparison of exterior design element spacing between east and west areas of Fonger site

<table>
<thead>
<tr>
<th>Exterior design element spacing class (spaces/cm)</th>
<th>West village</th>
<th>East village</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>cumulative proportion</td>
</tr>
<tr>
<td>0.5 - 0.9</td>
<td>1</td>
<td>0.02</td>
</tr>
<tr>
<td>1.0 - 1.4</td>
<td>4</td>
<td>0.13</td>
</tr>
<tr>
<td>1.5 - 1.9</td>
<td>14</td>
<td>0.50</td>
</tr>
<tr>
<td>2.0 - 2.4</td>
<td>6</td>
<td>0.66</td>
</tr>
<tr>
<td>2.5 - 2.9</td>
<td>6</td>
<td>0.82</td>
</tr>
<tr>
<td>3.0 - 3.4</td>
<td>3</td>
<td>0.90</td>
</tr>
<tr>
<td>3.5 - 4.0</td>
<td>4</td>
<td>1.00</td>
</tr>
<tr>
<td>Totals</td>
<td>38</td>
<td></td>
</tr>
</tbody>
</table>

Kolmogorov-Smirnov Two-sample Test:

\[
\text{maximum } |D| = 0.15, \text{ critical } D_{0.05} = 0.329 \quad \text{(no significant difference)}
\]
Table 22. Ratio of adult to juvenile vessels in Middens A and B of the Fonger site

<table>
<thead>
<tr>
<th>Midden</th>
<th>Frequency of adult vessels</th>
<th>Frequency of juvenile vessels</th>
<th>Proportion of juvenile vessels</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>82</td>
<td>23</td>
<td>0.22</td>
</tr>
<tr>
<td>B</td>
<td>68</td>
<td>12</td>
<td>0.15</td>
</tr>
</tbody>
</table>

Testing equality of two percentages:

\[ t_s = 1.24, \text{ df}=183, \quad 0.4 > p > 0.2 \]
Table 23. Ceramic densities in Midden A and B of the Fonger site

<table>
<thead>
<tr>
<th>Midden</th>
<th>Density of ceramics (frequency per 10 l of fill)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
</tr>
<tr>
<td>A</td>
<td>15</td>
</tr>
<tr>
<td>B</td>
<td>12</td>
</tr>
</tbody>
</table>

Student's $t = 1.24$, df=25, $0.4 > p > 0.2$

Table 24. Correlation between historic Neutral pot mouth width and pot volume*

<table>
<thead>
<tr>
<th>Vessel No.</th>
<th>Pot mouth width (cm)</th>
<th>Pot volume (l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12.4</td>
<td>1.5</td>
</tr>
<tr>
<td>2</td>
<td>21.0</td>
<td>5.6</td>
</tr>
<tr>
<td>3</td>
<td>17.0</td>
<td>0.9</td>
</tr>
<tr>
<td>4</td>
<td>13.0</td>
<td>1.0</td>
</tr>
<tr>
<td>5</td>
<td>10.5</td>
<td>0.5</td>
</tr>
<tr>
<td>6</td>
<td>11.5</td>
<td>0.8</td>
</tr>
<tr>
<td>7</td>
<td>10.0</td>
<td>0.8</td>
</tr>
<tr>
<td>8</td>
<td>21.7</td>
<td>2.9</td>
</tr>
<tr>
<td>9</td>
<td>16.0</td>
<td>2.4</td>
</tr>
<tr>
<td>10</td>
<td>15.8</td>
<td>2.5</td>
</tr>
<tr>
<td>11</td>
<td>10.0</td>
<td>0.5</td>
</tr>
<tr>
<td>12</td>
<td>12.0</td>
<td>1.1</td>
</tr>
<tr>
<td>13</td>
<td>19.0</td>
<td>3.2</td>
</tr>
<tr>
<td>14</td>
<td>8.0</td>
<td>0.2</td>
</tr>
<tr>
<td>15</td>
<td>9.0</td>
<td>0.4</td>
</tr>
<tr>
<td>16</td>
<td>9.0</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Pearson's $r = +0.868$, $r^2 = 0.753$, $n=16$, df=14, $p<0.01$

* data from Kenyon (1982)
Table 25. Pot mouth widths in the east and west areas of the Fonger site

<table>
<thead>
<tr>
<th>Pot mouth width class (cm)</th>
<th>Frequency in west village</th>
<th>Cumulative proportion</th>
<th>Frequency in east village</th>
<th>Cumulative proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>3</td>
<td>0.06</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>0.10</td>
<td>1</td>
<td>0.02</td>
</tr>
<tr>
<td>14</td>
<td>6</td>
<td>0.22</td>
<td>4</td>
<td>0.11</td>
</tr>
<tr>
<td>16</td>
<td>5</td>
<td>0.32</td>
<td>4</td>
<td>0.20</td>
</tr>
<tr>
<td>18</td>
<td>-</td>
<td>0.32</td>
<td>1</td>
<td>0.22</td>
</tr>
<tr>
<td>20</td>
<td>2</td>
<td>0.36</td>
<td>8</td>
<td>0.40</td>
</tr>
<tr>
<td>22</td>
<td>3</td>
<td>0.42</td>
<td>2</td>
<td>0.44</td>
</tr>
<tr>
<td>24</td>
<td>3</td>
<td>0.48</td>
<td>5</td>
<td>0.55</td>
</tr>
<tr>
<td>26</td>
<td>7</td>
<td>0.62</td>
<td>2</td>
<td>0.59</td>
</tr>
<tr>
<td>28</td>
<td>5</td>
<td>0.72</td>
<td>2</td>
<td>0.63</td>
</tr>
<tr>
<td>30</td>
<td>3</td>
<td>0.78</td>
<td>2</td>
<td>0.67</td>
</tr>
<tr>
<td>32</td>
<td>2</td>
<td>0.82</td>
<td>2</td>
<td>0.71</td>
</tr>
<tr>
<td>34</td>
<td>2</td>
<td>0.86</td>
<td>-</td>
<td>0.71</td>
</tr>
<tr>
<td>36</td>
<td>3</td>
<td>0.92</td>
<td>3</td>
<td>0.78</td>
</tr>
<tr>
<td>38</td>
<td>1</td>
<td>0.94</td>
<td>1</td>
<td>0.80</td>
</tr>
<tr>
<td>40</td>
<td>-</td>
<td>0.94</td>
<td>1</td>
<td>0.82</td>
</tr>
<tr>
<td>42</td>
<td>2</td>
<td>0.96</td>
<td>5</td>
<td>0.94</td>
</tr>
<tr>
<td>44</td>
<td>1</td>
<td>0.98</td>
<td>1</td>
<td>0.96</td>
</tr>
</tbody>
</table>

Totals 50 40

Kolmogorov-Smirnov Two-sample Test:
maximum $D = 0.14$, critical $D_{.05} = 0.281$, $p > 0.05$
Table 26. Mean pot mouth width for east and west Fonger village

<table>
<thead>
<tr>
<th>Village area</th>
<th>Average pot mouth width (cm)</th>
<th>( \bar{x} )</th>
<th>s</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>West</td>
<td></td>
<td>24.28</td>
<td>9.10</td>
<td>50</td>
</tr>
<tr>
<td>East</td>
<td></td>
<td>26.04</td>
<td>9.56</td>
<td>44</td>
</tr>
</tbody>
</table>

Student's \( t = -0.13 \), df=92, \( p > 0.9 \)

Table 27. Relationship between pot size and decoration in Fonger ceramic vessels

<table>
<thead>
<tr>
<th></th>
<th>Small/medium-sized pots ((&lt;36) cm)</th>
<th>Large-sized pots ((&gt;36) cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plain</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>Decorated</td>
<td>67</td>
<td>15</td>
</tr>
<tr>
<td>Column totals</td>
<td>78</td>
<td>18</td>
</tr>
</tbody>
</table>

G-statistic: \( G_{adj.} = 0.008 \), df=1, \( p > 0.90 \)
Table 28. Fonger site exterior rim motif

<table>
<thead>
<tr>
<th>Motif</th>
<th>West village $o_i$</th>
<th>East village $o_i$</th>
<th>Row totals</th>
<th>$G_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$e_i$</td>
<td>$e_i$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ ]</td>
<td>12</td>
<td>13</td>
<td>25</td>
<td>1.09</td>
</tr>
<tr>
<td>[ ]</td>
<td>30</td>
<td>22</td>
<td>52</td>
<td>0.01</td>
</tr>
<tr>
<td>[ ]</td>
<td>38</td>
<td>20</td>
<td>58</td>
<td>1.22</td>
</tr>
<tr>
<td>[ ]</td>
<td>19</td>
<td>15</td>
<td>34</td>
<td>0.10</td>
</tr>
<tr>
<td>[ ]</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>0.06</td>
</tr>
<tr>
<td>[ ]</td>
<td>3</td>
<td>-</td>
<td>3</td>
<td>3.06</td>
</tr>
<tr>
<td>[ ]</td>
<td>1.8</td>
<td>1.2</td>
<td>3</td>
<td>3.06</td>
</tr>
<tr>
<td>Column totals</td>
<td>104</td>
<td>74</td>
<td>178</td>
<td>8.60</td>
</tr>
</tbody>
</table>

G-statistic: $G = 8.60$, df = 6, $0.25 > p > 0.10$

Table 29. Fonger site lip motif

<table>
<thead>
<tr>
<th>Motif</th>
<th>West village $o_i$</th>
<th>East village $o_i$</th>
<th>Row totals</th>
<th>$G_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$e_i$</td>
<td>$e_i$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ ]</td>
<td>89</td>
<td>57</td>
<td>146</td>
<td>0.78</td>
</tr>
<tr>
<td>[ ]</td>
<td>9</td>
<td>7</td>
<td>16</td>
<td>0.04</td>
</tr>
<tr>
<td>[ ]</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>0.52</td>
</tr>
<tr>
<td>[ ]</td>
<td>1</td>
<td>2.5</td>
<td>6</td>
<td>4.42*</td>
</tr>
<tr>
<td>Column totals</td>
<td>104</td>
<td>74</td>
<td>178</td>
<td>5.76</td>
</tr>
</tbody>
</table>

*significant at $p < 0.05$

$G = 5.76$, df = 3, $0.25 > p > 0.1$
Table 30. Fonger site interior rim motif

<table>
<thead>
<tr>
<th>Motif</th>
<th>West village $o_i$</th>
<th>East village $o_i$</th>
<th>Row totals</th>
<th>$G_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$e_i$</td>
<td>$e_i$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>55</td>
<td>31</td>
<td>86</td>
<td>1.04</td>
</tr>
<tr>
<td></td>
<td>50.4</td>
<td>35.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>32</td>
<td>49</td>
<td>11.32*</td>
</tr>
<tr>
<td></td>
<td>28.7</td>
<td>20.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>6</td>
<td>32</td>
<td>7.58*</td>
</tr>
<tr>
<td></td>
<td>18.7</td>
<td>13.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>1.2</td>
<td>0.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Column totals</td>
<td>99</td>
<td>70</td>
<td>169</td>
<td>20.02</td>
</tr>
</tbody>
</table>

*significant to $p \leq 0.05$

$G = 20.02$, df = 3, $p < 0.001$

Table 31. Fonger site rim form

<table>
<thead>
<tr>
<th></th>
<th>West village</th>
<th>East village</th>
<th>Row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collar</td>
<td>40</td>
<td>28</td>
<td>68</td>
</tr>
<tr>
<td>No collar</td>
<td>30</td>
<td>25</td>
<td>55</td>
</tr>
<tr>
<td>Column totals</td>
<td>70</td>
<td>53</td>
<td>123</td>
</tr>
</tbody>
</table>

$x^2 = 0.23$, df = 1, $0.75 > p > 0.5$
Table 32. Fonger site collar base shape

<table>
<thead>
<tr>
<th></th>
<th>West village</th>
<th>East village</th>
<th>Row totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angled collar base</td>
<td>23</td>
<td>11</td>
<td>34</td>
</tr>
<tr>
<td>Rounded collar base</td>
<td>17</td>
<td>17</td>
<td>34</td>
</tr>
<tr>
<td>Column totals</td>
<td>40</td>
<td>28</td>
<td>68</td>
</tr>
</tbody>
</table>

\[ X^2 = 2.18, \text{ df} = 1, \ 0.25 > p > 0.1 \]

Table 33. Fonger site exterior rim technique

<table>
<thead>
<tr>
<th></th>
<th>West village f</th>
<th>West village %</th>
<th>East village f</th>
<th>East village %</th>
<th>Row totals f</th>
<th>Row totals %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impressed motif</td>
<td>65</td>
<td>70.7</td>
<td>54</td>
<td>90.0</td>
<td>119</td>
<td>78.3</td>
</tr>
<tr>
<td>Incised motif</td>
<td>27</td>
<td>29.3</td>
<td>6</td>
<td>10.0</td>
<td>33</td>
<td>21.7</td>
</tr>
<tr>
<td>Column totals</td>
<td>92</td>
<td>100.0</td>
<td>60</td>
<td>100.0</td>
<td>152</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Testing difference between two percentages:

\[ t_s = 3.02, \ \text{ df} = 150, \ 0.001 < p < 0.01 \]
Table 34. Fonger site mean lip thickness*

(i) Correlation between lip thickness and pot mouth width on Fonger site vessels:

\[ n = 87, \text{Pearson's } r = +0.54 \]
\[ \text{df} = 85, \quad p < 0.001 \]

(ii) Comparison of mean lip thickness in west and east areas:

<table>
<thead>
<tr>
<th></th>
<th>West village</th>
<th>East village</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \bar{x} )</td>
<td>6.4</td>
<td>6.6</td>
</tr>
<tr>
<td>( s )</td>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td>( n )</td>
<td>45</td>
<td>42</td>
</tr>
</tbody>
</table>

Student's \( t = 0.08 \), \( \text{df} = 85 \), \( p > 0.9 \)

* lip thickness measured in mm

Table 35. Fonger site mean collar height

<table>
<thead>
<tr>
<th>Village area</th>
<th>Mean collar height (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \bar{x} )</td>
</tr>
<tr>
<td>West</td>
<td>10.0</td>
</tr>
<tr>
<td>East</td>
<td>9.2</td>
</tr>
</tbody>
</table>

\( F_s = 2.01, \quad 0.1 > p > 0.05 \)

Student's \( t = 0.16 \), \( \text{df} = 74 \), \( p > 0.9 \)
Table 36. Fonger site mean maximum temper size

<table>
<thead>
<tr>
<th>Village area</th>
<th>Mean maximum temper size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \bar{x} )</td>
</tr>
<tr>
<td>West</td>
<td>2.5</td>
</tr>
<tr>
<td>East</td>
<td>2.4</td>
</tr>
</tbody>
</table>

Student's \( t = 0.052 \), \( df=122 \), \( p > 0.9 \)
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